SINGAPORE UNIVERSITY OF TECHNOLOGY AND DESIGN

6 February – 9 April 2021

TOPICAL REPORT

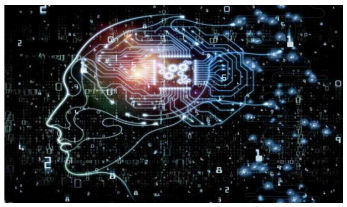
ARTIFICIAL INTELLIGENCE & DATA SCIENCE

Gain insight and keep up-to-date with the latest publications carefully selected by the library from credible sources in academic publications, industry & market research and scientific & industry news. If you have any sources to suggest for our report please let us know.

view past reports | subscribe to others | unsubscribe

news

DATA SCIENCE



Top 20 Data Science And Machine Learning Platforms: Gartner

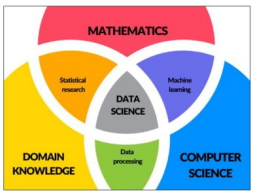
"The global COVID-19 pandemic hasn't slowed down the rapid pace of data science and machine learning (DSML) innovation or the bullish growth strategies from vendors. Many organizations are starting DSML initiatives using free or low-cost open-source and public cloud offerings to build up their expertise and explore new opportunities.
CRN breaks down the 20 market-leading vendors that made Gartner's 2021 Magic Quadrant for Data Science and Machine Learning Platforms, as well as each company's weaknesses and strengths in the market according to Gartner."
Source: CRN News

Top 10 data science books you must read to boost your career

"Educating yourself through data science books is one of the most holistic views to get a hold onto your data-skills. Through following data science books you can learn not only about problem-solving but get a bigger picture of using mathematics, probability, statistics, programming, machine learning and much more in your data science projects & initiatives.

academic

DATA SCIENCE



Data science applications for predictive maintenance and materials science in context to Industry 4.0

"This paper identifies five critical processes of data scientists for predictive maintenance and discussed briefly through a literature review. Data science uses various processes, scientific methods, and algorithms to extract knowledge from a large amount of data. It can collect a massive amount of industrial data, which is further used to improve the manufacturing systems' efficiency and reliability. It helps analyse the data and become essential for Industry 4.0."
Source: Materials Today Proceedings

Fixed Point Strategies in Data Science

"The goal of this paper is to promote the use of fixed point strategies in data science by showing that they provide a simplifying and unifying framework to model, analyze, and solve a great variety of problems. They are seen to constitute a natural environment to explain the behavior of advanced convex optimization methods as well as of recent nonlinear methods in data science which are formulated in terms of paradigms that go beyond

reports

DATA SCIENCE

Gartner Top 10 Data and Analytics Trends for 2021

"Transitioning from big data to small and wide data is one of the Gartner top data and analytics trends for 2021. These trends represent business, market and technology dynamics that data and analytics leaders cannot afford to ignore."
Source: Gartner

ARTIFICIAL INTELLIGENCE

Artificial Intelligence Index Report 2021

"The AI Index Report tracks, collates, distills, and visualizes data related to artificial intelligence. Its mission is to provide unbiased, rigorously vetted, and globally sourced data for policymakers, researchers, executives, journalists, and the general public to develop intuitions about the complex field of AI. The report aims to be the world's most credible and authoritative source for data and insights about AI."
Source: Stanford University

Here are the top 10 data science books you must read to boost your career."
Source: Analytics Insight

What is the data science strategy of microsoft?

"The days when siloed, monolithic data stores were the rule is long gone, and those that are still standing are insufficient for business needs in today's digital world. As part of its digital transformation, Microsoft is modernizing the data estate to unleash the power of Artificial Intelligence."
Source: Analytics Insight

Streamlit Transforms How Data Scientists Share Data, Raises $35 Million in Funding Led by Sequoia

"Streamlit is an open source, powerful and easy-to-use framework, first introduced in 2019, that lets data scientists quickly build web apps to access and explore machine learning models, advanced algorithms and complex data types. These apps are everything from advanced analytics dashboards to sales and marketing tools based off of the latest predictive algorithms."
Source: Intrado GlobeNewswire

