

# 图书情报专题研究

最新学科研究热点与前沿

( 2020 )

第 4 期

西北工业大学图书馆

2021 年 1 月

# 前 言

《图书情报专题研究》的宗旨是为我校师生开展学术研究提供有价值的参考信息，此项工作由图书馆信息咨询服务部承担。“最新学科研究热点与前沿”根据学校所购买的数字资源，通过分析其深层次的功能，从数据库中组织整理出了与我校学科领域相关的最新学科热点研究论文、最新研究前沿及最新国际会议信息等，以期能对我校师生开展学术研究、项目立项、开题等学术研究活动提供帮助。

本期收集整理如下七个方面的热点文献和前沿信息：

1、Nature Latest Research, Nature Physics 最新研究进展；

2、IEL Top25, IEL 数据库下载最多的 25 篇论文；

3、ESI (Essential Science Indicators) HOT PAPERS, 按照 ESI 某一学科热点论文被引频次排名选取前 25 篇；

4、ESI (Essential Science Indicators) HIGHLY CITED PAPERS, 按照 ESI 某一学科高被引论文被引频次排名选取前 25 篇；

5、AIAA、IAF 最新会议，由 AIAA、IAF 主站提供的最新会议信息，可供相关研究者参考；

6、ACM 最新会议，根据 ACM 主页所提供的最新会议信息整理所得，可供相关研究者参考；

7、IQPC 最新会议，由国际质量与竞争力中心 (IQPC: International Quality and Productivity Center) 提供的最新国际会议，内容涉及国防、能源、工业、科技、电信等领域。IQPC 是国际顶级的会议展览策划公司，于 1973 年成立于美国，旨在为全球业务主管提供量身定制的会议、大型会展以及培训课程，积极为行业人士的相互交流创建平台，使业内人士能够随时掌握行业发展的最新趋势及技术创新。

如果您对我们的栏目设置、内容编排等有好的意见和建议，欢迎与我们联系 (电话：88492928)，我们将积极采纳，使这份电子刊物日臻完善，共同为把我校建成学科特色鲜明的世界一流大学而努力。

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## *NatureLatest Research(Physics)*

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来源: <https://www.nature.com/nphys/research>

**1.标题:** Ultrafast manipulation of the weakly bound helium dimer

**作者:** Maksim Kunitski, Qingze Guan, Holger Maschkiwitz, Jörg Hahnenbruch, Sebastian Eckart, Stefan Zeller, Anton Kalinin, Markus Schöffler, Lothar Ph. H. Schmidt, Till Jahnke, Dörte Blume & Reinhard Dörner

**摘要:** Controlling the interactions between atoms with external fields opened up new branches in physics ranging from strongly correlated atomic systems to ideal Bose<sup>1</sup> and Fermi<sup>2</sup> gases and Efimov physics<sup>3,4</sup>. Such control usually prepares samples that are stationary or evolve adiabatically in time. In contrast, in molecular physics, external ultrashort laser fields are used to create anisotropic potentials that launch ultrafast rotational wave packets and align molecules in free space<sup>5</sup>. Here we combine these two regimes of ultrafast times and low energies. We apply a short laser pulse to the helium dimer, a weakly bound and highly delocalized single bound state quantum system. The laser field locally tunes the interaction between two helium atoms, imparting an angular momentum of  $2\hbar$  and evoking an initially confined dissociative wave packet. We record a video of the density and phase of this wave packet as it propagates from small to large internuclear distances. At large internuclear distances, where the interaction between atoms is negligible, the wave packet is essentially free. This work paves the way for future tomography of wave-packet dynamics and provides the technique for studying exotic and otherwise hardly accessible quantum systems, such as halo and Efimov states.

**链接:** <https://www.nature.com/articles/s41567-020-01081-3>

**2.标题:** Zero-refractive-index materials and topological photonics

**作者:** S. A. R. Horsley & M. Woolley

**摘要:** The refractive index is one of the most basic optical properties of a material and its interaction with light. Modern materials engineering—particularly the concept of metamaterials—has made it necessary to consider its subtleties, including anisotropy and complex values. Here we re-examine the refractive index and find a general way to calculate the direction-dependent refractive index and the condition for zero index in a given direction. By analogy with linear versus circular polarization, we show that when the zero-index direction is complex-valued, a material supports waves that can propagate in only one sense, for example, clockwise. We show that there is an infinite family of both time-reversible and time-irreversible homogeneous electromagnetic media that support unidirectional propagation for a particular polarization. As well as extending the concept of the refractive index, shedding new light on our understanding of topological photonics and providing new sets of material parameters, our simple picture also reproduces many of the findings derived using topology.

**链接:** <https://www.nature.com/articles/s41567-020-01082-2>

**3.标题:** Topological defects in the nematic order of actin fibres as organization centres of Hydra morphogenesis

**作者:** Yonit Maroudas-Sacks, Liora Garion, Lital Shani-Zerbib, Anton Livshits, Erez Braun & Kinneret Keren

**摘要:** Animal morphogenesis arises from the complex interplay between multiple mechanical and biochemical processes with mutual feedback. Developing an effective, coarse-grained description of morphogenesis is essential for understanding how these processes are coordinated across scales to form robust, functional outcomes. Here we show that the nematic order of the supracellular actin fibres in regenerating Hydra defines a slowly varying field, whose dynamics provide an effective description of the morphogenesis process. We show that topological defects in this field, which are long-lived yet display rich dynamics, act as organization centres with morphological features developing at defect sites. These observations suggest that the nematic orientation field can be considered a ‘mechanical morphogen’ whose dynamics, in conjugation with various biochemical and mechanical signalling processes, result in the robust emergence of functional patterns during morphogenesis.

**链接:** <https://www.nature.com/articles/s41567-020-01083-1>

**4.标题:** Ultrafast spin current generated from an antiferromagnet

**作者:** Hongsong Qiu, Lifan Zhou, Caihong Zhang, Jingbo Wu, Yuanzhe Tian, Shaodong Cheng, Shaobo Mi, Haibin Zhao, Qi Zhang, Di Wu, Biaobing Jin, Jian Chen & Peiheng Wu

**摘要:** Antiferromagnets (AFMs) have the potential to push spintronic devices from a static condition or gigahertz frequency range to the terahertz range for the sake of high-speed processing. However, the insensitivity of AFMs to magnetic fields makes the manipulation of spin currents difficult. The ultrafast generation of the spin current in ferromagnet/heavy-metal (HM) structures has received a lot of attention in recent years, but whether a similar scenario can be observed in an AFM/HM system is still unknown. Here, we show the optical generation of ultrafast spin current in an AFM/HM heterostructure at zero external magnetic field and at room temperature by detecting the associated terahertz emission. We believe that this is a common phenomenon in antiferromagnets with strong nonlinear optical effects. Our results open an avenue of fundamental research into antiferromagnetism and a route to AFM spintronic devices.

**链接:** <https://www.nature.com/articles/s41567-020-01061-7>

**5.标题:** Resonant phase-matching between a light wave and a free-electron wavefunction

**作者:** Raphael Dahan, Saar Nehemia, Michael Shentcic, Ori Reinhardt, Yuval Adiv, Xihang Shi, Orr Be'er, Morgan H. Lynch, Yaniv Kurman, Kangpeng Wang & Ido Kaminer

**摘要:** Quantum light - matter interactions of bound electron systems have been studied extensively. By contrast, quantum interactions of free electrons with light have only become accessible in recent years, following the discovery of photon-induced near-field electron microscopy (PINEM). So far, the fundamental free electron - light interaction in all PINEM experiments has remained weak due to its localized near-field nature, which imposes an energy - momentum mismatch between electrons and light. Here, we demonstrate a strong interaction between free-electron waves and light waves, resulting from precise energy - momentum phase-matching with the extended propagating light field. By exchanging hundreds of photons with the field, each electron simultaneously accelerates and



decelerates in a coherent manner. Consequently, each electron's quantum wavefunction evolves into a quantized energy comb, spanning a bandwidth of over 1,700 eV, requiring us to extend the PINEM theory. Our observation of coherent electron phase-matching with a propagating wave is a type of inverse-Cherenkov interaction that occurs with a quantum electron wavefunction, demonstrating how the extended nature of the electron wavefunction can alter stimulated electron - light interactions.

链接: <https://www.nature.com/articles/s41567-020-01042-w>

**6.标题:** Directional self-locomotion of active droplets enabled by nematic environment

**作者:** Mojtaba Rajabi, Hend Baza, Taras Turiv & Oleg D. Lavrentovich

**摘要:** Active matter composed of self-propelled interacting units holds a major promise for the extraction of useful work from its seemingly chaotic dynamics. Streamlining active matter is especially important at the microscale, where the viscous forces prevail over inertia and transport requires a non-reciprocal motion. Here we report that microscopic active droplets representing aqueous dispersions of swimming bacteria *Bacillus subtilis* become unidirectionally motile when placed in an inactive nematic liquid-crystal medium. Random motion of bacteria inside the droplet is rectified into a directional self-locomotion of the droplet by the polar director structure that the droplet creates in the surrounding nematic through anisotropic molecular interactions at its surface. Droplets without active swimmers show no net displacement. The trajectory of the active droplet can be predesigned by patterning the molecular orientation of the nematic. The effect demonstrates that broken spatial symmetry of the medium can be the reason for and the means to control directional microscale transport.

链接: <https://www.nature.com/articles/s41567-020-01055-5>

**7.标题:** Electrically tunable correlated and topological states in twisted monolayer - bilayer graphene

**作者:** Shaowen Chen, Minhao He, Ya-Hui Zhang, Valerie Hsieh, Zaiyao Fei, K. Watanabe, T. Taniguchi, David H. Cobden, Xiaodong Xu, Cory R. Dean & Matthew Yankowitz

**摘要:** Twisted van der Waals heterostructures with flat electronic bands have recently emerged as a platform for realizing correlated and topological states with a high degree of control and tunability. In graphene-based moiré heterostructures, the correlated phase diagram and band topology depend on the number of graphene layers and the details of the external environment from the encapsulating crystals. Here, we report that the system of twisted monolayer - bilayer graphene (tMBG) hosts a variety of correlated metallic and insulating states, as well as topological magnetic states. Because of its low symmetry, the phase diagram of tMBG approximates that of twisted bilayer graphene when an applied perpendicular electric field points from the bilayer towards the monolayer graphene, or twisted double bilayer graphene when the field is reversed. In the former case, we observe correlated states that undergo an orbitally driven insulating transition above a critical perpendicular magnetic field. In the latter case, we observe the emergence of electrically tunable ferromagnetism at one-quarter filling of the conduction band, and an associated anomalous Hall effect. The direction of the magnetization can be switched by electrostatic doping at zero magnetic field. Our results establish tMBG as a tunable platform for investigating correlated and topological states.

链接: <https://www.nature.com/articles/s41567-020-01062-6>



**8.标题:** Scale-invariant magnetic anisotropy in RuCl<sub>3</sub> at high magnetic fields

**作者:** K. A. Modic, Ross D. McDonald, J. P. C. Ruff, Maja D. Bachmann, You Lai, Johanna C. Palmstrom, David Graf, Mun K. Chan, F. F. Balakirev, J. B. Betts, G. S. Boebinger, Marcus Schmidt, Michael J. Lawler, D. A. Sokolov, Philip J. W. Moll, B. J. Ramshaw & Arkady Shekhter

**摘要:** In RuCl<sub>3</sub>, inelastic neutron scattering and Raman spectroscopy reveal a continuum of non-spin-wave excitations that persists to high temperature, suggesting the presence of a spin liquid state on a honeycomb lattice. In the context of the Kitaev model, finite magnetic fields introduce interactions between the elementary excitations, and thus the effects of high magnetic fields that are comparable to the spin-exchange energy scale must be explored. Here, we report measurements of the magnetotropic coefficient—the thermodynamic coefficient associated with magnetic anisotropy—over a wide range of magnetic fields and temperatures. We find that magnetic field and temperature compete to determine the magnetic response in a way that is independent of the large intrinsic exchange-interaction energy. This emergent scale-invariant magnetic anisotropy provides evidence for a high degree of exchange frustration that favours the formation of a spin liquid state in RuCl<sub>3</sub>.

**链接:** <https://www.nature.com/articles/s41567-020-1028-0>

**9.标题:** Intercontinental comparison of optical atomic clocks through very long baseline interferometry

**作者:** Marco Pizzocaro, Mamoru Sekido, Kazuhiro Takefuji, Hideki Ujihara, Hidekazu Hachisu, Nils Nemitz, Masanori Tsutsumi, Tetsuro Kondo, Eiji Kawai, Ryuichi Ichikawa, Kunitaka Namba, Yoshihiro Okamoto, Rumi Takahashi, Junichi Komuro, Cecilia Clivati, Filippo Bregolin, Piero Barbieri, Alberto Mura, Elena Cantoni, Giancarlo Cerretto, Filippo Levi, Giuseppe Maccaferri, Mauro Roma, Claudio Bortolotti, Monia Negusini, Roberto Ricci, Giampaolo Zacchiroli, Juri Roda, Julia Leute, Gérard Petit, Federico Perini, Davide Calonico & Tetsuya Ido -Show fewer authors

**摘要:** The comparison of distant atomic clocks is foundational to international timekeeping, global positioning and tests of fundamental physics. Optical-fibre links allow the most precise optical clocks to be compared, without degradation, over intracontinental distances up to thousands of kilometres, but intercontinental comparisons remain limited by the performance of satellite transfer techniques. Here we show that very long baseline interferometry (VLBI), although originally developed for radio astronomy and geodesy, can overcome this limit and compare remote clocks through the observation of extragalactic radio sources. We developed dedicated transportable VLBI stations that use broadband detection and demonstrate the comparison of two optical clocks located in Italy and Japan separated by 9,000 km. This system demonstrates performance beyond satellite techniques and can pave the way for future long-term stable international clock comparisons.

**链接:** <https://www.nature.com/articles/s41567-020-01038-6>

**10.标题:** Capturing the continuous complexity of behaviour in *Caenorhabditis elegans*

**作者:** Tosif Ahamed, Antonio C. Costa & Greg J. Stephens

**摘要:** Animal behaviour is often quantified through subjective, incomplete variables that mask essential dynamics. Here, we develop a maximally predictive behavioural-state space from multivariate measurements, in which the full instantaneous state is smoothly unfolded as a combination of short-time posture sequences. In the off-food behaviour of the roundworm



Caenorhabditis elegans, we discover a low-dimensional state space dominated by three sets of cyclic trajectories corresponding to the worm's basic stereotyped motifs: forward, backward and turning locomotion. We find similar results in the on-food behaviour of foraging worms and *npr-1* mutants. In contrast to this broad stereotypy, we find variability in the presence of locally unstable dynamics with signatures of deterministic chaos: a collection of unstable periodic orbits together with a positive maximal Lyapunov exponent. The full Lyapunov spectrum is symmetric with positive, chaotic exponents driving variability balanced by negative, dissipative exponents driving stereotypy. The symmetry is indicative of damped - driven Hamiltonian dynamics underlying the worm's movement control.

链接: <https://www.nature.com/articles/s41567-020-01036-8>

**11.标题:** Theory of mechanochemical patterning and optimal migration in cell monolayers

**作者:** Daniel Boocock, Naoya Hino, Natalia Ruzickova, Tsuyoshi Hirashima & Edouard Hannezo

**摘要:** Collective cell migration offers a rich field of study for non-equilibrium physics and cellular biology, revealing phenomena such as glassy dynamics, pattern formation and active turbulence. However, how mechanical and chemical signalling are integrated at the cellular level to give rise to such collective behaviours remains unclear. We address this by focusing on the highly conserved phenomenon of spatiotemporal waves of density and extracellular signal-regulated kinase (ERK) activation, which appear both *in vitro* and *in vivo* during collective cell migration and wound healing. First, we propose a biophysical theory, backed by mechanical and optogenetic perturbation experiments, showing that patterns can be quantitatively explained by a mechanochemical coupling between active cellular tensions and the mechanosensitive ERK pathway. Next, we demonstrate how this biophysical mechanism can robustly induce long-ranged order and migration in a desired orientation, and we determine the theoretically optimal wavelength and period for inducing maximal migration towards free edges, which fits well with experimentally observed dynamics. We thereby provide a bridge between the biophysical origin of spatiotemporal instabilities and the design principles of robust and efficient long-ranged migration.

链接: <https://www.nature.com/articles/s41567-020-01037-7>

**12.标题:** Inertial spin dynamics in ferromagnets

**作者:** Kumar Neeraj, Nilesh Awari, Sergey Kovalev, Debanjan Polley, Nanna Zhou Hagström, Sri Sai Phani Kanth Arekapudi, Anna Semisalova, Kilian Lenz, Bertram Green, Jan-Christoph Deinert, Igor Ilyakov, Min Chen, Mohammed Bawatna, Valentino Scalera, Massimiliano d' Aquino, Claudio Serpico, Olav Hellwig, Jean-Eric Wegrowe, Michael Gensch & Stefano Bonetti

**摘要:** The understanding of how spins move and can be manipulated at pico- and femtosecond timescales has implications for ultrafast and energy-efficient data-processing and storage applications. However, the possibility of realizing commercial technologies based on ultrafast spin dynamics has been hampered by our limited knowledge of the physics behind processes on this timescale. Recently, it has been suggested that inertial effects should be considered in the full description of the spin dynamics at these ultrafast timescales, but a clear observation of such effects in ferromagnets is still lacking. Here, we report direct experimental evidence of intrinsic inertial spin dynamics in ferromagnetic thin films in the form of a nutation of the magnetization at a frequency of  $\sim 0.5$  THz. This allows us to reveal that the angular momentum relaxation time in ferromagnets is on the order of





10 ps.