Why machine learning, not artificial intelligence, is the right way forward for data science

"We bandy about the term "artificial intelligence," evoking ideas of creative machines anticipating our every whim, though the reality is more banal: "For the foreseeable future, computers will not be able to match humans in their ability to reason abstractly about real-world situations." This is from Michael I. Jordan, one of the foremost authorities on AI and machine learning, who wants us to get real about AI."
Source: Tech Republic

The problem with data science education

"THE demand for data science professionals has been echoed in the increased supply of data science education. In the field of data science alone, we have witnessed a flourishing of formal degrees, diplomas, and certifications, among other forms of training.
However, has our eagerness in..."
Source: The Business Times

Saturn Cloud Introduces Free Cloud-Hosted Data Science Platform for Everyday and GPU-Accelerated Workloads

minimization concepts and involve constructs such as Nash equilibria or monotone inclusions."
Source: IEEE Xplore

Data science in organizations: Conceptualizing its breakthroughs and blind spots

"While numerous complex problems in science have become solvable through data science, not all scientific solutions are equally applicable to business. Many data-intensive business problems are situated in complex socio-political and behavioral contexts that still elude commonly used scientific methods. To what extent can such problems be addressed through data science? Does data science have any inherent blind spots in this regard? What types of business problems are likely to be addressed by data science in the near future, which will not, and why?"
Source: Sage Journals

Statistics Practicum: Placing 'Practice' at the Center of Data Science Education

"Much of the current post-secondary training in core data science fields treats 'practice' as something to be relegated to capstone projects or other final preparations before students leave their programs. Here we argue for a paradigm shift, placing a so-called Practicum course at the center of a data science program, intentionally organized as a hybrid between an educational classroom and an industry-like environment. As a case study, we detail our experience of the past five years developing the Statistics Practicum in Boston University's MS in Statistical Practice (MSSP) program."
Source: MIT

Data science literacy: Toward a philosophy of accessible and adaptable data science skill development in public administration programs

"Public administration is struggling to contend with a substantial shift in practice fueled by the accelerating adoption of information technology. New skills, competencies and pedagogies are required by the field to help overcome the data-skills gap. As a means to address these deficiencies, we introduce the Data Science Literacy Framework, a heuristic for incorporating data science principles into public administration programs. The framework suggests that data literacy is the dominant principle underlying a shift in professional practice, accentuated by an understanding of computational science, statistical

Navigating the top 5 AI trends facing your business

"Key takeaways

- Businesses are increasing their investment in AI in the wake of COVID-19.
- Three-quarters of businesses are not breaking even when it comes to their investments.
- To capitalise on their AI projects, companies should be aligning with five key trends."

Source: Price Waterhouse Cooper

Final Report: National Security Commission on Artificial Intelligence

"The AI future can be democratic, but we have learned enough about the power of technology to strengthen authoritarianism abroad and fuel extremism at home to know that we must not take for granted that future technology trends will reinforce rather than erode democracy. We must work with fellow democracies and the private sector to build privacy-protecting standards into AI technologies and advance democratic norms to guide AI uses so that democracies can responsibly use AI tools for national security purposes."
Source: National Security Commission on Artificial Intelligence

4 steps to using AI in an environmentally responsible way

(This article is part of the **Global Technology Governance Summit**)
"Artificial Intelligence can sustain the environment by helping to reduce GHG emissions and optimize the use of natural resources. However, AI can have unintended consequences – such as by increasing demand and thus increasing carbon footprint. This four-step plan can ensure AI can be deployed in a responsible way."
Source: World Economic Forum

Together, human expertise and AI can make city streets safer, scientists say

(This article is part of the **Global Technology Governance Summit**)
"Artificial intelligence (AI) is being used in research that it's hoped will help reduce road traffic accidents (RTAs), which claim about 1.35 million lives every year. Scientists in Spain have applied the technology to identify common patterns in RTAs. These could help guide urban planners in work to reduce collisions and make the world's streets safer."
Source: World Economic Forum

"Saturn Cloud, a Python data science company, announced that it is launching a free cloud-hosted data science and machine learning platform. The service includes hosted notebooks that run on CPUs or T4 and V100 GPUs, including managed Dask clusters for parallelizing code for faster models. These new capabilities make it easy for data scientists to scale up and down, scale across GPUs, share work and dashboards, productionize workflows, and much more."
Source: Yahoo Finance

Mistakes to Avoid When Starting a Career in Data Science

"The shortage of data science talent is dramatic, but there are still a few mistakes you can make getting your foot in the door. These are the types of mistakes that can slow down your initial career progress, so we're going to cover them in this article to help you make sure you'll avoid them."
Source: Inside Big Data

The New Hero Of Data Science: The CIO

"Two tectonic forces in enterprise infrastructure are on a high-speed collision course: the rise of data science and machine learning, and increasingly complex security threats. The convergence of these trends has created a critical moment for CIOs. Those who seize the opportunity will set their organizations on a course for growth and innovation, cementing the CIO's role as a critical and strategic leader. Those who don't will watch as innovation stagnates while new security and operational risks engulf the organization."
Source: Forbes

How Open Source is Driving the Future of Data Science

"Over the past decade, data science and machine learning have made their way from an obscure academic discipline to widespread corporate adoption. The academic community has a natural preference towards open source. Science is a collaborative effort, and its advancement is best served by enabling as large a community as possible to build upon existing research."
Source: RT Insights

Big data tells story of diversity, migration of math's elite

"Published in *Nature's Humanities and Social Sciences Communications*, the study analyzed the effectiveness of the Fields Medal to make math at its highest level more representative across nations and identities. The result provides a visual, data-driven methodology, and data-adjacent domain knowledge."
Source: Sage Journals

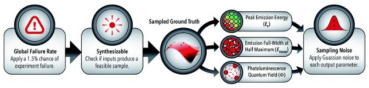
Categorical data as a stone guest in a data science project for predicting defective water meters

"In this paper, we want to discuss the fact that while the prediction accuracy of our RNN has exceeded the 80% on average, based on the use of continuous data, those performances did not improve, significantly, with the introduction of categorical information during the training phase. From a specific viewpoint, this remains an unsolved and critical problem of our research. Yet, if we reason about this controversial case from a data science perspective, we realize that we have had a confirmation that accurate machine learning solutions cannot be built without the participation of domain experts, who can differentiate on the importance of (the relation between) different types of data, each with its own sense, validity, and implications."
Source: Cornell University

Development of Online Learning Material for Data Science Programming Using 3D Puzzle

"In multidimensional data processing, one of the important data structures is a higher-order tensor or a multidimensional array... Therefore, in this study, we developed a new programming exercise material for the higher-order tensor, which is supposed to be used in data science subjects, by using a 3D puzzle. This learning material is also composed of Microsoft Teams, and students can access the material remotely to learn programming"
Source: International Journal of Information and Education Technology

ARTIFICIAL INTELLIGENCE



Accelerated AI development for autonomous materials synthesis in flow

"In this work, a surrogate model is developed using data from over 1000 in-house conducted syntheses of metal halide perovskite quantum dots in a self-driven modular microfluidic material synthesizer. The model is designed to represent the global failure rate, unfeasible regions of the synthesis space, synthesis ground truth, and sampling noise of a real robotic material synthesis system with multiple output parameters (peak

Artificial Intelligence and Robotic Innovations Transforming the Global Endoscopy Devices Market

"As the need and preference for minimally invasive surgeries are rapidly rising, the demand for endoscopic procedures is also witnessing substantial growth. Since endoscopes are minimally invasive and use the natural openings of the body for insertion to aid physicians with enhanced images for the purpose of diagnosis and therapy, the need for scopes with smaller diameters and improved flexibility has been leading to the development of advanced endoscopic devices. Since modern endoscopy has few risks, is relatively quick, and delivers detailed images for diagnosis, it has proven incredibly essential across different application segments."
Source: Frost & Sullivan

AI-Based Image Analysis Tools and Cloud-Based Deployment to Expand the Global Digital Pathology Market

"The Transformational Health team at Frost & Sullivan provides critical insights into the global digital pathology market, highlighting key growth opportunities, market revenue forecast, and business models that will play an essential role in its growth. The study segments the market by product (hardware, software, and storage solutions) and region (North America, European Union, and Asia-Pacific). Frost & Sullivan provides the market forecast and breakdown by region from 2019–2025, capturing developing market trends and regional dynamics vital in increasing market growth."
Source: Frost & Sullivan

history of international migration and social networks among math elites, particularly since World War II."
Source: EurekAlert!