链接: <https://www.nature.com/articles/s41567-020-01040-y>

**13.标题:** Entanglement between distant macroscopic mechanical and spin systems

**作者:** Rodrigo A. Thomas, Michał Parniak, Christoffer Østfeldt, Christoffer B. Møller, Christian Bærentsen, Yeghishe Tsaturyan, Albert Schliesser, Jürgen Appel, Emil Zeuthen & Eugene S. Polzik

**摘要:** Entanglement is an essential property of multipartite quantum systems, characterized by the inseparability of quantum states of objects regardless of their spatial separation. Generation of entanglement between increasingly macroscopic and disparate systems is an ongoing effort in quantum science, as it enables hybrid quantum networks, quantum-enhanced sensing and probing of the fundamental limits of quantum theory. The disparity of hybrid systems and the vulnerability of quantum correlations have thus far hampered the generation of macroscopic hybrid entanglement. Here, we generate an entangled state between the motion of a macroscopic mechanical oscillator and a collective atomic spin oscillator, as witnessed by an Einstein - Podolsky - Rosen variance below the separability limit,  $0.83 \pm 0.02 < 1$ . The mechanical oscillator is a millimetre-size dielectric membrane and the spin oscillator is an ensemble of 109 atoms in a magnetic field. Light propagating through the two spatially separated systems generates entanglement because the collective spin plays the role of an effective negative-mass reference frame and provides—under ideal circumstances—a back-action-free subspace; in the experiment, quantum back-action is suppressed by 4.6 dB.

链接: <https://www.nature.com/articles/s41567-020-1031-5>

**14.标题:** Time - information uncertainty relations in thermodynamics

**作者:** Schuyler B. Nicholson, Luis Pedro García-Pintos, Adolfo del Campo & Jason R. Green

**摘要:** Physical systems powering motion and creating structure in a fixed amount of time dissipate energy and produce entropy. Whether living, synthetic or engineered, systems performing these dynamic functions must balance dissipation and speed. Here, we show that rates of energy and entropy exchange are subject to a speed limit—a time - information uncertainty relation—imposed by the rates of change in the information content of the system. This uncertainty relation bounds the time that elapses before the change in a thermodynamic quantity has the same magnitude as its s.d. From this general bound, we establish a family of speed limits for heat, dissipated/chemical work and entropy depending on the experimental constraints on the system and its environment. In all of these inequalities, the timescale of transient dynamical fluctuations is universally bounded by the Fisher information. Moreover, they all have a mathematical form that mirrors the Mandelstam - Tamm version of the time - energy uncertainty relation in quantum mechanics. These bounds on the speed of arbitrary observables apply to transient systems away from thermodynamic equilibrium, independent of the physical constraints on the stochastic dynamics or their function.

链接: <https://www.nature.com/articles/s41567-020-0981-y>

**15.标题:** Machine learning the thermodynamic arrow of time

**作者:** Alireza Seif, Mohammad Hafezi & Christopher Jarzynski

**摘要:** The asymmetry in the flow of events that is expressed by the phrase ‘time’ s arrow’ traces back to the second law of thermodynamics. In the microscopic regime, fluctuations prevent us from discerning the direction of time’ s arrow with certainty. Here, we find that a machine learning

algorithm that is trained to infer the direction of time' s arrow identifies entropy production as the relevant physical quantity in its decision-making process. Effectively, the algorithm rediscovers the fluctuation theorem as the underlying thermodynamic principle. Our results indicate that machine learning techniques can be used to study systems that are out of equilibrium, and ultimately to answer open questions and uncover physical principles in thermodynamics.

链接: <https://www.nature.com/articles/s41567-020-1018-2>

**16.标题:** Observation of energy-resolved many-body localization

**作者:** Qiujiang Guo, Chen Cheng, Zheng-Hang Sun, Zixuan Song, Hekang Li, Zhen Wang, Wenhui Ren, Hang Dong, Dongning Zheng, Yu-Ran Zhang, Rubem Mondaini, Heng Fan & H. Wang

**摘要:** Many-body localization (MBL) describes a quantum phase where an isolated interacting system subject to sufficient disorder displays non-ergodic behaviour, evading thermal equilibrium that occurs under its own dynamics. Previously, the thermalization – MBL transition has been largely characterized with the growth of disorder. Here, we explore a new axis, reporting on an energy-resolved MBL transition using a 19-qubit programmable superconducting processor, which enables precise control and flexibility of both disorder strength and initial state preparation. We observe that the onset of localization occurs at different disorder strengths, with distinguishable energy scales, by measuring time-evolved observables and quantities related to many-body wave functions. Our results open avenues for the experimental exploration of many-body mobility edges in MBL systems, whose existence is widely debated due to the finiteness of the system size, and where exact simulations in classical computers become unfeasible.

链接: <https://www.nature.com/articles/s41567-020-1035-1>

**17.标题:** Morphology selection kinetics of crystallization in a sphere

**作者:** Yanshuang Chen, Zhenwei Yao, Shixiang Tang, Hua Tong, Taiki Yanagishima, Hajime Tanaka & Peng Tan

**摘要:** Crystallization under geometrical confinement is of fundamental importance in condensed matter physics, biophysics and material science. Even the influence of the simplest geometry, a sphere, on crystallization remains far from well understood, thereby making morphology control of the final superstructures challenging. Here, we employ charged colloids encapsulated in an emulsion droplet as a model system to access the crystallization kinetics at the single-particle level. We find rapid formation of ‘skin’ layers with an icosahedral arrangement of defects under the geometrical frustration effect, followed by interior ordering and slow ripening. The final morphologies are determined by dynamical interplay between the system-independent skin layer formation and the system-dependent structural transformation towards the most stable solid far from the surface. We reveal the crucial role of kinetics in morphological selection under a geometrical constraint, besides the thermodynamics, which may shed new light on the structural design of nanoscale crystals.

链接: <https://www.nature.com/articles/s41567-020-0991-9>

**18.标题:** Weak-to-strong transition of quantum measurement in a trapped-ion system

**作者:** Yiming Pan, Jie Zhang, Eliahu Cohen, Chun-wang Wu, Ping-Xing Chen & Nir Davidson

**摘要:** Quantum measurement remains a puzzle through its stormy history from the birth of quantum mechanics to state-of-the-art quantum technologies. Two complementary measurement schemes have

been widely investigated in a variety of quantum systems: von Neumann's projective 'strong' measurement and Aharonov's weak measurement. Here, we report the observation of a weak-to-strong measurement transition in a single trapped  $40\text{Ca}^+$  ion system. The transition is realized by tuning the interaction strength between the ion's internal electronic state and its vibrational motion, which play the roles of the measured system and the measuring pointer, respectively. By pre- and post-selecting the internal state, a pointer state composed of two of the ion's motional wavepackets is obtained, and its central-position shift, which corresponds to the measurement outcome, demonstrates the transition from the weak-value asymptotes to the expectation-value asymptotes. Quantitatively, the weak-to-strong measurement transition is characterized by a universal transition factor  $e^{-\Gamma/2}$ , where  $\Gamma$  is a dimensionless parameter related to the system - apparatus coupling. This transition, which continuously connects weak measurements and strong measurements, may open new experimental possibilities to test quantum foundations and prompt us to re-examine and improve the measurement schemes of related quantum technologies.

链接: <https://www.nature.com/articles/s41567-020-0973-y>

**19.标题:** Generalized superradiance for producing broadband coherent radiation with transversely modulated arbitrarily diluted bunches

作者: J. Vieira, M. Pardal, J. T. Mendonça & R. A. Fonseca

摘要: Superradiance is the anomalous radiance describing coherent photon emission from a gas. It plays a crucial role in atomic physics, quantum mechanics and astrophysics. Because the intensity of superradiant light beams is proportional to the number of particles squared, superradiance is also at the core of today's most powerful light sources. Superradiant emission is intuitively expected when the distance between light-emitting particles is much smaller than the photon wavelength. Here, we break this assumption by predicting a never considered superradiance effect that holds even when the particle number per wavelength vanishes. We discover that a bunch of relativistic charged particles arranged in certain ways can generate an optical shock along the Vavilov - Cherenkov angle in vacuum, thereby concentrating broadband radiation in any spectral region into single light bullets. The process leaves clear experimental signatures, and we illustrate it in the form of a previously unrecognized nonlinear superradiant Thomson scattering. This concept may enable new forms of superradiant emission in advanced light sources, atomic physics systems, and unlock coherent emission in plasma accelerators.

链接: <https://www.nature.com/articles/s41567-020-0995-5>

**20.标题:** Underground test of gravity-related wave function collapse

作者: Sandro Donadi, Kristian Piscicchia, Catalina Curceanu, Lajos Diósi, Matthias Laubenstein & Angelo Bassi

摘要: Roger Penrose proposed that a spatial quantum superposition collapses as a back-reaction from spacetime, which is curved in different ways by each branch of the superposition. In this sense, one speaks of gravity-related wave function collapse. He also provided a heuristic formula to compute the decay time of the superposition—similar to that suggested earlier by Lajos Diósi, hence the name Diósi - Penrose model. The collapse depends on the effective size of the mass density of particles in the



superposition, and is random: this randomness shows up as a diffusion of the particles' motion, resulting, if charged, in the emission of radiation. Here, we compute the radiation emission rate, which is faint but detectable. We then report the results of a dedicated experiment at the Gran Sasso underground laboratory to measure this radiation emission rate. Our result sets a lower bound on the effective size of the mass density of nuclei, which is about three orders of magnitude larger than previous bounds. This rules out the natural parameter-free version of the Diósi - Penrose model.

链接: <https://www.nature.com/articles/s41567-020-1008-4>

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## *IEL Top25*

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(来源: <http://ieeexplore.ieee.org/>)

1. **标题:** COVID-19 Artificial Intelligence Diagnosis Using Only Cough Recordings

**出处:** IEEE Open Journal of Engineering in Medicine and Biology

**作者:** Jordi Laguarda; Ferran Hueto; Brian Subirana

**摘要:** Goal: We hypothesized that COVID-19 subjects, especially including asymptomatics, could be accurately discriminated only from a forced-cough cell phone recording using Artificial Intelligence. To train our MIT Open Voice model we built a data collection pipeline of COVID-19 cough recordings through our website ([opensigma.mit.edu](https://opensigma.mit.edu)) between April and May 2020 and created the largest audio COVID-19 cough balanced dataset reported to date with 5,320 subjects. Methods: We developed an AI speech processing framework that leverages acoustic biomarker feature extractors to pre-screen for COVID-19 from cough recordings, and provide a personalized patient saliency map to longitudinally monitor patients in real-time, non-invasively, and at essentially zero variable cost. Cough recordings are transformed with Mel Frequency Cepstral Coefficient and inputted into a Convolutional Neural Network (CNN) based architecture made up of one Poisson biomarker layer and 3 pre-trained ResNet50's in parallel, outputting a binary pre-screening diagnostic. Our CNN-based models have been trained on 4256 subjects and tested on the remaining 1064 subjects of our dataset. Transfer learning was used to learn biomarker features on larger datasets, previously successfully tested in our Lab on Alzheimer's, which significantly improves the COVID-19 discrimination accuracy of our architecture. Results: When validated with subjects diagnosed using an official test, the model achieves COVID-19 sensitivity of 98.5% with a specificity of 94.2% (AUC: 0.97). For asymptomatic subjects it achieves sensitivity of 100% with a specificity of 83.2% . Conclusions: AI techniques can produce a free, non-invasive, real-time, any-time, instantly distributable, large-scale COVID-19 asymptomatic screening tool to augment current approaches in containing the spread of COVID-19. Practical use cases could be for daily screening of students, workers, and public as schools, jobs, and transport reopen, or for pool testing to quickly alert of outbreaks in groups. General speech biomarkers may exist that cover several disease categories, as we demonstrated using the same ones for COVID-19 and Alzheimer's.

**链接:** <https://ieeexplore.ieee.org/document/9208795>

2. **标题:** Phantom Malware: Conceal Malicious Actions From Malware Detection Techniques by Imitating User Activity

**出处:** IEEE Access

**作者:** Tim Niklas Witte

**摘要:** State of the art malware detection techniques only consider the interaction of programs with the operating system's API (system calls) for malware classification. This paper demonstrates that techniques like these are insufficient. A point that is overlooked by the currently existing techniques is presented in this paper: Malware is able to interact with windows providing the corresponding

functionality in order to execute the desired action by mimicking user activity. In other words, harmful actions will be masked as simulated user actions. To start with, the article introduces User Imitating techniques for concealing malicious commands of the malware as impersonated user activity. Thereafter, the concept of Phantom Malware will be presented: This malware is constantly applying User Imitating to execute each of its malicious actions. A Phantom Ransomware (ransomware employs the User Imitating for every of its malicious actions) is implemented in C++ for testing anti-virus programs in Windows 10. Software of various manufacturers are applied for testing purposes. All of them failed without exception. This paper analyzes the reasons why these products failed and further, presents measures that have been developed against Phantom Malware based on the test results.

链接: <https://ieeexplore.ieee.org/document/9186656>

3. 标题: Internet of Things for Smart Cities

出处: IEEE Internet of Things Journal

作者: Andrea Zanella; Nicola Bui; Angelo Castellani; Lorenzo Vangelista; Michele Zorzi

摘要: The Internet of Things (IoT) shall be able to incorporate transparently and seamlessly a large number of different and heterogeneous end systems, while providing open access to selected subsets of data for the development of a plethora of digital services. Building a general architecture for the IoT is hence a very complex task, mainly because of the extremely large variety of devices, link layer technologies, and services that may be involved in such a system. In this paper, we focus specifically to an urban IoT system that, while still being quite a broad category, are characterized by their specific application domain. Urban IoTs, in fact, are designed to support the Smart City vision, which aims at exploiting the most advanced communication technologies to support added-value services for the administration of the city and for the citizens. This paper hence provides a comprehensive survey of the enabling technologies, protocols, and architecture for an urban IoT. Furthermore, the paper will present and discuss the technical solutions and best-practice guidelines adopted in the Padova Smart City project, a proof-of-concept deployment of an IoT island in the city of Padova, Italy, performed in collaboration with the city municipality.

链接: <https://ieeexplore.ieee.org/document/6740844>

4. 标题: Peeking Inside the Black-Box: A Survey on Explainable Artificial Intelligence (XAI)

出处: IEEE Access

作者: Amina Adadi; Mohammed Berrada

摘要: At the dawn of the fourth industrial revolution, we are witnessing a fast and widespread adoption of artificial intelligence (AI) in our daily life, which contributes to accelerating the shift towards a more algorithmic society. However, even with such unprecedented advancements, a key impediment to the use of AI-based systems is that they often lack transparency. Indeed, the black-box nature of these systems allows powerful predictions, but it cannot be directly explained. This issue has triggered a new debate on explainable AI (XAI). A research field holds substantial promise for improving trust and transparency of AI-based systems. It is recognized as the sine qua non for AI to continue making steady progress without disruption. This survey provides an entry point for interested researchers and practitioners to learn key aspects of the young and rapidly growing body of research related to XAI. Through the lens of the literature, we review the existing approaches



regarding the topic, discuss trends surrounding its sphere, and present major research trajectories.

链接: <https://ieeexplore.ieee.org/document/8466590>

5. 标题: Artificial Intelligence and COVID-19: Deep Learning Approaches for Diagnosis and Treatment

出处: IEEE Access

作者: Mohammad Jamshidi; Ali Lalbakhsh; Jakub Talla; Zdeněk Peroutka; Farimah Hadjilooei; Pedram Lalbakhsh; Morteza Jamshidi; Luigi La Spada; Mirhamed Mirmozafari; Mojgan Deghani; Asal Sabet; Saeed Roshani; Sobhan Roshani; Nima Bayat-Makou; Bahare Mohamadzade; Zahra Malek; Alireza Jamshidi; Sarah Kiani; Hamed Hashemi-Dezaki; Wahab Mohyuddin

摘要: COVID-19 outbreak has put the whole world in an unprecedented difficult situation bringing life around the world to a frightening halt and claiming thousands of lives. Due to COVID-19's spread in 212 countries and territories and increasing numbers of infected cases and death tolls mounting to 5,212,172 and 334,915 (as of May 22 2020), it remains a real threat to the public health system. This paper renders a response to combat the virus through Artificial Intelligence (AI). Some Deep Learning (DL) methods have been illustrated to reach this goal, including Generative Adversarial Networks (GANs), Extreme Learning Machine (ELM), and Long/Short Term Memory (LSTM). It delineates an integrated bioinformatics approach in which different aspects of information from a continuum of structured and unstructured data sources are put together to form the user-friendly platforms for physicians and researchers. The main advantage of these AI-based platforms is to accelerate the process of diagnosis and treatment of the COVID-19 disease. The most recent related publications and medical reports were investigated with the purpose of choosing inputs and targets of the network that could facilitate reaching a reliable Artificial Neural Network-based tool for challenges associated with COVID-19. Furthermore, there are some specific inputs for each platform, including various forms of the data, such as clinical data and medical imaging which can improve the performance of the introduced approaches toward the best responses in practical applications.