ARTIFICIAL INTELLIGENCE

A New Artificial Intelligence Makes Mistakes—on Purpose

"IT TOOK ABOUT 50 years for computers to eviscerate humans in the venerable game of chess. A standard smartphone can now play the kind of moves that make a grandmaster's head spin. But one artificial intelligence program is taking a few steps backward, to appreciate how average humans play—blunders and all."
Source: WIRED

Bringing AI into the real world

"Artificial intelligence (AI) researchers and health experts modelling COVID-19's spread have warned that for vaccines to be useful in curbing the pandemic, a significant percentage of the population must be vaccinated to reach herd immunity. But, as SMU's Vice Provost of Research Professor Archan Misra pointed out at an AI-centred panel discussion, held in conjunction with the SMU- Global Young Scientists Summit (GYSS) on 15 January 2021, from a purely self-interested point of view, each person would be best served if all the others got vaccinated and they themselves did not have to vaccinate – because that would stop the spread of the virus without their having to take on the possible risks of side effects."
Source: Singapore Management University

Using AI ethically to tackle covid-19

"In a crisis such as the covid-19 pandemic, governments and health services must act quickly and decisively to stop the spread of the disease. Artificial intelligence (AI), which in this context largely means increasingly powerful data driven algorithms, can be an important part of that action—for example, by helping to track the progress of a virus or to prioritise scarce resources.1 To save lives it might be tempting to deploy these technologies at speed and scale. Deployment of AI can affect a wide range of fundamental values, however, such as autonomy, privacy, and fairness. AI is much more likely to be beneficial, even in urgent situations, if those commissioning, designing, and deploying it take a systematically ethical approach from the start."
Source: The BMJ

emission, emission linewidth, and quantum yield). With this model, over 150 AI-guided decision-making strategies within a single-period horizon reinforcement learning framework are automatically explored across more than 600 000 simulated experiments."
Source: Royal Society of Chemistry

The Sanction of Authority: Promoting Public Trust in AI

"Trusted AI literature to date has focused on the trust needs of users who knowingly interact with discrete AIs. Conspicuously absent from the literature is a rigorous treatment of public trust in AI. We argue that public distrust of AI originates from the underdevelopment of a regulatory ecosystem that would guarantee the trustworthiness of the AIs that pervade society. Drawing from structuration theory and literature on institutional trust, we offer a model of public trust in AI that differs starkly from models driving Trusted AI efforts."
Source: ACM Digital Library

Brain-computer interface for generating personally attractive images

"While we instantaneously recognize a face as attractive, it is much harder to explain what exactly defines personal attraction. This suggests that attraction depends on implicit processing of complex, culturally and individually defined features. Generative adversarial neural networks (GANs), which learn to mimic complex data distributions, can potentially model subjective preferences unconstrained by pre-defined model parameterization. Here, we present generative brain-computer interfaces (GBCI), coupling GANs with brain-computer interfaces. GBCI first presents a selection of images and captures personalized attractiveness reactions toward the images via electroencephalography."
Source: IEEE Xplore

Roles of artificial intelligence in construction engineering and management: A critical review and future trends

"With the extensive adoption of artificial intelligence (AI), construction engineering and management (CEM) is experiencing a rapid digital transformation. Since AI-based solutions in CEM has become the current research focus, it needs to be comprehensively understood. In this regard, this paper presents a systematic review under both scientometric and qualitative analysis to present the current state of AI

Artificial intelligence calculates suicide attempt risk

"Over the 11 consecutive months concluding in April 2020, predictions ran silently in the background as adult patients were seen at VUMC. The algorithm, dubbed the Vanderbilt Suicide Attempt and Ideation Likelihood (VSAIL) model, uses routine information from electronic health records (EHRs) to calculate 30-day risk of return visits for suicide attempt, and, by extension, suicidal ideation."
Source: EurekAlert!

How to Make All Headphones Intelligent

"How do you turn "dumb" headphones into smart ones? Rutgers engineers have invented a cheap and easy way by transforming headphones into sensors that can be plugged into smartphones, identify their users, monitor their heart rates and perform other services."
Source: Rutgers The State University of New Jersey

Making artificial intelligence understandable – constructing explanation processes

"The basis for these artificial intelligence (AI) processes is algorithmic decision-making. However, as these are generally difficult to understand, they often prove less useful than anticipated. Researchers at Paderborn and Bielefeld University are hoping to change this, and are discussing how the explainability of artificial intelligence can be improved and adapted to the needs of human users. Their work has recently been published in the respected journal "IEEE Transactions on Cognitive and Developmental Systems"."
Source: Paderborn University

AI Identifies Social Bias Trends in Bollywood, Hollywood Movies

"Fans and critics of Bollywood — the popular name for a $2.1 billion film industry centered in Mumbai, India — might have some inkling of all this, particularly as movies often reflect changes in the culture. But these insights came via an automated computer analysis designed by Carnegie Mellon University computer scientists."
Source: Carnegie Mellon University

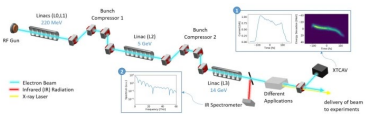
MACHINE LEARNING

adoption in the context of CEM and discuss its future research trends."
Source: Elsevier

Attachment and trust in artificial intelligence

"Lack of trust is one of the main obstacles standing in the way of taking full advantage of the benefits artificial intelligence (AI) has to offer. Most research on trust in AI focuses on cognitive ways to boost trust. Here, instead, we focus on boosting trust in AI via affective means. Specifically, we tested and found associations between one's attachment style—an individual difference representing the way people feel, think, and behave in relationships—and trust in AI."
Source: Elsevier

MACHINE LEARNING



Accurate and confident prediction of electron beam longitudinal properties using spectral virtual diagnostics

"In this work we present a machine learning-based Virtual Diagnostic (VD) tool to accurately predict the LPS for every shot using spectral information collected non-destructively from the radiation of relativistic electron beam. We demonstrate the tool's accuracy for three different case studies with experimental or simulated data. For each case, we introduce a method to increase the confidence in the VD tool. We anticipate that spectral VD would improve the setup and understanding of experimental configurations at DOE's user facilities as well as data sorting and analysis."
Source: Nature

Machine learning based approach to pH imaging and classification of single cancer cells

"The ability to identify different cell populations in a noninvasive manner and without the use of fluorescence labeling remains an important goal in biomedical research. Various techniques have been developed over the last decade, which mainly rely on fluorescent probes or nanoparticles… Here, we leverage a recently developed pH imaging modality and machine learning-based single-cell segmentation and classification to identify different cancer cell lines based on their characteristic intracellular pH. This simple method opens up the potential to perform rapid noninvasive identification of living

New machine learning tool diagnoses electron beams in an efficient, non-invasive way

"Beams of accelerated electrons power electron microscopes, X-ray lasers, medical accelerators and other devices. To optimize the performance of these applications, operators must be able to analyze the quality of the beams and adjust them as needed."
Source: Phys.Org

New machine learning tool diagnoses electron beams in an efficient, non-invasive way

"For the past few years, researchers at the Department of Energy's SLAC National Accelerator Laboratory have been developing "virtual diagnostics" that use machine learning to obtain crucial information about beam quality in an efficient, non-invasive way. Now, a new virtual diagnostic approach, published in Scientific Reports, incorporates additional information about the beam that allows the method to work in situations where conventional diagnostics have failed."
Source: Stanford University

New machine learning theory that can be applied to fusion energy raises questions about the very nature of science