链接: <https://ieeexplore.ieee.org/document/9115663>

6. 标题: SegNet: A Deep Convolutional Encoder-Decoder Architecture for Image Segmentation

出处: IEEE Transactions on Pattern Analysis and Machine Intelligence

作者: Vijay Badrinarayanan; Alex Kendall; Roberto Cipolla

摘要: We present a novel and practical deep fully convolutional neural network architecture for semantic pixel-wise segmentation termed SegNet. This core trainable segmentation engine consists of an encoder network, a corresponding decoder network followed by a pixel-wise classification layer. The architecture of the encoder network is topologically identical to the 13 convolutional layers in the VGG16 network [1]. The role of the decoder network is to map the low resolution encoder feature maps to full input resolution feature maps for pixel-wise classification. The novelty of SegNet lies in the manner in which the decoder upsamples its lower resolution input feature map(s). Specifically, the decoder uses pooling indices computed in the max-pooling step of the corresponding encoder to perform non-linear upsampling. This eliminates the need for learning to upsample. The upsampled maps are sparse and are then convolved with trainable filters to produce dense feature maps. We compare our proposed architecture with the widely adopted FCN [2] and also



with the well known DeepLab-LargeFOV [3], DeconvNet [4] architectures. This comparison reveals the memory versus accuracy trade-off involved in achieving good segmentation performance. SegNet was primarily motivated by scene understanding applications. Hence, it is designed to be efficient both in terms of memory and computational time during inference. It is also significantly smaller in the number of trainable parameters than other competing architectures and can be trained end-to-end using stochastic gradient descent. We also performed a controlled benchmark of SegNet and other architectures on both road scenes and SUN RGB-D indoor scene segmentation tasks. These quantitative assessments show that SegNet provides good performance with competitive inference time and most efficient inference memory-wise as compared to other architectures.

链接: <https://ieeexplore.ieee.org/document/7803544>

7. 标题: A Comprehensive Review of the COVID-19 Pandemic and the Role of IoT, Drones, AI, Blockchain, and 5G in Managing its Impact

出处: IEEE Access

作者: Vinay Chamola; Vikas Hassija; Vatsal Gupta; Mohsen Guizani

摘要: The unprecedented outbreak of the 2019 novel coronavirus, termed as COVID-19 by the World Health Organization (WHO), has placed numerous governments around the world in a precarious position. The impact of the COVID-19 outbreak, earlier witnessed by the citizens of China alone, has now become a matter of grave concern for virtually every country in the world. The scarcity of resources to endure the COVID-19 outbreak combined with the fear of overburdened healthcare systems has forced a majority of these countries into a state of partial or complete lockdown. The number of laboratory-confirmed coronavirus cases has been increasing at an alarming rate throughout the world, with reportedly more than 3 million confirmed cases as of 30 April 2020. Adding to these woes, numerous false reports, misinformation, and unsolicited fears in regards to coronavirus, are being circulated regularly since the outbreak of the COVID-19. In response to such acts, we draw on various reliable sources to present a detailed review of all the major aspects associated with the COVID-19 pandemic. In addition to the direct health implications associated with the outbreak of COVID-19, this study highlights its impact on the global economy. In drawing things to a close, we explore the use of technologies such as the Internet of Things (IoT), Unmanned Aerial Vehicles (UAVs), blockchain, Artificial Intelligence (AI), and 5G, among others, to help mitigate the impact of COVID-19 outbreak.

链接: <https://ieeexplore.ieee.org/document/9086010>

8. 标题: Molecular Mimicry between SARS Coronavirus Spike Protein and Human Protein

出处: 2007 Frontiers in the Convergence of Bioscience and Information Technologies

作者: Kuo-Yuan Hwa; Wan Man Lin; Yung-I Hou; Trai-Ming Yeh

摘要: Molecular mimicry defined as similar structures shared by molecules from dissimilar genes or by their protein products, is a general strategy for pathogens to infect host cells. Therefore, identification of the molecular mimic regions of a pathogen may be helpful to understand the disease. Severe acute respiratory syndrome (SARS) is a new human respiratory infectious disease caused by SARS coronavirus (SARS-CoV). The virus uses the spike (S) protein to interact with the angiotensin converting enzyme 2, the host cell receptor. Our approach is to design a workflow with multiple bioinformatics tools in analyzing the sequence of spike protein of the SARS-CoV in searching its

similarity to human proteins. Furthermore, eleven peptides have been synthesized to validate the in silico results.

链接: <https://ieeexplore.ieee.org/document/4524122>

9. 标题: Deep Residual Learning for Image Recognition

出处: 2016 IEEE Conference on Computer Vision and Pattern Recognition (CVPR)

作者: Kaiming He; Xiangyu Zhang; Shaoqing Ren; Jian Sun

摘要: Deeper neural networks are more difficult to train. We present a residual learning framework to ease the training of networks that are substantially deeper than those used previously. We explicitly reformulate the layers as learning residual functions with reference to the layer inputs, instead of learning unreferenced functions. We provide comprehensive empirical evidence showing that these residual networks are easier to optimize, and can gain accuracy from considerably increased depth. On the ImageNet dataset we evaluate residual nets with a depth of up to 152 layers -  $8\times$  deeper than VGG nets [40] but still having lower complexity. An ensemble of these residual nets achieves 3.57% error on the ImageNet test set. This result won the 1st place on the ILSVRC 2015 classification task. We also present analysis on CIFAR-10 with 100 and 1000 layers. The depth of representations is of central importance for many visual recognition tasks. Solely due to our extremely deep representations, we obtain a 28% relative improvement on the COCO object detection dataset. Deep residual nets are foundations of our submissions to ILSVRC & COCO 2015 competitions<sup>1</sup>, where we also won the 1st places on the tasks of ImageNet detection, ImageNet localization, COCO detection, and COCO segmentation.

链接: <https://ieeexplore.ieee.org/document/7780459>

10. 标题: A Survey of COVID-19 Contact Tracing Apps

出处: IEEE Access

作者: Nadeem Ahmed; Regio A. Michelin; Wanli Xue; Sushmita Ruj; Robert Malaney; Salil S. Kanhere; Aruna Seneviratne; Wen Hu; Helge Janicke; Sanjay K. Jha

摘要: The recent outbreak of COVID-19 has taken the world by surprise, forcing lockdowns and straining public health care systems. COVID-19 is known to be a highly infectious virus, and infected individuals do not initially exhibit symptoms, while some remain asymptomatic. Thus, a non-negligible fraction of the population can, at any given time, be a hidden source of transmissions. In response, many governments have shown great interest in smartphone contact tracing apps that help automate the difficult task of tracing all recent contacts of newly identified infected individuals. However, tracing apps have generated much discussion around their key attributes, including system architecture, data management, privacy, security, proximity estimation, and attack vulnerability. In this article, we provide the first comprehensive review of these much-discussed tracing app attributes. We also present an overview of many proposed tracing app examples, some of which have been deployed countrywide, and discuss the concerns users have reported regarding their usage. We close by outlining potential research directions for next-generation app design, which would facilitate improved tracing and security performance, as well as wide adoption by the population at large.

链接: <https://ieeexplore.ieee.org/document/9144194>

11. **标题:** A Survey of 5G Network: Architecture and Emerging Technologies

**出处:** IEEE Access

**作者:** A. Gupta; R. K. Jha

**摘要:** In the near future, i.e., beyond 4G, some of the prime objectives or demands that need to be addressed are increased capacity, improved data rate, decreased latency, and better quality of service. To meet these demands, drastic improvements need to be made in cellular network architecture. This paper presents the results of a detailed survey on the fifth generation (5G) cellular network architecture and some of the key emerging technologies that are helpful in improving the architecture and meeting the demands of users. In this detailed survey, the prime focus is on the 5G cellular network architecture, massive multiple input multiple output technology, and device-to-device communication (D2D). Along with this, some of the emerging technologies that are addressed in this paper include interference management, spectrum sharing with cognitive radio, ultra-dense networks, multi-radio access technology association, full duplex radios, millimeter wave solutions for 5G cellular networks, and cloud technologies for 5G radio access networks and software defined networks. In this paper, a general probable 5G cellular network architecture is proposed, which shows that D2D, small cell access points, network cloud, and the Internet of Things can be a part of 5G cellular network architecture. A detailed survey is included regarding current research projects being conducted in different countries by research groups and institutions that are working on 5G technologies.

**链接:** <https://ieeexplore.ieee.org/document/7169508>

12. **标题:** Deep Learning for Health Informatics

**出处:** IEEE Journal of Biomedical and Health Informatics

**作者:** Daniele Ravi; Charence Wong; Fani Deligianni; Melissa Berthelot; Javier Andreu-Perez; Benny Lo; Guang-Zhong Yang

**摘要:** With a massive influx of multimodality data, the role of data analytics in health informatics has grown rapidly in the last decade. This has also prompted increasing interests in the generation of analytical, data driven models based on machine learning in health informatics. Deep learning, a technique with its foundation in artificial neural networks, is emerging in recent years as a powerful tool for machine learning, promising to reshape the future of artificial intelligence. Rapid improvements in computational power, fast data storage, and parallelization have also contributed to the rapid uptake of the technology in addition to its predictive power and ability to generate automatically optimized high-level features and semantic interpretation from the input data. This article presents a comprehensive up-to-date review of research employing deep learning in health informatics, providing a critical analysis of the relative merit, and potential pitfalls of the technique as well as its future outlook. The paper mainly focuses on key applications of deep learning in the fields of translational bioinformatics, medical imaging, pervasive sensing, medical informatics, and public health.

**链接:** <https://ieeexplore.ieee.org/document/7801947>

13. 标题: The Impact of COVID-19 on Consumers: Preparing for Digital Sales

出处: IEEE Engineering Management Review

作者: Rae Yule Kim

摘要: COVID-19 has affected everyone's daily lives. At least 316 million people in 42 states have been asked to stay at home to slow down the pandemic. In this aspect, businesses have been susceptible to make substantial transformations. Workplace operations of many businesses went virtual. The effect of the digital transformation on productivity and corporate culture has been studied extensively. Meanwhile, how COVID-19 has influenced consumers and the consumption culture has received relatively limited attention. Managers often take a wait-and-see approach on the impact of COVID-19 on sales. It is often uncertain whether and how many customers will return after the pandemic passes. Consumers live through the pandemic, and some changes might be long-lasting even after the situation eases. We examine the pandemic as an accelerator of the structural change in consumption and the digital transformation in the marketplace. Managers might adapt to the digital transformation in the market to recover or even grow further the sales after COVID-19.

链接: <https://ieeexplore.ieee.org/document/9076858>

14. 标题: Blockchains and Smart Contracts for the Internet of Things

出处: IEEE Access

作者: Konstantinos Christidis; Michael Devetsikiotis

摘要: Motivated by the recent explosion of interest around blockchains, we examine whether they make a good fit for the Internet of Things (IoT) sector. Blockchains allow us to have a distributed peer-to-peer network where non-trusting members can interact with each other without a trusted intermediary, in a verifiable manner. We review how this mechanism works and also look into smart contracts-scripts that reside on the blockchain that allow for the automation of multi-step processes. We then move into the IoT domain, and describe how a blockchain-IoT combination: 1) facilitates the sharing of services and resources leading to the creation of a marketplace of services between devices and 2) allows us to automate in a cryptographically verifiable manner several existing, time-consuming workflows. We also point out certain issues that should be considered before the deployment of a blockchain network in an IoT setting: from transactional privacy to the expected value of the digitized assets traded on the network. Wherever applicable, we identify solutions and workarounds. Our conclusion is that the blockchain-IoT combination is powerful and can cause significant transformations across several industries, paving the way for new business models and novel, distributed applications.

链接: <https://ieeexplore.ieee.org/document/7467408>

15. 标题: A Survey on Transfer Learning

出处: IEEE Transactions on Knowledge and Data Engineering

作者: Sinno Jialin Pan; Qiang Yang

摘要: A major assumption in many machine learning and data mining algorithms is that the training and future data must be in the same feature space and have the same distribution. However, in many real-world applications, this assumption may not hold. For example, we sometimes have a classification task in one domain of interest, but we only have sufficient training data in another domain of interest, where the latter data may be in a different feature space or follow a different data



distribution. In such cases, knowledge transfer, if done successfully, would greatly improve the performance of learning by avoiding much expensive data-labeling efforts. In recent years, transfer learning has emerged as a new learning framework to address this problem. This survey focuses on categorizing and reviewing the current progress on transfer learning for classification, regression, and clustering problems. In this survey, we discuss the relationship between transfer learning and other related machine learning techniques such as domain adaptation, multitask learning and sample selection bias, as well as covariate shift. We also explore some potential future issues in transfer learning research.

链接: <https://ieeexplore.ieee.org/document/5288526>

16. 标题: Edge Intelligence: Paving the Last Mile of Artificial Intelligence With Edge Computing

出处: Proceedings of the IEEE

作者: Zhi Zhou; Xu Chen; En Li; Liekang Zeng; Ke Luo; Junshan Zhang

摘要: With the breakthroughs in deep learning, the recent years have witnessed a booming of artificial intelligence (AI) applications and services, spanning from personal assistant to recommendation systems to video/audio surveillance. More recently, with the proliferation of mobile computing and Internet of Things (IoT), billions of mobile and IoT devices are connected to the Internet, generating zillions bytes of data at the network edge. Driving by this trend, there is an urgent need to push the AI frontiers to the network edge so as to fully unleash the potential of the edge big data. To meet this demand, edge computing, an emerging paradigm that pushes computing tasks and services from the network core to the network edge, has been widely recognized as a promising solution. The resulted new interdisciplinary, edge AI or edge intelligence (EI), is beginning to receive a tremendous amount of interest. However, research on EI is still in its infancy stage, and a dedicated venue for exchanging the recent advances of EI is highly desired by both the computer system and AI communities. To this end, we conduct a comprehensive survey of the recent research efforts on EI. Specifically, we first review the background and motivation for AI running at the network edge. We then provide an overview of the overarching architectures, frameworks, and emerging key technologies for deep learning model toward training/inference at the network edge. Finally, we discuss future research opportunities on EI. We believe that this survey will elicit escalating attentions, stimulate fruitful discussions, and inspire further research ideas on EI.

链接: <https://ieeexplore.ieee.org/document/8736011>

17. 标题: Internet-of-Things (IoT)-Based Smart Agriculture: Toward Making the Fields Talk

出处: IEEE Access

作者: Muhammad Ayaz; Mohammad Ammad-Uddin; Zubair Sharif; Ali Mansour; El-Hadi M. Aggoune

摘要: Despite the perception people may have regarding the agricultural process, the reality is that today's agriculture industry is data-centered, precise, and smarter than ever. The rapid emergence of the Internet-of-Things (IoT) based technologies redesigned almost every industry including "smart agriculture" which moved the industry from statistical to quantitative approaches. Such revolutionary changes are shaking the existing agriculture methods and creating new opportunities along a range of challenges. This article highlights the potential of wireless sensors and IoT in agriculture, as well as the challenges expected to be faced when integrating this technology with the



traditional farming practices. IoT devices and communication techniques associated with wireless sensors encountered in agriculture applications are analyzed in detail. What sensors are available for specific agriculture application, like soil preparation, crop status, irrigation, insect and pest detection are listed. How this technology helping the growers throughout the crop stages, from sowing until harvesting, packing and transportation is explained. Furthermore, the use of unmanned aerial vehicles for crop surveillance and other favorable applications such as optimizing crop yield is considered in this article. State-of-the-art IoT-based architectures and platforms used in agriculture are also highlighted wherever suitable. Finally, based on this thorough review, we identify current and future trends of IoT in agriculture and highlight potential research challenges.

链接: <https://ieeexplore.ieee.org/document/8784034>

**18. 标题:** A fast and elitist multiobjective genetic algorithm: NSGA-II

**出处:** IEEE Transactions on Evolutionary Computation

**作者:** K. Deb; A. Pratap; S. Agarwal; T. Meyarivan

**摘要:** Multi-objective evolutionary algorithms (MOEAs) that use non-dominated sorting and sharing have been criticized mainly for: (1) their  $O(MN/\text{sup } 3/)$  computational complexity (where  $M$  is the number of objectives and  $N$  is the population size); (2) their non-elitism approach; and (3) the need to specify a sharing parameter. In this paper, we suggest a non-dominated sorting-based MOEA, called NSGA-II (Non-dominated Sorting Genetic Algorithm II), which alleviates all of the above three difficulties. Specifically, a fast non-dominated sorting approach with  $O(MN/\text{sup } 2/)$  computational complexity is presented. Also, a selection operator is presented that creates a mating pool by combining the parent and offspring populations and selecting the best  $N$  solutions (with respect to fitness and spread). Simulation results on difficult test problems show that NSGA-II is able, for most problems, to find a much better spread of solutions and better convergence near the true Pareto-optimal front compared to the Pareto-archived evolution strategy and the strength-Pareto evolutionary algorithm - two other elitist MOEAs that pay special attention to creating a diverse Pareto-optimal front. Moreover, we modify the definition of dominance in order to solve constrained multi-objective problems efficiently. Simulation results of the constrained NSGA-II on a number of test problems, including a five-objective, seven-constraint nonlinear problem, are compared with another constrained multi-objective optimizer, and the much better performance of NSGA-II is observed.

链接: <https://ieeexplore.ieee.org/document/996017>

**19. 标题:** A Survey on IoT Security: Application Areas, Security Threats, and Solution Architectures

**出处:** IEEE Access

**作者:** Vikas Hassija; Vinay Chamola; Vikas Saxena; Divyansh Jain; Pranav Goyal; Biplab Sikdar

**摘要:** The Internet of Things (IoT) is the next era of communication. Using the IoT, physical objects can be empowered to create, receive, and exchange data in a seamless manner. Various IoT applications focus on automating different tasks and are trying to empower the inanimate physical objects to act without any human intervention. The existing and upcoming IoT applications are highly promising to increase the level of comfort, efficiency, and automation for the users. To be able to implement such a world in an ever-growing fashion requires high security, privacy, authentication, and recovery from attacks. In this regard, it is imperative to make the required changes in the

architecture of the IoT applications for achieving end-to-end secure IoT environments. In this paper, a detailed review of the security-related challenges and sources of threat in the IoT applications is presented. After discussing the security issues, various emerging and existing technologies focused on achieving a high degree of trust in the IoT applications are discussed. Four different technologies, blockchain, fog computing, edge computing, and machine learning, to increase the level of security in IoT are discussed.

链接: <https://ieeexplore.ieee.org/document/8742551>

20. 标题: Internet of Things: A Survey on Enabling Technologies, Protocols, and Applications

出处: IEEE Communications Surveys & Tutorials

作者: Ala Al-Fuqaha; Mohsen Guizani; Mehdi Mohammadi; Mohammed Aledhari; Moussa Ayyash

摘要: This paper provides an overview of the Internet of Things (IoT) with emphasis on enabling technologies, protocols, and application issues. The IoT is enabled by the latest developments in RFID, smart sensors, communication technologies, and Internet protocols. The basic premise is to have smart sensors collaborate directly without human involvement to deliver a new class of applications. The current revolution in Internet, mobile, and machine-to-machine (M2M) technologies can be seen as the first phase of the IoT. In the coming years, the IoT is expected to bridge diverse technologies to enable new applications by connecting physical objects together in support of intelligent decision making. This paper starts by providing a horizontal overview of the IoT. Then, we give an overview of some technical details that pertain to the IoT enabling technologies, protocols, and applications. Compared to other survey papers in the field, our objective is to provide a more thorough summary of the most relevant protocols and application issues to enable researchers and application developers to get up to speed quickly on how the different protocols fit together to deliver desired functionalities without having to go through RFCs and the standards specifications. We also provide an overview of some of the key IoT challenges presented in the recent literature and provide a summary of related research work. Moreover, we explore the relation between the IoT and other emerging technologies including big data analytics and cloud and fog computing. We also present the need for better horizontal integration among IoT services. Finally, we present detailed service use-cases to illustrate how the different protocols presented in the paper fit together to deliver desired IoT services.

链接: <https://ieeexplore.ieee.org/document/7123563>

21. 标题: End-to-End Velocity Estimation for Autonomous Racing

出处: IEEE Robotics and Automation Letters

作者: Sirish Srinivasan; Inkyu Sa; Alex Zyner; Victor Reijgwart; Miguel I. Valls; Roland Siegwart

摘要: Velocity estimation plays a central role in driverless vehicles, but standard, and affordable methods struggle to cope with extreme scenarios like aggressive maneuvers due to the presence of high sideslip. To solve this, autonomous race cars are usually equipped with expensive external velocity sensors. In this letter, we present an end-to-end recurrent neural network that takes available raw sensors as input (IMU, wheel odometry, and motor currents), and outputs velocity estimates. The results are compared to two state-of-the-art Kalman filters, which respectively include, and exclude expensive velocity sensors. All methods have been extensively tested on a formula student driverless race car with very high sideslip ( $10^\circ$  at the rear axle), and slip ratio ( $\approx 20\%$ ), operating close to the



limits of handling. The proposed network is able to estimate lateral velocity up to 15x better than the Kalman filter with the equivalent sensor input, and matches (0.06 m/s RMSE) the Kalman filter with the expensive velocity sensor setup.

链接: <https://ieeexplore.ieee.org/document/9167427>

22. 标题: Machine Learning and Deep Learning Methods for Cybersecurity

出处: IEEE Access

作者: Yang Xin; Lingshuang Kong; Zhi Liu; Yuling Chen; Yanmiao Li; Hongliang Zhu; Mingcheng Gao; Haixia Hou; Chunhua Wang

摘要: With the development of the Internet, cyber-attacks are changing rapidly and the cyber security situation is not optimistic. This survey report describes key literature surveys on machine learning (ML) and deep learning (DL) methods for network analysis of intrusion detection and provides a brief tutorial description of each ML/DL method. Papers representing each method were indexed, read, and summarized based on their temporal or thermal correlations. Because data are so important in ML/DL methods, we describe some of the commonly used network datasets used in ML/DL, discuss the challenges of using ML/DL for cybersecurity and provide suggestions for research directions.

链接: <https://ieeexplore.ieee.org/document/8359287>

23. 标题: COVID-19 Future Forecasting Using Supervised Machine Learning Models

出处: IEEE Access

作者: Furqan Rustam; Aijaz Ahmad Reshi; Arif Mehmood; Saleem Ullah; Byung-Won On; Waqar Aslam; Gyu Sang Choi

摘要: Machine learning (ML) based forecasting mechanisms have proved their significance to anticipate in perioperative outcomes to improve the decision making on the future course of actions. The ML models have long been used in many application domains which needed the identification and prioritization of adverse factors for a threat. Several prediction methods are being popularly used to handle forecasting problems. This study demonstrates the capability of ML models to forecast the number of upcoming patients affected by COVID-19 which is presently considered as a potential threat to mankind. In particular, four standard forecasting models, such as linear regression (LR), least absolute shrinkage and selection operator (LASSO), support vector machine (SVM), and exponential smoothing (ES) have been used in this study to forecast the threatening factors of COVID-19. Three types of predictions are made by each of the models, such as the number of newly infected cases, the number of deaths, and the number of recoveries in the next 10 days. The results produced by the study proves it a promising mechanism to use these methods for the current scenario of the COVID-19 pandemic. The results prove that the ES performs best among all the used models followed by LR and LASSO which performs well in forecasting the new confirmed cases, death rate as well as recovery rate, while SVM performs poorly in all the prediction scenarios given the available dataset.

链接: <https://ieeexplore.ieee.org/document/9099302>

24. 标题: Optical Fibre Capacity Optimisation via Continuous Bandwidth Amplification and Geometric Shaping

出处: IEEE Photonics Technology Letters

作者: Lidia Galdino; Adrian Edwards; Wenting Yi; Eric Sillekens; Yuta Wakayama; Thomas Gerard; Wayne Sheldon Pelouch; Stuart Barnes; Takehiro Tsuritani; Robert I. Killey; Domaniç Lavery; Polina Bayvel

摘要: The maximum data throughput in a single mode optical fibre is a function of both the signal bandwidth and the wavelength-dependent signal-to-noise ratio (SNR). In this paper, we investigate the use of hybrid discrete Raman & rare-earth doped fibre amplifiers to enable wide-band signal gain, without spectral gaps between amplification bands. We describe the widest continuous coherent transmission bandwidth experimentally demonstrated to date of 16.83 THz, achieved by simultaneously using the S-, C- and L-bands. The variation of fibre parameters over this bandwidth, together with the hybrid amplification method result in a significant SNR wavelength-dependence. To cope with this, the signal was optimised for each SNR, wavelength and transmission band. By using a system-tailored set of geometrically shaped constellations, we demonstrate the transmission of  $660 \times 25$  GBd channels over 40 km, resulting in a record single mode fibre net throughput of 178.08 Tbit/s.

链接: <https://ieeexplore.ieee.org/document/9144561>

25. 标题: Robust and Communication-Efficient Federated Learning From Non-i.i.d. Data

出处: IEEE Transactions on Neural Networks and Learning Systems

作者: Felix Sattler; Simon Wiedemann; Klaus-Robert Müller; Wojciech Samek

摘要: Federated learning allows multiple parties to jointly train a deep learning model on their combined data, without any of the participants having to reveal their local data to a centralized server. This form of privacy-preserving collaborative learning, however, comes at the cost of a significant communication overhead during training. To address this problem, several compression methods have been proposed in the distributed training literature that can reduce the amount of required communication by up to three orders of magnitude. These existing methods, however, are only of limited utility in the federated learning setting, as they either only compress the upstream communication from the clients to the server (leaving the downstream communication uncompressed) or only perform well under idealized conditions, such as i.i.d. distribution of the client data, which typically cannot be found in federated learning. In this article, we propose sparse ternary compression (STC), a new compression framework that is specifically designed to meet the requirements of the federated learning environment. STC extends the existing compression technique of top-k gradient sparsification with a novel mechanism to enable downstream compression as well as ternarization and optimal Golomb encoding of the weight updates. Our experiments on four different learning tasks demonstrate that STC distinctively outperforms federated averaging in common federated learning scenarios. These results advocate for a paradigm shift in federated optimization toward high-frequency low-bitwidth communication, in particular in the bandwidth-constrained learning environments.

链接: <https://ieeexplore.ieee.org/document/8889996>

## *ESI HOT PAPERS*

### *(Engineering)*

(来源: <http://esi.incites.thomsonreuters.com>)

1.被引频次: 11367

题目: MULTIPLE MARGINAL FISHER ANALYSIS

作者: HUANG, ZY;ZHU, HY;ZHOU, JT;PENG, X

出处: IEEE TRANSACTIONS ON INDUSTRIAL ELECTRONICS 66 (12): 9798-9807 DEC 2019

摘要: Dimension reduction is a fundamental task of machine learning and computer vision, which is widely used in a variety of industrial applications. Over past decades, a lot of unsupervised and supervised algorithms have been proposed. However, few of them can automatically determine the feature dimension that could be adaptive to different data distributions. To obtain a good performance, it is popular to seek the optimal dimension by exhaustively enumerating some possible values. Clearly, such a scheme is ad hoc and computationally extensive. Therefore, a method which can automatically estimate the feature dimension in an efficient and principled manner is of significant practical and theoretical value. In this paper, we propose a novel supervised subspace learning method called multiple marginal Fisher analysis (MMFA), which can automatically estimate the feature dimension. By maxing the interclass separability among marginal points while minimizing within-class scatter, MMFA obtains low-dimensional representations with outstanding discriminative properties. Extensive experiments show that MMFA not only outperforms other algorithms on clean data, but also show robustness on corrupted and disguised data.

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2.被引频次: 959

题目: SINGLE-JUNCTION ORGANIC SOLAR CELL WITH OVER 15% EFFICIENCY USING FUSED-RING ACCEPTOR WITH ELECTRON-DEFICIENT CORE

作者: YUAN, J;ZHANG, YQ;ZHOU, LY;ZHANG, GC;YIP, HL;LAU, TK;LU, XH;ZHU, C;PENG, HJ;JOHNSON, PA;LECLERC, M;CAO, Y;ULANSKI, J;LI, YF;ZOU, YP

出处: JOULE 3 (4): 1140-1151 APR 17 2019

摘要: Recently, non-fullerene n-type organic semiconductors have attracted significant attention as acceptors in organic photovoltaics (OPVs) due to their great potential to realize high-power conversion efficiencies. The rational design of the central fused ring unit of these acceptor molecules is crucial to maximize device performance. Here, we report a new class of non-fullerene acceptor, Y6, that employs a ladder-type electron-deficient-core-based central fused ring

(dithienothiophen[3.2-b]-pyrrolbenzothiadiazole) with a benzothiadiazole (BT) core to fine-tune its absorption and electron affinity. OPVs made from Y6 in conventional and inverted architectures each exhibited a high efficiency of 15.7%, measured in two separate labs. Inverted device structures were certified at Enli Tech Laboratory demonstrated an efficiency of 14.9%. We further observed that the Y6-based devices maintain a high efficiency of 13.6% with an active layer thickness of 300 nm. The electron-deficient-core-based fused ring reported in this work opens a new door in the molecular design of high-performance acceptors for OPVs.

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3.被引频次: 693

题目: FOCAL LOSS FOR DENSE OBJECT DETECTION

作者: LIN, TY;GOYAL, P;GIRSHICK, R;HE, KM;DOLLAR, P

出处: IEEE TRANSACTIONS ON PATTERN ANALYSIS AND MACHINE INTELLIGENCE 42 (2): 318-327 FEB 2020

摘要: The highest accuracy object detectors to date are based on a two-stage approach popularized by R-CNN, where a classifier is applied to a sparse set of candidate object locations. In contrast, one-stage detectors that are applied over a regular, dense sampling of possible object locations have the potential to be faster and simpler, but have trailed the accuracy of two-stage detectors thus far. In this paper, we investigate why this is the case. We discover that the extreme foreground-background class imbalance encountered during training of dense detectors is the central cause. We propose to address this class imbalance by reshaping the standard cross entropy loss such that it down-weights the loss assigned to well-classified examples. Our novel Focal Loss focuses training on a sparse set of hard examples and prevents the vast number of easy negatives from overwhelming the detector during training. To evaluate the effectiveness of our loss, we design and train a simple dense detector we call RetinaNet. Our results show that when trained with the focal loss, RetinaNet is able to match the speed of previous one-stage detectors while surpassing the accuracy of all existing state-of-the-art two-stage detectors. Code is at: <https://github.com/facebookresearch/Detectron>.

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4.被引频次: 673

题目: SQUEEZE-AND-EXCITATION NETWORKS

作者: HU, J;SHEN, L;ALBANIE, S;SUN, G;WU, EH

出处: IEEE TRANSACTIONS ON PATTERN ANALYSIS AND MACHINE INTELLIGENCE 42

(8): 2011-2023 AUG. 1 2020

摘要: The central building block of convolutional neural networks (CNNs) is the convolution operator, which enables networks to construct informative features by fusing both spatial and channel-wise information within local receptive fields at each layer. A broad range of prior research has investigated the spatial component of this relationship, seeking to strengthen the representational power of a CNN by enhancing the quality of spatial encodings throughout its feature hierarchy. In this work, we focus instead on the channel relationship and propose a novel architectural unit, which we term the Squeeze-and-Excitation (SE) block, that adaptively recalibrates channel-wise feature responses by explicitly modelling interdependencies between channels. We show that these blocks can be stacked together to form SENet architectures that generalise extremely effectively across different datasets. We further demonstrate that SE blocks bring significant improvements in performance for existing state-of-the-art CNNs at slight additional computational cost. Squeeze-and-Excitation Networks formed the foundation of our ILSVRC 2017 classification submission which won first place and reduced the top-5 error to 2.251 percent, surpassing the winning entry of 2016 by a relative improvement of similar to 25 percent. Models and code are available at <https://github.com/hujie-frank/SENet>.

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5.被引频次: 352

题目: MEMRISTOR-BASED ECHO STATE NETWORK WITH ONLINE LEAST MEAN SQUARE

作者: WEN, SP;HU, R;YANG, Y;HUANG, TW;ZENG, ZG;SONG, YD

出处: IEEE TRANSACTIONS ON SYSTEMS MAN CYBERNETICS-SYSTEMS 49 (9): 1787-1796 SEP 2019

摘要: In this paper, we propose a novel computational architecture of memristor-based echo state network (MESN) with the online least mean square (LMS) algorithm. Newman and Watts small-world network is adopted for the topological structure of MESN network with memristive neural synapses. In the MESN network, the state matrix of the reservoir layer, which is obtained by raising the dimension of input data, is utilized as an input of the LMS algorithm to train the output weight matrix on chip. After certain iterations, the resistance value of memristor is adjusted to a constant. Thus, the final weight output matrix is obtained. To verify the effectiveness of the proposed MESN network, car evaluation and short-term power load forecasting are employed with the effect evaluation of the node number and the connectivity degree of the reservoir layer. The research provides a novel way to design neuromorphic computing systems.

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6.被引频次: 326

题目: SOLAR CELL EFFICIENCY TABLES (VERSION 53)

作者: GREEN, MA;HISHIKAWA, Y;DUNLOP, ED;LEVI, DH;HOHL-EBINGER, J;YOSHITA, M;HO-BAILLIE, AWY

出处: PROGRESS IN PHOTOVOLTAICS 27 (1): 3-12 JAN 2019

摘要: Consolidated tables showing an extensive listing of the highest independently confirmed efficiencies for solar cells and modules are presented. Guidelines for inclusion of results into these tables are outlined and new entries since July 2018 are reviewed.

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7.被引频次: 288

题目: PATHWAYS FOR PRACTICAL HIGH-ENERGY LONG-CYCLING LITHIUM METAL BATTERIES

作者: LIU, J;BAO, ZN;CUI, Y;DUFEK, EJ;GOODENOUGH, JB;KHALIFAH, P;LI, QY;LIAW, BY;LIU, P;MANTHIRAM, A;MENG, YS;SUBRAMANIAN, VR;TONEY, MF;VISWANATHAN, VV;WHITTINGHAM, MS;XIAO, J;XU, W;YANG, JH;YANG, XQ;ZHANG, JG

出处: NATURE ENERGY 4 (3): 180-186 MAR 2019

摘要: State-of-the-art lithium (Li)-ion batteries are approaching their specific energy limits yet are challenged by the ever-increasing demand of today's energy storage and power applications, especially for electric vehicles. Li metal is considered an ultimate anode material for future high-energy rechargeable batteries when combined with existing or emerging high-capacity cathode materials. However, much current research focuses on the battery materials level, and there have been very few accounts of cell design principles. Here we discuss crucial conditions needed to achieve a specific energy higher than 350 Wh kg<sup>-1</sup>, up to 500 Wh kg<sup>-1</sup>, for rechargeable Li metal batteries using high-nickel-content lithium nickel manganese cobalt oxides as cathode materials. We also provide an analysis of key factors such as cathode loading, electrolyte amount and Li foil

thickness that impact the cell-level cycle life. Furthermore, we identify several important strategies to reduce electrolyte-Li reaction, protect Li surfaces and stabilize anode architectures for long-cycling high-specific-energy cells.

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8.被引频次: 259

题目: MASK R-CNN

作者: HE, KM;GKIOXARI, G;DOLLAR, P;GIRSHICK, R

出处: IEEE TRANSACTIONS ON PATTERN ANALYSIS AND MACHINE INTELLIGENCE 42 (2): 386-397 FEB 2020

摘要: We present a conceptually simple, flexible, and general framework for object instance segmentation. Our approach efficiently detects objects in an image while simultaneously generating a high-quality segmentation mask for each instance. The method, called Mask R-CNN, extends Faster R-CNN by adding a branch for predicting an object mask in parallel with the existing branch for bounding box recognition. Mask R-CNN is simple to train and adds only a small overhead to Faster R-CNN, running at 5 fps. Moreover, Mask R-CNN is easy to generalize to other tasks, e.g., allowing us to estimate human poses in the same framework. We show top results in all three tracks of the COCO suite of challenges, including instance segmentation, bounding-box object detection, and person keypoint detection. Without bells and whistles, Mask R-CNN outperforms all existing, single-model entries on every task, including the COCO 2016 challenge winners. We hope our simple and effective approach will serve as a solid baseline and help ease future research in instance-level recognition. Code has been made available at: <https://github.com/facebookresearch/Detectron>.