"The algorithm, devised by a scientist at the U.S. Department of Energy's (DOE) Princeton Plasma Physics Laboratory (PPPL), applies machine learning, the form of artificial intelligence (AI) that learns from experience, to develop the predictions. "Usually in physics, you make observations, create a theory based on those observations, and then use that theory to predict new observations," said PPPL physicist Hong Qin, author of a paper (link is external) detailing the concept in Scientific Reports. "What I'm doing is replacing this process with a type of black box that can produce accurate predictions without using a traditional theory or law.""
Source: Princeton Plasma Physics Laboratory

Faster fusion reactor calculations thanks to machine learning

"Aaron Ho from the Science and Technology of Nuclear Fusion group in the department of Applied Physics has explored the use of machine learning approaches to speed up the numerical simulation of core plasma turbulent transport."
Source: Phys.Org

cancer cells for early cancer diagnosis and further downstream analyses."
Source: APL Bioengineering

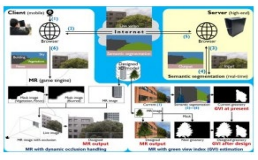
Common pitfalls and recommendations for using machine learning to detect and prognosticate for COVID-19 using chest radiographs and CT scans

"Machine learning methods offer great promise for fast and accurate detection and prognostication of coronavirus disease 2019 (COVID-19) from standard-of-care chest radiographs (CXR) and chest computed tomography (CT) images... In this systematic review, we consider all published papers and preprints, for the period from 1 January 2020 to 3 October 2020, which describe new machine learning models for the diagnosis or prognosis of COVID-19 from CXR or CT images."
Source: Nature

Fictitious phase separation in Li layered oxides driven by electro-autocatalysis

"Here, we show that the apparent phase separation is a dynamical artefact occurring in a many-particle system driven by autocatalytic electrochemical reactions, that is, an interfacial exchange current that increases with the extent of delithiation. We experimentally validate this population-dynamics model using the single-phase material Lix(Ni1/3Mn1/3Co1/3)O2 ($0.5 < x < 1$) and demonstrate generality with other transition-metal compositions."
Source: Nature Materials

DEEP LEARNING



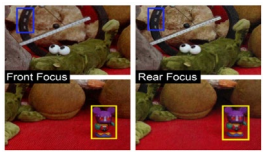
Assessing future landscapes using enhanced mixed reality with semantic segmentation by deep learning

"Architecture, engineering, and construction projects need to be promoted in harmony with the natural environment and with the aim of preserving people's living environment... In this study, semantic segmentation by deep learning was integrated into an MR system to enable dynamic occlusion handling and landscape index estimation for both existing and designed landscape assessment. This system can be operated on a mobile device with video communication over the

FSU researchers enhance quantum machine learning algorithms

"William Oates, the Cummins Inc. Professor in Mechanical Engineering and chair of the Department of Mechanical Engineering at the FAMU-FSU College of Engineering, and postdoctoral researcher Guanglei Xu found a way to automatically infer parameters used in an important quantum Boltzmann machine algorithm for machine learning applications. Their findings were published in **Scientific Reports**."
Source: Florida State University

DEEP LEARNING



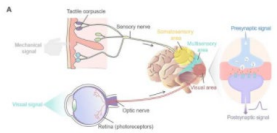
Deep Learning Enables Real-Time 3D Holograms On a Smartphone

"Using artificial intelligence, scientists can now rapidly generate photorealistic color 3D holograms even on a smartphone. And according to a new study, this new technology could find use in virtual reality (VR) and augmented reality (AR) headsets and other applications."
Source: IEEE Spectrum

Deep learning networks prefer the human voice -- just like us

"Columbia engineers demonstrate that AI systems might reach higher performance if programmed with sound files of human language rather than with binary data labels."
Source: EurekAlert!