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9.被引频次: 250

题目: MATERIAL INSIGHTS AND CHALLENGES FOR NON-FULLERENE ORGANIC SOLAR CELLS BASED ON SMALL MOLECULAR ACCEPTORS

作者: ZHANG, JQ;TAN, HS;GUO, XG;FACCHETTI, A;YAN, H

出处: NATURE ENERGY 3 (9): 720-731 SEP 2018

摘要: The field of non-fullerene organic solar cells has experienced rapid development during the past few years, mainly driven by the development of novel non-fullerene acceptors and matching donor semiconductors. However, organic solar cell material development has progressed via a



trial-and-error approach with limited understanding of the materials' structure-property relationships and the underlying device physics of non-fullerene devices. In addition, the availability of hundreds of donor and acceptor semiconductors creates an extremely large pool of possible donor-acceptor combinations, which poses a daunting challenge for rational material screening and matching. This Review describes several important conceptual aspects of the emerging non-fullerene devices by highlighting key contributions that provided fundamental insights regarding rational material design, donor-acceptor pair matching, blend morphology control and the reduced voltage losses in non-fullerene organic solar cells. We also discuss the key challenges that need to be addressed to develop more-efficient non-fullerene organic solar cells.

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10.被引频次: 238

题目: DEEP LEARNING AND ITS APPLICATIONS TO MACHINE HEALTH MONITORING

作者: ZHAO, R;YAN, RQ;CHEN, ZH;MAO, KZ;WANG, P;GAO, RX

出处: MECHANICAL SYSTEMS AND SIGNAL PROCESSING 115: 213-237 JAN 15 2019

摘要: Since 2006, deep learning (DL) has become a rapidly growing research direction, redefining state-of-the-art performances in a wide range of areas such as object recognition, image segmentation, speech recognition and machine translation. In modern manufacturing systems, data-driven machine health monitoring is gaining in popularity due to the widespread deployment of low-cost sensors and their connection to the Internet. Meanwhile, deep learning provides useful tools for processing and analyzing these big machinery data. The main purpose of this paper is to review and summarize the emerging research work of deep learning on machine health monitoring. After the brief introduction of deep learning techniques, the applications of deep learning in machine health monitoring systems are reviewed mainly from the following aspects: Auto-encoder (AE) and its variants, Restricted Boltzmann Machines and its variants including Deep Belief Network (DBN) and Deep Boltzmann Machines (DBM), Convolutional Neural Networks (CNN) and Recurrent Neural Networks (RNN). In addition, an experimental study on the performances of these approaches has been conducted, in which the data and code have been online. Finally, some new trends of DL-based machine health monitoring methods are discussed. (C) 2018 Elsevier Ltd. All rights reserved.

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11.被引频次: 236

题目: HEAT TRANSFER BEHAVIOR OF NANOPARTICLE ENHANCED PCM SOLIDIFICATION THROUGH AN ENCLOSURE WITH V SHAPED FINS

作者: SHEIKHOESLAMI, M;RIZWAN-UL HAQ;SHAFEE, A;LI, ZX

出处: INTERNATIONAL JOURNAL OF HEAT AND MASS TRANSFER 130: 1322-1342 MAR 2019

摘要: Thermal storage unit can be utilized to satisfy the balance of energy supply and demand. Copper oxide nanoparticles and V shaped fins are involved in storage unit in current research to expedite the solidification. To show the variation of energy storage efficiency, Finite element method has been employed. Important selected parameters are nanofluid concentration, angle of V shaped fin, copper oxide particle size and length of fins. Contours and profiles in various time steps are depicted. Outputs display that discharging rate augments with rise of angle of V shaped fin. Using copper oxide helps solidification. Length of fin has inverse relationship with discharging rate. (C) 2018 Elsevier Ltd. All rights reserved.

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12.被引频次: 227

题目: HIGH-EFFICIENCY SMALL-MOLECULE TERNARY SOLAR CELLS WITH A HIERARCHICAL MORPHOLOGY ENABLED BY SYNERGIZING FULLERENE AND NON-FULLERENE ACCEPTORS

作者: ZHOU, ZC;XU, SJ;SONG, JN;JIN, YZ;YUE, QH;QIAN, YH;LIU, F;ZHANG, FL;ZHU, XZ

出处: NATURE ENERGY 3 (11): 952-959 NOV 2018

摘要: Using combinatory photoactive blends is a promising approach to achieve high power conversion efficiency in ternary organic photovoltaics. However, the fundamental challenge of how to manipulate the morphology of multiple components and correlate structure details via device performance has not been well addressed. Achieving an ideal morphology that simultaneously enhances charge generation and transport and reduces voltage loss is an imperative avenue to improve device efficiency. Here, we achieve a high power conversion efficiency of 13.20 +/- 0.25% for ternary solar cells by using a combination of small molecules with both fullerene and non-fullerene acceptors, which form a hierarchical morphology consisting of a PCBM transporting highway and an intricate non-fullerene phase-separated pathway network. Carrier generation and transport find an optimized balance, and voltage loss is simultaneously reduced. Such a morphology fully utilizes the individual advantages of both fullerene and non-fullerene acceptors, demonstrating their indispensability in organic photovoltaics.

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13.被引频次: 217

题目: A COMPREHENSIVE REVIEW ON THE PYROLYSIS OF LIGNOCELLULOSIC BIOMASS

作者: DHYANI, V;BHASKAR, T

出处: RENEWABLE ENERGY 129: 695-716 PART B SP. ISS. SI DEC 2018

摘要: In the pursuit of renewable sources of energy, biomass is emerging as a promising resource because of its abundance and carbon neutral nature. Pyrolysis is a prevailing technology for biomass conversion into the valuable hydrocarbon and alternative fuels. In this review, pyrolysis of lignocellulosic biomass has been addressed, focusing primarily on the ideal feedstock, technologies, reactors, and properties of the end product. Technical problems in using biofuel from pyrolysis, as transport fuel have also been discussed, along with solutions to address these challenges, and comments on the future scope of the pyrolysis process. (C) 2017 Elsevier Ltd. All rights reserved.

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14.被引频次: 207

题目: SOLAR CELL EFFICIENCY TABLES (VERSION 54)

作者: GREEN, MA;DUNLOP, ED;LEVI, DH;HOHL-EBINGER, J;YOSHITA, M;HO-BAILLIE, AWY

出处: PROGRESS IN PHOTOVOLTAICS 27 (7): 565-575 JUL 2019

摘要: Consolidated tables showing an extensive listing of the highest independently confirmed efficiencies for solar cells and modules are presented. Guidelines for inclusion of results into these tables are outlined, and new entries since January 2019 are reviewed.

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15.被引频次: 206

题目: SOLAR-DRIVEN INTERFACIAL EVAPORATION

作者: TAO, P;NI, G;SONG, CY;SHANG, W;WU, JB;ZHU, J;CHEN, G;DENG, T

出处: NATURE ENERGY 3 (12): 1031-1041 DEC 2018

摘要: As a ubiquitous solar-thermal energy conversion process, solar-driven evaporation has attracted tremendous research attention owing to its high conversion efficiency of solar energy and transformative industrial potential. In recent years, solar-driven interfacial evaporation by localization of solar-thermal energy conversion to the air/liquid interface has been proposed as a promising alternative to conventional bulk heating-based evaporation, potentially reducing thermal losses and improving energy conversion efficiency. In this Review, we discuss the development of the key components for achieving high-performance evaporation, including solar absorbers, evaporation structures, thermal insulators and thermal concentrators, and discuss how they improve the performance of the solar-driven interfacial evaporation system. We describe the possibilities for applying this efficient solar-driven interfacial evaporation process for energy conversion applications. The exciting opportunities and challenges in both fundamental research and practical implementation of the solar-driven interfacial evaporation process are also discussed.

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16.被引频次: 187

题目: METHYLAMMONIUM CHLORIDE INDUCES INTERMEDIATE PHASE STABILIZATION FOR EFFICIENT PEROVSKITE SOLAR CELLS

作者: KIM, M;KIM, GH;LEE, TK;CHOI, IW;CHOI, HW;JO, Y;YOON, YJ;KIM, JW;LEE, J;HUH, D;LEE, H;KWAK, SK;KIM, JY;KIM, DS

出处: JOULE 3 (9): 2179-2192 SEP 18 2019

摘要: One of the most effective methods to achieve high-performance perovskite solar cells has been to include additives that serve as dopants, crystallization agents, or passivate defect sites. Cl-based additives are among the most prevalent in literature, yet their exact role is still uncertain. In this work, we systematically study the function of methylammonium chloride (MACl) additive in formamidinium lead iodide (FAPbI<sub>3</sub>)-based perovskite. Using density functional theory, we provide a theoretical framework for understanding the interaction of MACl with a perovskite. We show that MACl successfully induces an intermediate to the pure FAPbI<sub>3</sub> alpha-phase without annealing. The formation energy is related to the amount of incorporated MACl. By tuning the incorporation of MACl, the perovskite film quality can be significantly improved, exhibiting a 6 x increase in grain size, a 3 x increase in phase crystallinity, and a 4.3 x increase in photoluminescence lifetime. The optimized solar cells achieved a certified efficiency of 23.48%.

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17.被引频次: 187

题目: FINITE-TIME EVENT-TRIGGERED H-INFINITY CONTROL FOR T-S FUZZY MARKOV JUMP SYSTEMS

作者: SHEN, H;LI, F;YAN, HC;KARIMI, HR;LAM, HK

出处: IEEE TRANSACTIONS ON FUZZY SYSTEMS 26 (5): 3122-3135 OCT 2018

摘要: This paper investigates the finite-time event-triggered H-infinity control problem for Takagi-Sugeno Markov jump fuzzy systems. Because of the sampling behaviors and the effect of network environment, the premise variables considered in this paper are subject to asynchronous constraints. The aim of this paper is to synthesize a controller via an event-triggered communication scheme such that not only the resulting closed-loop system is finite-time bounded and satisfies a prescribed H-infinity performance level, but also the communication burden is reduced. First, a sufficient condition is established for the finite-time bounded H-infinity performance analysis of the closed-loop fuzzy system with fully considering the asynchronous premises. Then, based on the derived condition, the method of the desired controller design is presented. Two illustrative examples are finally presented to demonstrate the practicability and efficacy of the proposed method.

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18.被引频次: 186

题目: HEAT TRANSFER SIMULATION OF HEAT STORAGE UNIT WITH NANOPARTICLES AND FINS THROUGH A HEAT EXCHANGER

作者: SHEIKHOESLAMI, M;RIZWAN-UL HAQ;SHAFEE, A;LI, ZX;ELARAKI, YG;TLILI, I

出处: INTERNATIONAL JOURNAL OF HEAT AND MASS TRANSFER 135: 470-478 JUN 2019

摘要: The current article investigates the impact of using fins and nano sized materials on performance of discharging system. Various shapes for nanoparticle have been considered. Cold fluid flows in both inner and outer layers and middle layer is full of PCM. To make a careful choice of designing heat storage based on uniform solidification, two factor has been examined; length of fins and shape factor. Temperature and solid fraction distributions were reported at various time steps. The homogeneous model for nanofluid has been extended by incorporating various shapes of CuO nanoparticles. The mathematical model has been offered in the form of PDE's, which were solved using Galerkin FEM. It can be observed that the employing nanofluid augments the discharging rate and best performance is obtained for platelet shape. (C) 2019 Elsevier Ltd. All rights reserved.



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19.被引频次: 186

题目: EFFICIENT ELECTROCATALYTIC N-2 FIXATION WITH MXENE UNDER AMBIENT CONDITIONS

作者: LUO, YR;CHEN, GF;DING, L;CHEN, XZ;DING, LX;WANG, HH

出处: JOULE 3 (1): 279-289 JAN 16 2019

摘要: The current efficiency of NH<sub>3</sub> electrosynthesis from N<sub>2</sub> and H<sub>2</sub>O is ultralow as a result of poor selectivity in most catalysts. Here, we demonstrate that under ambient conditions, MXene (Ti<sub>3</sub>C<sub>2</sub>T<sub>x</sub>) nanosheets attached to a vertically aligned metal host can achieve a high faradic efficiency (5.78%) at an ultralow potential for NH<sub>3</sub> electrosynthesis. On the basis of experimental and theoretical evidence, the basal plane of MXene is relatively inert, and its higher activity is related to a greater number of exposed edge sites. This work elucidates that significantly improved selectivity of NH<sub>3</sub> electrosynthesis can be achieved by tuning active sites and retarding hydrogen evolution activity. The proposed strategy provides a new opportunity to optimize the surface properties of 2D catalysts for efficient N<sub>2</sub> fixation under ambient conditions.

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20.被引频次: 180

题目: AN IMPROVED ANT COLONY OPTIMIZATION ALGORITHM BASED ON HYBRID STRATEGIES FOR SCHEDULING PROBLEM

作者: DENG, W;XU, JJ;ZHAO, HM

出处: IEEE ACCESS 7: 20281-20292 2019

摘要: In this paper, an improved ant colony optimization(ICMPACO) algorithm based on the multi-population strategy, co-evolution mechanism, pheromone updating strategy, and pheromone diffusion mechanism is proposed to balance the convergence speed and solution diversity, and improve the optimization performance in solving the large-scale optimization problem. In the proposed ICMPACO algorithm, the optimization problem is divided into several sub-problems and the ants in the population are divided into elite ants and common ants in order to improve the convergence rate, and avoid to fall into the local optimum value. The pheromone updating strategy is used to improve optimization ability. The pheromone diffusion mechanism is used to make the

pheromone released by ants at a certain point, which gradually affects a certain range of adjacent regions. The co-evolution mechanism is used to interchange information among different sub-populations in order to implement information sharing. In order to verify the optimization performance of the ICMPACO algorithm, the traveling salesmen problem (TSP) and the actual gate assignment problem are selected here. The experiment results show that the proposed ICMPACO algorithm can effectively obtain the best optimization value in solving TSP and effectively solve the gate assignment problem, obtain better assignment result, and it takes on better optimization ability and stability.

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21.被引频次: 179

题目: HIGH ELECTRONIC CONDUCTIVITY AS THE ORIGIN OF LITHIUM DENDRITE FORMATION WITHIN SOLID ELECTROLYTES

作者: HAN, FD; WESTOVER, AS; YUE, J; FAN, XL; WANG, F; CHI, MF; LEONARD, DN; DUDNEY, N; WANG, H; WANG, CS

出处: NATURE ENERGY 4 (3): 187-196 MAR 2019

摘要: Solid electrolytes (SEs) are widely considered as an 'enabler' of lithium anodes for high-energy batteries. However, recent reports demonstrate that the Li dendrite formation in Li<sub>7</sub>La<sub>3</sub>Zr<sub>2</sub>O<sub>12</sub> (LLZO) and Li<sub>2</sub>S-P<sub>2</sub>S<sub>5</sub> is actually much easier than that in liquid electrolytes of lithium batteries, by mechanisms that remain elusive. Here we illustrate the origin of the dendrite formation by monitoring the dynamic evolution of Li concentration profiles in three popular but representative SEs (LiPON, LLZO and amorphous Li<sub>3</sub>PS<sub>4</sub>) during lithium plating using time-resolved operando neutron depth profiling. Although no apparent changes in the lithium concentration in LiPON can be observed, we visualize the direct deposition of Li inside the bulk LLZO and Li<sub>3</sub>PS<sub>4</sub>. Our findings suggest the high electronic conductivity of LLZO and Li<sub>3</sub>PS<sub>4</sub> is mostly responsible for dendrite formation in these SEs. Lowering the electronic conductivity, rather than further increasing the ionic conductivity of SEs, is therefore critical for the success of all-solid-state Li batteries.

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22.被引频次: 176

题目: CU<sub>2</sub>ZNSNS<sub>4</sub> SOLAR CELLS WITH OVER 10% POWER CONVERSION EFFICIENCY ENABLED BY HETEROJUNCTION HEAT TREATMENT

作者: YAN, C; HUANG, JL; SUN, KW; JOHNSTON, S; ZHANG, YF; SUN, H; PU, AB; HE, MR; LIU, FY; EDER, K; YANG, LM; CAIRNEY, JM; EKINS-DAUKES, NJ; HAMEIRI, Z; STRIDE, JA; CHEN, SY; GREEN, MA; HAO, XJ





出处: NATURE ENERGY 3 (9): 764-772 SEP 2018

摘要: Sulfide kesterite  $\text{Cu}_2\text{ZnSnS}_4$  provides an attractive low-cost, environmentally benign and stable photovoltaic material, yet the record power conversion efficiency for such solar cells has been stagnant at around 9% for years. Severe non-radiative recombination within the heterojunction region is a major cause limiting voltage output and overall performance. Here we report a certified 11% efficiency  $\text{Cu}_2\text{ZnSnS}_4$  solar cell with a high 730 mV open-circuit voltage using heat treatment to reduce heterojunction recombination. This heat treatment facilitates elemental inter-diffusion, directly inducing Cd atoms to occupy Zn or Cu lattice sites, and promotes Na accumulation accompanied by local Cu deficiency within the heterojunction region. Consequently, new phases are formed near the hetero-interface and more favourable conduction band alignment is obtained, contributing to reduced non-radiative recombination. Using this approach, we also demonstrate a certified centimetre-scale ( $1.11 \text{ cm}^2$ ) 10% efficiency  $\text{Cu}_2\text{ZnSnS}_4$  photovoltaic device; the first kesterite cell (including selenium-containing) of standard centimetre-size to exceed 10%.

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23.被引频次: 174

题目: VISUALIZATION AND SUPPRESSION OF INTERFACIAL RECOMBINATION FOR HIGH-EFFICIENCY LARGE-AREA PIN PEROVSKITE SOLAR CELLS

作者: STOLTERFOHT, M; WOLFF, CM; MARQUEZ, JA; ZHANG, SS; HAGES, CJ; ROTHHARDT, D; ALBRECHT, S; BURN, PL; MEREDITH, P; UNOLD, T; NEHER, D

出处: NATURE ENERGY 3 (10): 847-854 OCT 2018

摘要: The performance of perovskite solar cells is predominantly limited by non-radiative recombination, either through trap-assisted recombination in the absorber layer or via minority carrier recombination at the perovskite/transport layer interfaces. Here, we use transient and absolute photoluminescence imaging to visualize all non-radiative recombination pathways in planar p-type perovskite solar cells with undoped organic charge transport layers. We find significant quasi-Fermi-level splitting losses (135 meV) in the perovskite bulk, whereas interfacial recombination results in an additional free energy loss of 80 meV at each individual interface, which limits the open-circuit voltage ( $V_{oc}$ ) of the complete cell to similar to 1.12 V. Inserting ultrathin interlayers between the perovskite and transport layers leads to a substantial reduction of these interfacial losses at both the p and n contacts. Using this knowledge and approach, we demonstrate reproducible dopant-free  $1 \text{ cm}^2$  perovskite solar cells surpassing 20% efficiency (19.83% certified) with stabilized power output, a high  $V_{oc}$  (1.17 V) and record fill factor (>81%).

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24.被引频次: 171

题目: BIOGAS: DEVELOPMENTS AND PERSPECTIVES IN EUROPE

作者: SCARLAT, N;DALLEMAND, JF;FAHL, F

出处: RENEWABLE ENERGY 129: 457-472 PART A DEC 2018

摘要: This paper presents an overview of the development and perspectives of biogas in and its use for electricity, heat and in transport in the European Union (EU) and its Member States. Biogas production has increased in the EU, encouraged by the renewable energy policies, in addition to economic, environmental and climate benefits, to reach 18 billion m<sup>3</sup> methane (654 PJ) in 2015, representing half of the global biogas production. The EU is the world leader in biogas electricity production, with more than 10 GW installed and a number of 17,400 biogas plants, in comparison to the global biogas capacity of 15 GW in 2015. In the EU, biogas delivered 127 TJ of heat and 61 TWh of electricity in 2015; about 50% of total biogas consumption in Europe was destined to heat generation. Europe is the world's leading producer of biomethane for the use as a vehicle fuel or for injection into the natural gas grid, with 459 plants in 2015 producing 1.2 billion m<sup>3</sup> and 340 plants feeding into the gas grid, with a capacity of 1.5 million m<sup>3</sup>. About 697 biomethane filling stations ensured the use 160 million m<sup>3</sup> of biomethane as a transport fuel in 2015. (C) 2018 The Authors. Published by Elsevier Ltd.

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25.被引频次: 165

题目: AUTONOMOUS STRUCTURAL VISUAL INSPECTION USING REGION-BASED DEEP LEARNING FOR DETECTING MULTIPLE DAMAGE TYPES

作者: CHA, YJ;CHOI, W;SUH, G;MAHMOUDKHANI, S;BUYUKOZTURK, O

出处: COMPUTER-AIDED CIVIL AND INFRASTRUCTURE ENGINEERING 33 (9): 731-747 SP. ISS. SI SEP 2018

摘要: Computer vision-based techniques were developed to overcome the limitations of visual inspection by trained human resources and to detect structural damage in images remotely, but most methods detect only specific types of damage, such as concrete or steel cracks. To provide quasi real-time simultaneous detection of multiple types of damages, a Faster Region-based Convolutional Neural Network (Faster R-CNN)-based structural visual inspection method is proposed. To realize this, a database including 2,366 images (with 500 x 375 pixels) labeled for five types of damagesconcrete crack, steel corrosion with two levels (medium and high), bolt corrosion, and steel delaminationis developed. Then, the architecture of the Faster R-CNN is modified, trained, validated, and tested using this database. Results show 90.6%, 83.4%, 82.1%, 98.1%, and 84.7% average precision (AP) ratings for the five damage types, respectively, with a mean AP of 87.8%. The robustness of the trained Faster R-CNN is evaluated and demonstrated using 11 new 6,000 x 4,000-pixel images taken of different structures. Its performance is also compared to that of the



traditional CNN-based method. Considering that the proposed method provides a remarkably fast test speed (0.03 seconds per image with 500 x 375 resolution), a framework for quasi real-time damage detection on video using the trained networks is developed.

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## *ESI HIGHLY CITED PAPERS*

### *(Engineering)*

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(来源: <http://esi.incites.thomsonreuters.com>)

1.被引频次: 11367

题目: MULTIPLE MARGINAL FISHER ANALYSIS

作者: HUANG, ZY;ZHU, HY;ZHOU, JT;PENG, X

出处: IEEE TRANSACTIONS ON INDUSTRIAL ELECTRONICS 66 (12): 9798-9807 DEC 2019

摘要: Dimension reduction is a fundamental task of machine learning and computer vision, which is widely used in a variety of industrial applications. Over past decades, a lot of unsupervised and supervised algorithms have been proposed. However, few of them can automatically determine the feature dimension that could be adaptive to different data distributions. To obtain a good performance, it is popular to seek the optimal dimension by exhaustively enumerating some possible values. Clearly, such a scheme is ad hoc and computationally extensive. Therefore, a method which can automatically estimate the feature dimension in an efficient and principled manner is of significant practical and theoretical value. In this paper, we propose a novel supervised subspace learning method called multiple marginal Fisher analysis (MMFA), which can automatically estimate the feature dimension. By maxing the interclass separability among marginal points while minimizing within-class scatter, MMFA obtains low-dimensional representations with outstanding discriminative properties. Extensive experiments show that MMFA not only outperforms other algorithms on clean data, but also show robustness on corrupted and disguised data.

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2.被引频次: 10435

题目: DEEP LEARNING

作者: LECUN, Y;BENGIO, Y;HINTON, G

出处: NATURE 521 (7553): 436-444 MAY 28 2015

摘要: Deep learning allows computational models that are composed of multiple processing layers to learn representations of data with multiple levels of abstraction. These methods have dramatically improved the state-of-the-art in speech recognition, visual object recognition, object detection and many other domains such as drug discovery and genomics. Deep learning discovers intricate structure in large data sets by using the backpropagation algorithm to indicate how a machine should change its internal parameters that are used to compute the representation in each layer from the

representation in the previous layer. Deep convolutional nets have brought about breakthroughs in processing images, video, speech and audio, whereas recurrent nets have shone light on sequential data such as text and speech.

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3.被引频次: 4461

题目: FULLY CONVOLUTIONAL NETWORKS FOR SEMANTIC SEGMENTATION

作者: SHELHAMER, E;LONG, J;DARRELL, T

出处: IEEE TRANSACTIONS ON PATTERN ANALYSIS AND MACHINE INTELLIGENCE 39 (4): 640-651 APR 2017

摘要: Convolutional networks are powerful visual models that yield hierarchies of features. We show that convolutional networks by themselves, trained end-to-end, pixels-to-pixels, improve on the previous best result in semantic segmentation. Our key insight is to build fully convolutional networks that take input of arbitrary size and produce correspondingly-sized output with efficient inference and learning. We define and detail the space of fully convolutional networks, explain their application to spatially dense prediction tasks, and draw connections to prior models. We adapt contemporary classification networks (AlexNet, the VGG net, and GoogLeNet) into fully convolutional networks and transfer their learned representations by fine-tuning to the segmentation task. We then define a skip architecture that combines semantic information from a deep, coarse layer with appearance information from a shallow, fine layer to produce accurate and detailed segmentations. Our fully convolutional networks achieve improved segmentation of PASCAL VOC (30% relative improvement to 67.2% mean IU on 2012), NYUDv2, SIFT Flow, and PASCAL-Context, while inference takes one tenth of a second for a typical image.

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4.被引频次: 4155

题目: FASTER R-CNN: TOWARDS REAL-TIME OBJECT DETECTION WITH REGION PROPOSAL NETWORKS

作者: REN, SQ;HE, KM;GIRSHICK, R;SUN, J

出处: IEEE TRANSACTIONS ON PATTERN ANALYSIS AND MACHINE INTELLIGENCE 39 (6): 1137-1149 JUN 2017

摘要: State-of-the-art object detection networks depend on region proposal algorithms to hypothesize object locations. Advances like SPPnet [1] and Fast R-CNN [2] have reduced the running time of these detection networks, exposing region proposal computation as a bottleneck. In this work, we introduce a Region Proposal Network (RPN) that shares full-image convolutional features with the detection network, thus enabling nearly cost-free region proposals. An RPN is a fully convolutional network that simultaneously predicts object bounds and objectness scores at each position. The RPN

is trained end-to-end to generate high-quality region proposals, which are used by Fast R-CNN for detection. We further merge RPN and Fast R-CNN into a single network by sharing their convolutional features-using the recently popular terminology of neural networks with 'attention' mechanisms, the RPN component tells the unified network where to look. For the very deep VGG-16 model [3], our detection system has a frame rate of 5 fps (including all steps) on a GPU, while achieving state-of-the-art object detection accuracy on PASCAL VOC 2007, 2012, and MS COCO datasets with only 300 proposals per image. In ILSVRC and COCO 2015 competitions, Faster R-CNN and RPN are the foundations of the 1st-place winning entries in several tracks. Code has been made publicly available.

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5.被引频次: 3459

题目: IMAGENET LARGE SCALE VISUAL RECOGNITION CHALLENGE

作者: RUSSAKOVSKY, O; DENG, J; SU, H; KRAUSE, J; SATHEESH, S; MA, S; HUANG, ZH; KARPATY, A; KHOSLA, A; BERNSTEIN, M; BERG, AC; FEI-FEI, L

出处: INTERNATIONAL JOURNAL OF COMPUTER VISION 115 (3): 211-252 DEC 2015

摘要: The ImageNet Large Scale Visual Recognition Challenge is a benchmark in object category classification and detection on hundreds of object categories and millions of images. The challenge has been run annually from 2010 to present, attracting participation from more than fifty institutions. This paper describes the creation of this benchmark dataset and the advances in object recognition that have been possible as a result. We discuss the challenges of collecting large-scale ground truth annotation, highlight key breakthroughs in categorical object recognition, provide a detailed analysis of the current state of the field of large-scale image classification and object detection, and compare the state-of-the-art computer vision accuracy with human accuracy. We conclude with lessons learned in the 5 years of the challenge, and propose future directions and improvements.

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6.被引频次: 3218

题目: OPPORTUNITIES AND CHALLENGES FOR A SUSTAINABLE ENERGY FUTURE

作者: CHU, S; MAJUMDAR, A

出处: NATURE 488 (7411): 294-303 AUG 16 2012

摘要: Access to clean, affordable and reliable energy has been a cornerstone of the world's increasing prosperity and economic growth since the beginning of the industrial revolution. Our use of energy in the twenty-first century must also be sustainable. Solar and water-based energy generation, and engineering of microbes to produce biofuels are a few examples of the alternatives. This Perspective puts these opportunities into a larger context by relating them to a number of aspects in the transportation and electricity generation sectors. It also provides a snapshot of the current energy landscape and discusses several research and development opportunities and pathways that could



lead to a prosperous, sustainable and secure energy future for the world.

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7.被引频次: 3127

题目: INSIGHTS INTO THE MODELING OF ADSORPTION ISOTHERM SYSTEMS

作者: FOO, KY;HAMEED, BH

出处: CHEMICAL ENGINEERING JOURNAL 156 (1): 2-10 JAN 1 2010

摘要: Concern about environmental protection has increased over the years from a global viewpoint. To date, the prevalence of adsorption separation in the environmental chemistry remains an aesthetic attention and consideration abroad the nations, owing to its low initial cost, simplicity of design, ease of operation, insensitivity to toxic substances and complete removal of pollutants even from dilute solutions. With the renaissance of isotherms modeling, there has been a steadily growing interest in this research field. Confirming the assertion, this paper presents a state of art review of adsorption isotherms modeling, its fundamental characteristics and mathematical derivations. Moreover, the key advance of the error functions, its utilization principles together with the comparisons of linearized and non-linearized isotherm models have been highlighted and discussed. Conclusively, the expanding of the nonlinear isotherms represents a potentially viable and powerful tool, leading to the superior improvement in the area of adsorption science. (C) 2009 Elsevier B. V. All rights reserved.

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8.被引频次: 2673

题目: A SURVEY ON TRANSFER LEARNING

作者: PAN, SJ;YANG, QA

出处: IEEE TRANSACTIONS ON KNOWLEDGE AND DATA ENGINEERING 22 (10): 1345-1359 OCT 2010

摘要: A major assumption in many machine learning and data mining algorithms is that the training and future data must be in the same feature space and have the same distribution. However, in many real-world applications, this assumption may not hold. For example, we sometimes have a classification task in one domain of interest, but we only have sufficient training data in another domain of interest, where the latter data may be in a different feature space or follow a different data distribution. In such cases, knowledge transfer, if done successfully, would greatly improve the performance of learning by avoiding much expensive data-labeling efforts. In recent years, transfer learning has emerged as a new learning framework to address this problem. This survey focuses on categorizing and reviewing the current progress on transfer learning for classification, regression, and clustering problems. In this survey, we discuss the relationship between transfer learning and other related machine learning techniques such as domain adaptation, multitask learning and sample selection bias, as well as covariate shift. We also explore some potential future issues in transfer learning research.

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9.被引频次: 2367

题目: MICROALGAE FOR BIODIESEL PRODUCTION AND OTHER APPLICATIONS: A REVIEW

作者: MATA, TM; MARTINS, AA; CAETANO, NS

出处: RENEWABLE & SUSTAINABLE ENERGY REVIEWS 14 (1): 217-232 JAN 2010

摘要: Sustainable production of renewable energy is being hotly debated globally since it is increasingly understood that first generation biofuels, primarily produced from food crops and mostly oil seeds are limited in their ability to achieve targets for biofuel production, climate change mitigation and economic growth. These concerns have increased the interest in developing second generation biofuels produced from non-food feedstocks such as microalgae, which potentially offer greatest opportunities in the longer term. This paper reviews the current status of microalgae use for biodiesel production, including their cultivation, harvesting, and processing. The microalgae species most used for biodiesel production are presented and their main advantages described in comparison with other available biodiesel feedstocks. The various aspects associated with the design of microalgae production units are described, giving an overview of the current state of development of algae cultivation systems (photo-bioreactors and open ponds). Other potential applications and products from microalgae are also presented such as for biological sequestration Of CO<sub>2</sub>, wastewater treatment, in human health, as food additive, and for aquaculture. (C) 2009 Elsevier Ltd. All rights reserved.

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10.被引频次: 2157

题目: DATA CLUSTERING: 50 YEARS BEYOND K-MEANS

作者: JAIN, AK

出处: PATTERN RECOGNITION LETTERS 31 (8): 651-666 SP. ISS. SI JUN 1 2010

摘要: Organizing data into sensible groupings is one of the most fundamental modes of understanding and learning. As an example, a common scheme of scientific classification puts organisms into a system of ranked taxa: domain, kingdom, phylum, class, etc. Cluster analysis is the formal study of methods and algorithms for grouping, or clustering, objects according to measured or perceived intrinsic characteristics or similarity. Cluster analysis does not use category labels that tag objects with prior identifiers, i.e., class labels. The absence of category information distinguishes data clustering (unsupervised learning) from classification or discriminant analysis (supervised learning). The aim of clustering is to find structure in data and is therefore exploratory in nature. Clustering has a long and rich history in a variety of scientific fields. One of the most popular and simple clustering algorithms, K-means, was first published in 1955. In spite of the fact that K-means was proposed over 50 years ago and thousands of clustering algorithms have been published since then, K-means is still widely used. This speaks to the difficulty in designing a general purpose clustering algorithm and the ill-posed problem of clustering. We provide a brief overview of clustering, summarize well

known clustering methods, discuss the major challenges and key issues in designing clustering algorithms, and point out some of the emerging and useful research directions, including semi-supervised clustering, ensemble clustering, simultaneous feature selection during data clustering, and large scale data clustering. (C) 2009 Elsevier B.V. All rights reserved.

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11. 被引频次: 2046

题目: SLIC SUPERPIXELS COMPARED TO STATE-OF-THE-ART SUPERPIXEL METHODS

作者: ACHANTA, R; SHAJI, A; SMITH, K; LUCCHI, A; FUA, P; SUSSTRUNK, S

出处: IEEE TRANSACTIONS ON PATTERN ANALYSIS AND MACHINE INTELLIGENCE 34 (11): 2274-2281 NOV 2012

摘要: Computer vision applications have come to rely increasingly on superpixels in recent years, but it is not always clear what constitutes a good superpixel algorithm. In an effort to understand the benefits and drawbacks of existing methods, we empirically compare five state-of-the-art superpixel algorithms for their ability to adhere to image boundaries, speed, memory efficiency, and their impact on segmentation performance. We then introduce a new superpixel algorithm, simple linear iterative clustering (SLIC), which adapts a k-means clustering approach to efficiently generate superpixels. Despite its simplicity, SLIC adheres to boundaries as well as or better than previous methods. At the same time, it is faster and more memory efficient, improves segmentation performance, and is straightforward to extend to supervoxel generation.