NEURAL NETWORKS



A bio-inspired mechano-photonic artificial synapse

"In this work, Yu et al. presented a mechano-photonic artificial synapse with synergistic mechanical and optical plasticity. The device contained an optoelectronic transistor and an integrated triboelectric nanogenerator (TENG) in contact-separation mode. The mechano-optical artificial synapses have huge functional potential as interactive optoelectronic interfaces, synthetic retinas and intelligent robots."
Source: Phys.Org

internet by connecting to real-time semantic segmentation on a high-performance personal computer. The applicability of the developed system is demonstrated through accuracy verification and case studies."
Source: Elsevier

Enabling Large Intelligent Surfaces With Compressive Sensing and Deep Learning

"This paper proposes efficient solutions for these problems by leveraging tools from compressive sensing and deep learning. First, a novel LIS architecture based on sparse channel sensors is proposed. In this architecture, all the LIS elements are passive except for a few elements that are active (connected to the baseband). We then develop two solutions that design the LIS reflection matrices with negligible training overhead. In the first approach, we leverage compressive sensing tools to construct the channels at all the LIS elements from the channels seen only at the active elements."
Source: IEEE Xplore

DeepXDE: A Deep Learning Library for Solving Differential Equations

"Deep learning has achieved remarkable success in diverse applications; however, its use in solving partial differential equations (PDEs) has emerged only recently. Here, we present an overview of physics-informed neural networks (PINNs), which embed a PDE into the loss of the neural network using automatic differentiation. The PINN algorithm is simple, and it can be applied to different types of PDEs, including integro-differential equations, fractional PDEs, and stochastic PDEs."
Source: SIAM

NEURAL NETWORKS

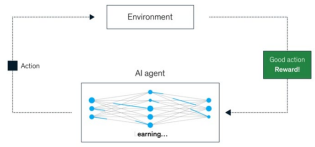
Near-Infrared-to-Visible Vein Imaging via Convolutional Neural Networks and Reinforcement Learning

"We introduce the first "smart" engine to govern the components of such imagers in a mixed reality setting. Namely, a closed-loop hardware system that optimizes cross-talk between the virtual mask generated from the NIR measurement and the projected augmenting image is proposed. Such real-virtual image translation is accomplished in several steps. First, the NIR vein segmentation

Artificial neuron device could shrink energy use and size of neural network hardware

"Training neural networks to perform tasks, such as recognizing images or navigating self-driving cars, could one day require less computing power and hardware thanks to a new artificial neuron device developed by researchers at the University of California San Diego. The device can run neural network computations using 100 to 1000 times less energy and area than existing CMOS-based hardware."
Source: Phys.Org

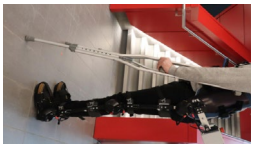
REINFORCEMENT LEARNING



It's time for businesses to chart a course for reinforcement learning

"An advanced artificial intelligence technique is quickly becoming accessible to organizations as a tool for speeding innovation and solving complex business problems."
Source: McKinsey Company

ROBOTICS



Engineers combine AI and wearable cameras in self-walking robotic exoskeletons

"Robotics researchers are developing exoskeletons and prosthetic legs capable of thinking and making control decisions on their own using sophisticated artificial intelligence (AI) technology.
The system combines computer vision and deep-learning AI to mimic how able-bodied people walk by seeing their surroundings and adjusting their movements."
Source: EurekAlert!

BIOMEDICAL

X-Rays Combined with AI Offer Fast Diagnostic Tool in Detecting COVID-19

"X-rays could be a leading-edge diagnostic tool for COVID-19 patients with the help of artificial intelligence (AI), according to researchers who task is solved using U-Net-based network architecture and the Frangi vesselness filter."
Source: IEEE Xplore

Deep artificial neural networks reveal a distributed cortical network encoding propositional sentence-level meaning

"Understanding how and where in the brain sentence-level meaning is constructed from words presents a major scientific challenge. Recent advances have begun to explain brain activation elicited by sentences using vector models of word meaning derived from patterns of word co-occurrence in text corpora. These studies have helped map out semantic representation across a distributed brain network spanning temporal, parietal and frontal cortex. However, it remains unclear whether activation patterns within regions reflect unified representations of sentence-level meaning, as opposed to superpositions of context-independent component words."
Source: The Journal of Neuroscience

Decoding and interpreting cortical signals with a compact convolutional neural network

"Brain–computer interfaces (BCIs) decode information from neural activity and send it to external devices. The use of Deep Learning approaches for decoding allows for automatic feature engineering within the specific decoding task. Physiologically plausible interpretation of the network parameters ensures the robustness of the learned decision rules and opens the exciting opportunity for automatic knowledge discovery. Approach. We describe a compact convolutional network-based architecture for adaptive decoding of electrocorticographic (ECoG) data into finger kinematics."
Source: IOP Science