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12. 被引频次: 2003

题目: EXTREME LEARNING MACHINE FOR REGRESSION AND MULTICLASS CLASSIFICATION

作者: HUANG, GB; ZHOU, HM; DING, XJ; ZHANG, R

出处: IEEE TRANSACTIONS ON SYSTEMS MAN AND CYBERNETICS PART B-CYBERNETICS 42 (2): 513-529 SP. ISS. SI APR 2012

摘要: Due to the simplicity of their implementations, least square support vector machine (LS-SVM) and proximal support vector machine (PSVM) have been widely used in binary classification applications. The conventional LS-SVM and PSVM cannot be used in regression and multiclass classification applications directly, although variants of LS-SVM and PSVM have been proposed to handle such cases. This paper shows that both LS-SVM and PSVM can be simplified further and a unified learning framework of LS-SVM, PSVM, and other regularization algorithms referred to extreme learning machine (ELM) can be built. ELM works for the generalized single-hidden-layer

feedforward networks (SLFNs), but the hidden layer (or called feature mapping) in ELM need not be tuned. Such SLFNs include but are not limited to SVM, polynomial network, and the conventional feedforward neural networks. This paper shows the following: 1) ELM provides a unified learning platform with a widespread type of feature mappings and can be applied in regression and multiclass classification applications directly; 2) from the optimization method point of view, ELM has milder optimization constraints compared to LS-SVM and PSVM; 3) in theory, compared to ELM, LS-SVM and PSVM achieve suboptimal solutions and require higher computational complexity; and 4) in theory, ELM can approximate any target continuous function and classify any disjoint regions. As verified by the simulation results, ELM tends to have better scalability and achieve similar (for regression and binary class cases) or much better (for multiclass cases) generalization performance at much faster learning speed (up to thousands times) than traditional SVM and LS-SVM.

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13.被引频次: 1992

题目: THE PASCAL VISUAL OBJECT CLASSES (VOC) CHALLENGE

作者: EVERINGHAM, M;VAN GOOL, L;WILLIAMS, CKI;WINN, J;ZISSERMAN, A

出处: INTERNATIONAL JOURNAL OF COMPUTER VISION 88 (2): 303-338 SP. ISS. SI JUN 10 2010

摘要: The Pascal Visual Object Classes (VOC) challenge is a benchmark in visual object category recognition and detection, providing the vision and machine learning communities with a standard dataset of images and annotation, and standard evaluation procedures. Organised annually from 2005 to present, the challenge and its associated dataset has become accepted as the benchmark for object detection. This paper describes the dataset and evaluation procedure. We review the state-of-the-art in evaluated methods for both classification and detection, analyse whether the methods are statistically different, what they are learning from the images (e.g. the object or its context), and what the methods find easy or confuse. The paper concludes with lessons learnt in the three year history of the challenge, and proposes directions for future improvement and extension.

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14.被引频次: 1950

题目: HUMAN-LEVEL CONTROL THROUGH DEEP REINFORCEMENT LEARNING

作者: MNIH, V;KAVUKCUOGLU, K;SILVER, D;RUSU, AA;VENESS, J;BELLEMARE, MG;GRAVES, A;RIEDMILLER, M;FIDJELAND, AK;OSTROVSKI, G;PETERSEN, S;BEATTIE, C;SADIK, A;ANTONOGLOU, I;KING, H;KUMARAN, D;WIERSTRA, D;LEGG, S;HASSABIS, D

出处: NATURE 518 (7540): 529-533 FEB 26 2015

摘要: The theory of reinforcement learning provides a normative account', deeply rooted in psychological' and neuroscientific perspectives on animal behaviour, of how agents may optimize their control of an environment. To use reinforcement learning successfully in situations approaching real-world complexity, however, agents are confronted with a difficult task: they must derive efficient representations of the environment from high-dimensional sensory inputs, and use these to generalize past experience to new situations. Remarkably, humans and other animals seem to solve this problem through a harmonious combination of reinforcement learning and hierarchical sensory processing systems<sup>4,5</sup>, the former evidenced by a wealth of neural data revealing notable parallels between the phasic signals emitted by dopaminergic neurons and temporal difference reinforcement learning algorithms'. While reinforcement learning agents have achieved some successes in a variety of domains, their applicability has previously been limited to domains in which useful features can be handcrafted, or to domains with fully observed, low-dimensional state spaces. Here we use recent advances in training deep neural networks' to develop a novel artificial agent, termed a deep Q-network, that can learn successful policies directly from high-dimensional sensory inputs using end-to-end reinforcement learning. We tested this agent on the challenging domain of classic Atari 2600 games. We demonstrate that the deep Q-network agent, receiving only the pixels and the game score as inputs, was able to surpass the performance of all previous algorithms and achieve a level comparable to that of a professional human games tester across a set of 49 games, using the same algorithm, network architecture and hyperparameters. This work bridges the divide between high-dimensional sensory inputs and actions, resulting in the first artificial agent that is capable of learning to excel at a diverse array of challenging tasks.

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15.被引频次: 1924

题目: BIOFUELS FROM MICROALGAE-A REVIEW OF TECHNOLOGIES FOR PRODUCTION, PROCESSING, AND EXTRACTIONS OF BIOFUELS AND CO-PRODUCTS

作者: BRENNAN, L;OWENDE, P

出处: RENEWABLE & SUSTAINABLE ENERGY REVIEWS 14 (2): 557-577 FEB 2010

摘要: Sustainability is a key principle in natural resource management, and it involves operational efficiency, minimisation of environmental impact and socio-economic considerations. all of which are interdependent It has become increasingly obvious that continued reliance on fossil fuel energy resources is unsustainable, owing to both depleting world reserves and the green house gas emissions associated with their use Therefore, there are vigorous research initiatives aimed at developing alternative renewable and potentially carbon neutral solid, liquid and gaseous biofuels as alternative energy resources. However, alternate energy resources akin to first generation biofuels derived from terrestrial crops such as sugarcane, Sugar beet, maize and rapeseed place an enormous strain on world food markets, contribute to water shortages and precipitate the destruction of the world's forests. Second generation biofuels derived from lignocellulosic agriculture and forest residues and from non-food crop feedstocks address some of the above problems; however there is concern over competing land use or required land use changes Therefore, based on current knowledge and technology projections, third generation biofuels specifically derived from microalgae are considered



to be a technically viable alternative energy resource that is devoid of the major drawbacks associated with first and second generation biofuels. Microalgae are photosynthetic microorganisms with simple growing requirements (light, Sugars, CO<sub>2</sub>, N, P, and K) that can produce lipids, proteins and carbohydrates in large amounts Over short periods of time. These products can be processed into both biofuels and valuable co-products. This study reviewed the technologies underpinning microalgae-to-biofuels systems, focusing on the biomass production, harvesting, conversion technologies. and the extraction of useful co-products it also reviewed the synergistic coupling of microalgae propagation with carbon sequestration and wastewater treatment potential for mitigation of environmental impacts associated with energy conversion and utilisation. It was found that, whereas there are outstanding issues related to photosynthetic efficiencies and biomass output, microalgae-derived biofuels could progressively substitute a significant proportion of the fossil fuels required to meet the growing energy demand (C) 2009 Elsevier Ltd All rights reserved.

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16.被引频次：1917

题目：REPRESENTATION LEARNING: A REVIEW AND NEW PERSPECTIVES

作者：BENGIO, Y;COURVILLE, A;VINCENT, P

出处：IEEE TRANSACTIONS ON PATTERN ANALYSIS AND MACHINE INTELLIGENCE 35 (8): 1798-1828 AUG 2013

摘要：The success of machine learning algorithms generally depends on data representation, and we hypothesize that this is because different representations can entangle and hide more or less the different explanatory factors of variation behind the data. Although specific domain knowledge can be used to help design representations, learning with generic priors can also be used, and the quest for AI is motivating the design of more powerful representation-learning algorithms implementing such priors. This paper reviews recent work in the area of unsupervised feature learning and deep learning, covering advances in probabilistic models, autoencoders, manifold learning, and deep networks. This motivates longer term unanswered questions about the appropriate objectives for learning good representations, for computing representations (i.e., inference), and the geometrical connections between representation learning, density estimation, and manifold learning.

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17.被引频次：1857

题目：DEEP NEURAL NETWORKS FOR ACOUSTIC MODELING IN SPEECH RECOGNITION

作者：HINTON, G;DENG, L;YU, D;DAHL, GE;MOHAMED, AR;JAITLEY, N;SENIOR, A;VANHOUCHE, V;NGUYEN, P;SAINATH, TN;KINGSBURY, B

出处：IEEE SIGNAL PROCESSING MAGAZINE 29 (6): 82-97 NOV 2012

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18.被引频次: 1680

题目: MILLIMETER WAVE MOBILE COMMUNICATIONS FOR 5G CELLULAR: IT WILL  
WORK!

作者: RAPPAPORT, TS;SUN, S;MAYZUS, R;ZHAO, H;AZAR, Y;WANG, K;WONG,  
GN;SCHULZ, JK;SAMIMI, M;GUTIERREZ, F

出处: IEEE ACCESS 1: 335-349 2013

摘要: The global bandwidth shortage facing wireless carriers has motivated the exploration of the underutilized millimeter wave (mm-wave) frequency spectrum for future broadband cellular communication networks. There is, however, little knowledge about cellular mm-wave propagation in densely populated indoor and outdoor environments. Obtaining this information is vital for the design and operation of future fifth generation cellular networks that use the mm-wave spectrum. In this paper, we present the motivation for new mm-wave cellular systems, methodology, and hardware for measurements and offer a variety of measurement results that show 28 and 38 GHz frequencies can be used when employing steerable directional antennas at base stations and mobile devices.

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19.被引频次: 1613

题目: SCALING UP MIMO

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出处: IEEE SIGNAL PROCESSING MAGAZINE 30 (1): 40-60 JAN 2013

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20.被引频次: 1565

题目: OVERVIEW OF THE HIGH EFFICIENCY VIDEO CODING (HEVC) STANDARD

作者: SULLIVAN, GJ;OHM, JR;HAN, WJ;WIEGAND, T

出处: IEEE TRANSACTIONS ON CIRCUITS AND SYSTEMS FOR VIDEO TECHNOLOGY 22

(12): 1649-1668 DEC 2012

摘要: High Efficiency Video Coding (HEVC) is currently being prepared as the newest video coding standard of the ITU-T Video Coding Experts Group and the ISO/IEC Moving Picture Experts Group. The main goal of the HEVC standardization effort is to enable significantly improved compression performance relative to existing standards-in the range of 50% bit-rate reduction for equal perceptual video quality. This paper provides an overview of the technical features and characteristics of the HEVC standard.

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21.被引频次: 1550

题目: IMAGE SUPER-RESOLUTION VIA SPARSE REPRESENTATION

作者: YANG, JC;WRIGHT, J;HUANG, TS;MA, Y

出处: IEEE TRANSACTIONS ON IMAGE PROCESSING 19 (11): 2861-2873 NOV 2010

摘要: This paper presents a new approach to single-image superresolution, based upon sparse signal representation. Research on image statistics suggests that image patches can be well-represented as a sparse linear combination of elements from an appropriately chosen over-complete dictionary. Inspired by this observation, we seek a sparse representation for each patch of the low-resolution input, and then use the coefficients of this representation to generate the high-resolution output. Theoretical results from compressed sensing suggest that under mild conditions, the sparse representation can be correctly recovered from the downsampled signals. By jointly training two dictionaries for the low-and high-resolution image patches, we can enforce the similarity of sparse representations between the low-resolution and high-resolution image patch pair with respect to their own dictionaries. Therefore, the sparse representation of a low-resolution image patch can be applied with the high-resolution image patch dictionary to generate a high-resolution image patch. The learned dictionary pair is a more compact representation of the patch pairs, compared to previous approaches, which simply sample a large amount of image patch pairs [1], reducing the computational cost substantially. The effectiveness of such a sparsity prior is demonstrated for both general image super-resolution (SR) and the special case of face hallucination. In both cases, our algorithm generates high-resolution images that are competitive or even superior in quality to images produced by other similar SR methods. In addition, the local sparse modeling of our approach is naturally robust to noise, and therefore the proposed algorithm can handle SR with noisy inputs in a more unified framework.

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22.被引频次: 1492

题目: EFFICIENT ORGANIC SOLAR CELLS PROCESSED FROM HYDROCARBON SOLVENTS

作者: ZHAO, JB;LI, YK;YANG, GF;JIANG, K;LIN, HR;ADE, H;MA, W;YAN, H

出处: NATURE ENERGY 1: - JAN 25 2016

摘要: Organic solar cells have desirable properties, including low cost of materials, high-throughput roll-to-roll production, mechanical flexibility and light weight. However, all top-performance devices are at present processed using halogenated solvents, which are environmentally hazardous and would thus require expensive mitigation to contain the hazards. Attempts to process organic solar cells from non-halogenated solvents lead to inferior performance. Overcoming this hurdle, here we present a hydrocarbon-based processing system that is not only more environmentally friendly but also yields cells with power conversion efficiencies of up to 11.7%. Our processing system incorporates the synergistic effects of a hydrocarbon solvent, a novel additive, a suitable choice of polymer side chain, and strong temperature-dependent aggregation of the donor polymer. Our results not only demonstrate a method of producing active layers of organic solar cells in an environmentally friendly way, but also provide important scientific insights that will facilitate further improvement of the morphology and performance of organic solar cells.

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23.被引频次: 1473

题目: MATPOWER: STEADY-STATE OPERATIONS, PLANNING, AND ANALYSIS TOOLS FOR POWER SYSTEMS RESEARCH AND EDUCATION

作者: ZIMMERMAN, RD;MURILLO-SANCHEZ, CE;THOMAS, RJ

出处: IEEE TRANSACTIONS ON POWER SYSTEMS 26 (1): 12-19 FEB 2011

摘要: MATPOWER is an open-source Matlab-based power system simulation package that provides a high-level set of power flow, optimal power flow (OPF), and other tools targeted toward researchers, educators, and students. The OPF architecture is designed to be extensible, making it easy to add user-defined variables, costs, and constraints to the standard OPF problem. This paper presents the details of the network modeling and problem formulations used by MATPOWER, including its extensible OPF architecture. This structure is used internally to implement several extensions to the standard OPF problem, including piece-wise linear cost functions, dispatchable loads, generator capability curves, and branch angle difference limits. Simulation results are presented for a number of test cases comparing the performance of several available OPF solvers and demonstrating MATPOWER's ability to solve large-scale AC and DC OPF problems.

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24.被引频次: 1458

题目: A REVIEW OF POLYMER ELECTROLYTE MEMBRANE FUEL CELLS: TECHNOLOGY, APPLICATIONS, AND NEEDS ON FUNDAMENTAL RESEARCH

作者: WANG, Y;CHEN, KS;MISHLER, J;CHO, SC;ADROHER, XC

出处: APPLIED ENERGY 88 (4): 981-1007 APR 2011

摘要: Polymer electrolyte membrane (PEM) fuel cells, which convert the chemical energy stored in hydrogen fuel directly and efficiently to electrical energy with water as the only byproduct, have the potential to reduce our energy use, pollutant emissions, and dependence on fossil fuels. Great deal of efforts has been made in the past, particularly during the last couple of decades or so, to advance the PEM fuel cell technology and fundamental research. Factors such as durability and cost still remain as the major barriers to fuel cell commercialization. In the past two years, more than 35% cost reduction has been achieved in fuel cell fabrication, the current status of \$61/kW (2009) for transportation fuel cell is still over 50% higher than the target of the US Department of Energy (DOE), i.e. \$30/kW by 2015, in order to compete with the conventional technology of internal-combustion engines. In addition, a lifetime of similar to 2500 h (for transportation PEM fuel cells) was achieved in 2009, yet still needs to be doubled to meet the DOE's target, i.e. 5000 h. Breakthroughs are urgently needed to overcome these barriers. In this regard, fundamental studies play an important and indeed critical role. Issues such as water and heat management, and new material development remain the focus of fuel-cell performance improvement and cost reduction. Previous reviews mostly focus on one aspect, either a specific fuel cell application or a particular area of fuel cell research. The objective of this review is three folds: (1) to present the latest status of PEM fuel cell technology development and applications in the transportation, stationary, and portable/micro power generation sectors through an overview of the state-of-the-art and most recent technical progress; (2) to describe the need for fundamental research in this field and fill the gap of addressing the role of fundamental research in fuel cell technology; and (3) to outline major challenges in fuel cell technology development and the needs for fundamental research for the near future and prior to fuel cell commercialization. (C) 2010 Elsevier Ltd. All rights reserved.

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25.被引频次: 1428

题目: NEW WORLD RECORD EFFICIENCY FOR CU(IN,Ga)SE-2 THIN-FILM SOLAR CELLS BEYOND 20%

作者: JACKSON, P;HARISKOS, D;LOTTER, E;PAETEL, S;WUERZ, R;MENNER, R;WISCHMANN, W;POWALLA, M

出处: PROGRESS IN PHOTOVOLTAICS 19 (7): 894-897 SP. ISS. SI NOV 2011

摘要: In this contribution, we present a new certified world record efficiency of 20.1 and 20.3% for Cu(In,Ga)Se-2 thin-film solar cells. We analyse the characteristics of solar cells on such a



performance level and demonstrate a high degree of reproducibility. Copyright (C) 2011 John Wiley & Sons, Ltd.

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## AIAA、IAF 最新会议

### AIAA

(AIAA 来源: <http://www.aiaa.org/>)

1. 会议名称: 6th CEAS Conference on Guidance Navigation and Control (2021 EuroGNC)

会议时间: 5 May - 7 May 2021

会议地点: Technical University of Berlin, Berlin, Germany

会议简介: EuroGNC is the biannual conference for the international community of researchers and practitioners in the field of aerospace guidance, navigation and control. It provides a platform to discuss latest research results, perspectives on future developments and innovative applications relevant to aerospace and aeronautics. Scientists and engineers from industry, research institutes and universities involved in the development of novel GNC methods, flight dynamic modelling and simulation, applications or technologies are invited to attend the upcoming EuroGNC held 2021 in Berlin, Germany. Presentations should primarily be focused on technical and scientific aspects of GNC architectures, algorithms and methods as well as flight dynamic modelling and simulation and on experience gained from real-life applications in those fields.

链接:

[https://www.aiaa.org/events-learning/event/2021/05/05/default-calendar/6th-ceas-conference-on-guidance-navigation-and-control-\(2021-eurognc\)](https://www.aiaa.org/events-learning/event/2021/05/05/default-calendar/6th-ceas-conference-on-guidance-navigation-and-control-(2021-eurognc))

2. 会议名称: 10th International Conference on Recent Advances in Space Technologies - RAST2021 (Postponed)

会议时间: 1 June - 4 June 2021

会议地点: Istanbul, Turkey

会议简介: RAST 2021 has the main objective of providing a forum for the presentation and review of developments in space, as well as all aspects of recent developments in space technologies. A focus is desired on a historical and current evaluation helping the societies to solve demanding problems of this decadred we have entered 0 is intended to be a forum for the exchange of recent research results and ideas in space technologies and applications; this time with specific reference to space economy. It should be of interest to a wide range of participants from government agencies, relevant international institutions, universities, research organizations, space companies, as well as media and the general public. The conference should serve as an opportunity for networking and fruitful exchange with fellow participants on topics of mutual interest.

链接:

[https://www.aiaa.org/events-learning/event/2021/06/01/default-calendar/10th-international-conference-on-recent-advances-in-space-technologies-\(rast2021\)](https://www.aiaa.org/events-learning/event/2021/06/01/default-calendar/10th-international-conference-on-recent-advances-in-space-technologies-(rast2021))





3. 会议名称: 2021 AIAA Aviation and Aeronautics Forum and Exposition (2021 AIAA AVIATION Forum)

会议时间: 7 June - 11 June 2021

会议地点: Marriott Wardman Park, Washington, DC, USA

会议简介: The AIAA AVIATION Forum is the only aviation event that covers the entire integrated spectrum of aviation business, research, development, and technology. The 2021 forum will bring together experts to share ideas on aeroacoustics; applied aerodynamics; fluid dynamics; multidisciplinary design optimization; air traffic operations, management, and systems; and much more.

链接:

<https://www.aiaa.org/events-learning/event/2021/06/07/default-calendar/2021-aiaa-aviation-and-aeronautics-forum-and-exposition>

4. 会议名称: 3rd Cognitive Communications for Aerospace Applications (CCAA) Workshop

会议时间: 21 June - 23 June 2021

会议地点: Ohio Aerospace Institute (OAI), Cleveland, Ohio

会议简介: This is the third workshop on cognitive telecommunications systems co-sponsored by IEEE Northeastern Ohio Chapter and NASA Glenn Research Center in Cleveland, OH. The aim of this workshop is to bring together Researchers, Engineers, Technologists, and leaders across industry, government, and academia to discuss and present their recent advancements and future interest in the field of artificial intelligence and machine learning with applications toward the development of cognitive telecommunication systems for aerospace.

链接:

[https://www.aiaa.org/events-learning/event/2021/06/21/default-calendar/3rd-cognitive-communications-for-aerospace-applications-\(ccaa\)-workshop](https://www.aiaa.org/events-learning/event/2021/06/21/default-calendar/3rd-cognitive-communications-for-aerospace-applications-(ccaa)-workshop)

## IAF

(IAF 来源: <http://www.iafastro.org/>)

- 1.会议名称: SPACEOPS 2021 - VIRTUAL EDITION

会议时间: 3-5 May 2021

会议地点: Cape Town, South Africa (Virtual Event)

会议简介: Since the inception of SpaceOps in 1990, the organization has hosted thirteen biennial conferences by various countries around the world. In 2020, South Africa was meant to host SpaceOps 2020 in the city of Cape Town. Due to the Covid-19 pandemic however, a decision was taken to postpone the conference until things got back to normal.

After many consultations and continuous monitoring of developments that currently affected the world as a result of the pandemic, the Space Ops ExCom decided to continue with the conference in 2021 and go with the virtual format instead. Hosting SpaceOps 2021 - Virtual Edition is important for the industry as the conference offers industry peers and experts an opportunity to engage and share knowledge on advances and improvements in the Space Operations industry.



SpaceOps 2021 - Virtual Edition, will deliver quality and engaging content that relates to the Space Operations and the Space industry. It is exciting that the virtual conference will also provide an opportunity for more delegates to participate without traveling abroad and appreciate the diverse and interesting topics from the comfort of their homes and/or office spaces.

Although the conference will be online, the organizing committee is committed to giving you an unforgettable African experience without traveling to South Africa.

链接:

<https://www.iafastro.org/events/iaf-affiliated-events/spaceops-2021-virtual-edition/2020-international-symposium-on-the-peaceful-use-of-space-technology-health.html>



## ACM 最新会议

来源: <http://www.acm.org/>

1. 会议名称: ACM SIGUCCS 2021 Conference

会议时间: March 14-April 30, 2021

会议地点: Free online seminar series

会议简介: This year's conference will be free for attendees and held online as a series of seminars. Gather with fellow higher education technology professionals for the online Seminar Series and social events occurring between March 14th and April 30th, 2021 to share successes, find inspiration, and connect with colleagues who strive for excellence in providing information technology services for colleges and universities.

链接: <https://siguccs.org/Conference/2021/>

2. 会议名称: ICDM 2021 Introduction

会议时间: April 23-26, 2021

会议地点: Singapore

会议简介: Digital manufacturing is an approach based on technology to production that links different data silos and processes in the manufacturing lifecycle so that stakeholders can make better business decisions both comprehensively and at each step. And an significant aim of digital manufacturing is to improve efficiency and respond to changing customer demands in a more agile manner.

2021 International Conference on Digital Manufacturing (ICDM 2021) will be held in Singapore on April 23-26, 2021 as the workshop of ICMMT 2021 conference. ICDM 2021 aims to provide a forum for researchers and practitioners involved in different but related domains to confront research results and discuss key problems, giving impetus to high quality research on digital manufacturing. ICDM 2021 is soliciting the original and high-quality submissions in the related areas.

链接: <http://icdm.net/>

3. 会议名称: The 11th ACM Conference on Data and Application Security and Privacy

会议时间: April 26 - 28, 2021

会议地点: Taking place virtually.

会议简介: ACM SIGSAC announces the continuation of its annual ACM Conference on Data and Application Security and Privacy. The eleventh conference will be held virtually.

On its 8th gathering, the CODASPY community finally reached a consensus on the pronunciation of the conference acronym. It's officially called /<sub>1</sub>kəʊdə<sup>1</sup>spaɪ/ or [koh-də-spy].

COVID-19

CODASPY 2021 will be a virtual event. However, should COVID-19 circumstances allow, the conference will include an in-person optional component in the USA. Participation in the in-person component will be entirely at authors' and attendees' discretion. All authors of accepted papers will have the option to present and participate virtually.

链接: <http://www.codaspy.org/2021/>

4. 会议名称: ICCEMS 2021

会议时间: May 15 to 18, 2021

会议地点: Shanghai, China.

会议简介: Welcome to ICCEMS 2021

ICCEMS 2021 will bring together the researchers from countries and regions around the world to exchange their research results and address open issues in civil engineering and materials science. It is one of the leading international conferences for presenting novel and fundamental advances in the fields of civil engineering and materials science. ICCEMS 2021 will provide a comfortable, pleasant conference atmosphere for every attendee.

链接: <http://www.iccem.org/>

5. 会议名称: 2021 6th International Conference on Big Data and Computing

会议时间: May 22-24, 2021

会议地点: Shenzhen, China.

会议简介: Welcome to the official website of the 2021 6th International Conference on Big Data and Computing. It'll be held during May 22-24, 2021 in Shenzhen, China. The aim of ICBDC 2021 is to present the latest research and results of scientists related to Big Data and Computing topics. This conference provides opportunities for the different areas delegates to exchange new ideas and application experiences face to face, to establish business or research relations and to find global partners for future collaboration. We hope that the conference results constituted significant contribution to the knowledge in these up to date scientific field.

Important notification! The conference organising committees is aware of the current developments regarding the novel coronavirus and we understand that some participants are now facing travel restrictions. Therefore the option to do remote presentation is offered to encourage participants to continue with their presentations virtually by online conference, video conference through the online platform.

链接: <http://www.icbdc.org/index.html>

6. 会议名称: 2021 4th International Conference on Artificial Intelligence and Big Data (ICAIBD 2021)

会议时间: May 28-31, 2021

会议地点: Chengdu, China

会议简介: It is sponsored by Sichuan Province Computer Federation and technically assisted by many local and international universities. This conference provides you opportunity to meet with academicians as well as practitioners in the fields of Artificial Intelligence and Big Data from all over the world, and get the latest insights from every area of Artificial Intelligence and Big Data theory and practice.

ICAIBD features invited keynote speech, peer-reviewed paper presentations, and academic visit. The conference is completely open (one needs to register first), you will not have to be an author or a discussant to attend. Submissions will be peer-reviewed and evaluated based on originality, relevance to conference, contributions, and presentation. We invite the submission of original research

contributions.

链接: <http://www.icaibd.org/>

7. 会议名称: 2021 ACM SIGSIM PADS

会议时间: May 31-June 2, 2021

会议地点: Suffolk, Virginia, U.S.A.

会议简介: The annual PADS conference has a long history dating back to 1985. The conference was formerly known under the name Principles of Advanced and Distributed Simulation, and before that simply Parallel and Distributed Simulation. Over the years PADS has broadened its scope beyond its origins in parallel and distributed simulation and now encompasses virtually all research that lies at the intersection of the computer science and the modeling and simulation fields. Specifically, many research topics not related to parallel or distributed model execution are now included.

SIGSIM PADS provides a unique forum for reporting and discussing research results and important topics of interest to the M&S community. SIGSIM PADS is the flagship conference of ACM's Special Interest Group on Simulation and Modeling (SIGSIM) and is fully sponsored by that organization.

链接: <http://www.acm-sigsim-pads.org/>

8. 会议名称: ICFET 2021

会议时间: June 4-7, 2021.

会议地点: Bangkok, Thailand

会议简介: The knowledge economy has very great demands for high-quality talents, and that enables educating, especially higher education becomes one of the hot questions of the current society. To meet this challenge, the current education method of the world is shifting towards more efficiency and edutainment. The objective of ICFET is to present the latest research and results of scientists (professors, doctoral students, and post-doc scientists) related to Frontiers of Educational Technologies topics. This conference provides opportunities for delegates from different areas to exchange new ideas, applications and experiences face to face, to establish business or research relations, and to find global partners for future collaboration. We hope that the conference results in significant contributions to the knowledge base in these scientific fields.

链接: <http://www.icfet.org/>

9. 会议名称: ICCMST 2021

会议时间: June 17-21, 2021

会议地点: Cavtat, Croatia

会议简介: 2021 The 3rd International Conference on Composite Materials Science and Technology (ICCMST 2021) will be held in Cavtat, Croatia, during June 17-21, 2021. It is a great pleasure for ICCMST to invite prospective authors initiating the discussion on the challenges that need to be timely overcome and addressing key questions in the field of Composite Materials Science and Technology.

ICCMST is a remarkable event which facilitates the exchanges of ideas, novel and practical techniques and applications in various fields of advanced materials including but limited to composite materials and nanomaterials, chemical and materials engineering, nanotechnology etc.



链接: <http://iccmst.org/>

10. 会议名称: ICCIR 2021

会议时间: June 18-20, 2021

会议地点: Guangzhou, China

会议简介: 2021 International Conference on Control and Intelligent Robotics (ICCIR 2021) will be held in Guangzhou, China during June 18-20, 2021, which is co-organized by South China University of Technology, Sun Yat-sen University, SYSU and Guangzhou University. The major goal of the conference is to bring academic scientists, engineers, industry researchers together to exchange and share their experiences and research results, and discuss the practical challenges encountered and the solutions adopted. Prestigious experts and professors have been invited as keynote speakers to deliver the latest information in their respective expertise areas. It will be a golden opportunity for students, researchers and engineers to interact with the experts on technical matters, research methodology, career advices, vision into the future, etc.

链接: <http://ic-cir2021.org/>





## ***IQPC 最新国防会议(Defence)***

IQPC 来源: <http://www.iqpc.com/>

1. 会议名称: Future Amphibious Forces

会议时间: 18 - 20 May, 2021

会议地点: London

会议简介: Hosted with the official support of the Royal Marines, the inaugural Future Amphibious Force conference will bring together senior military and industry personnel to contribute and share knowledge on the future nature of amphibious operations, and the utility of amphibiousness. Our speakers will share their assessments of the changing threats faced by navies and amphibious forces (including A2/AD); priority capability areas for development, and how Marine forces are adapting to this new world through the use of new disruptive technologies.

The conference will take place at an exciting time for UK Amphibious capability, as the Royal Marines embark on a major transformation programme to develop the Future Commando Force.

FAF20 will feature keynote presentations from the Commandant General Royal Marines, as well as the heads of navies and marine corps from around the World, and we invite you to join us in discussing priority capability development areas, as well as new approaches and technologies for advancing amphibiousness.

链接:

[https://www.defenceiq.com/events-future-amphibious-force/?utm\\_medium=portal&utm\\_source=iqpc](https://www.defenceiq.com/events-future-amphibious-force/?utm_medium=portal&utm_source=iqpc)

2. 会议名称: Future Artillery 2021

会议时间: 24 - 26 May, 2021

会议地点: London

会议简介: It is no coincidence that the fielding of a long-range precision fires capability tops the US Army's list of modernisation priorities. The importance of artillery as a joint enabler has been consistently underlined by concepts of operation that describe a contested future battlespace – where the predominance of A2/AD technologies deny the air superiority on which NATO has come to rely.

The Future Artillery conference remains the premier platform for discussing those next-generation systems that will provide a decisive long-range fires capability for future multi-domain operations.

链接: [https://www.defenceiq.com/events-futureartillery/?utm\\_medium=portal&utm\\_source=iqpc](https://www.defenceiq.com/events-futureartillery/?utm_medium=portal&utm_source=iqpc)

3. 会议名称: Air Defence Week

会议时间: 23-24 June 2021

会议地点: Zurich, Switzerland

会议简介: The return to Great Power competition and continued technological progress has led to a rise in both high-end and low-end threats. Faced with the proliferation of UAVs of all sizes and

classes as well as heightened tensions with ballistic and cruise missile capable nations, armed forces need to rapidly evolve air defence systems across the full spectrum of threats.

The annual Full Spectrum Air Defence International Forum has been built in response to the military need to consider the total operating environment and has rapidly become the chosen meeting ground for the international air defence community; bringing together both industry and military to address the threat.

With ever increasing threats from state and non-state actors alike, the need for an immediate global response has never been greater.

链接:

[https://www.defenceiq.com/events-airdefenceinternational/?utm\\_medium=portal&mac=IQPCCORP](https://www.defenceiq.com/events-airdefenceinternational/?utm_medium=portal&mac=IQPCCORP)

4. 会议名称: Military Flight Training

会议时间: 29 June - 01 July, 2021

会议地点: Hilton London Syon Park, Middlesex, United Kingdom

会议简介: Defence iQ's Military Flight Training conference will be taking place from 23 - 25th March online.

Concurrent with today's operational context, Military Flight Training 2021 will discuss key challenge areas including: training for contested and degraded environments, delivering LVC in mixed inventories of new and legacy platforms, solving red air deficiency, LVC interoperability, rotary-wing training, recruitment & retention, operational conversion training and crew resource management, integrated synthetic/virtual training capabilities, and effective threat emulations.

链接:

[https://www.defenceiq.com/events-militaryflighttraining/?utm\\_medium=portal&mac=IQPCCORP](https://www.defenceiq.com/events-militaryflighttraining/?utm_medium=portal&mac=IQPCCORP)

5. 会议名称: Coast Guard Capability

会议时间: 06 - 07 July, 2021

会议地点: London, United Kingdom

会议简介: Coast Guard Capability 2021 provides a forum to help coast guards and related maritime organisations achieve mission success.

Modern coast guards are faced with increasingly varied and complex challenges covering a wide range of missions which demand specialist equipment and highly trained personnel. Often this requires working under extreme stress, strict time conditions using multi-function capabilities and platforms as effectively as possible.

Focusing on Interoperability, Search and Rescue, Border Security and Resource Protection this conference aims to improve inter-agency and international cooperation as well as provide an opportunity to meet with industry leaders providing the next generation of specialist equipment. Coast Guard Capability 2021 will again feature whole day sessions that cater to both SAR and Law Enforcement specialists and will include an interactive workshop giving attendees an opportunity to explore the planning, implementation and sustainment of a mass casualty Search and Rescue operation in a challenging environment.

Join this forum to meet with international colleagues, discuss current challenges and develop well-defined future propriety areas, as well as share case-studies and take part in the critical discussion for maritime organisations.



链接:

[https://www.defenceiq.com/events-coastguardcapability/?utm\\_medium=portal&mac=IQCCORP](https://www.defenceiq.com/events-coastguardcapability/?utm_medium=portal&mac=IQCCORP)

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