Energy-efficient Mott activation neuron for full-hardware implementation of neural networks

"To circumvent the von Neumann bottleneck, substantial progress has been made towards in-memory computing with synaptic devices. However, compact nanodevices implementing non-linear activation functions are required for efficient full-hardware implementation of deep neural networks. Here, we present an energy-efficient and compact Mott activation neuron based on vanadium dioxide and its successful

taught a computer program, through various machine learning methods, to detect COVID-19 in chest X-rays with 95.6 to 98.5% accuracy.
The findings were made by researchers at the Universidade de Fortaleza (Fortaleza - CE, Brazil) who have previously focused on detecting and classifying lung pathologies, such as fibrosis, emphysema and lung nodules, through medical imaging. Common symptoms presented by suspected COVID-19 infections include respiratory distress, cough and, in more aggressive cases, pneumonia - all visible via medical imaging such as CT scans or X-rays."
Source: HospiMedica

AI used in battle against asbestos-linked cancer

"New research undertaken by the Leicester Mesothelioma Research Programme has now revealed, using AI analysis of DNA-sequenced mesotheliomas, that they evolve along similar or repeated paths between individuals. These paths predict the aggressiveness and possible therapy of this otherwise incurable cancer."
Source: University of Leicester

New AI model learns from thousands of possibilities to suggest medical diagnoses & tests

"While AI is very good when trained on years of human data in specific domains, it has not been able to deal with the huge number of diagnostic tests (about 5000) and disorders (about 14,000) of modern clinical practice. Now, a new algorithm developed by engineers at the USC Viterbi School of Engineering can think and learn just like a doctor but with essentially infinite experience."
Source: EurekAlert!

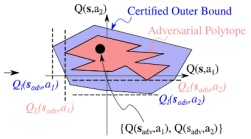
New AI tool can revolutionise microscopy

"An AI tool developed at the University of Gothenburg offers new opportunities for analysing images taken with microscopes. A study shows that the tool, which has already received international recognition, can fundamentally change microscopy and pave the way for new discoveries and areas of use within both research and industry."
Source: University of Gothenburg

Artificial intelligence can help spot traces of natural selection

"Researchers have used advanced AI and large sets of genomic data to unveil how humans have adapted to recent diseases.
The method could also be applied to new pathogens such as the integration with a conductive bridge random access memory (CBRAM) crossbar array in hardware."
Source: Nature Nanotechnology

REINFORCEMENT LEARNING



Certifiable Robustness to Adversarial State Uncertainty in Deep Reinforcement Learning

"This work leverages research on certified adversarial robustness to develop an online certifiably robust for deep reinforcement learning algorithms. The proposed defense computes guaranteed lower bounds on state-action values during execution to identify and choose a robust action under a worst case deviation in input space due to possible adversaries or noise. Moreover, the resulting policy comes with a certificate of solution quality, even though the true state and optimal action are unknown to the certifier due to the perturbations."
Source: IEEE Xplore

Deep Reinforcement Learning for Autonomous Driving: A Survey

"With the development of deep representation learning, the domain of reinforcement learning (RL) has become a powerful learning framework now capable of learning complex policies in high dimensional environments. This review summarises deep reinforcement learning (DRL) algorithms and provides a taxonomy of automated driving tasks where (D)RL methods have been employed, while addressing key computational challenges in real world deployment of autonomous driving agents."
Source: IEEE Xplore

Experimental quantum speed-up in reinforcement learning agents

"Here we present a reinforcement learning experiment in which the learning process of an agent is sped up by using a quantum communication channel with the environment. We further show that combining this scenario with classical communication enables the evaluation of this improvement and allows optimal control of the learning progress. We implement this learning protocol on a compact and fully tunable integrated nanophotonic processor."
Source: Nature

coronavirus that causes COVID-19, helping identify which gene mutations may be associated with more severe cases of the disease."
Source: Phys.Org

Explainability in deep reinforcement learning

"We review recent works in the direction to attain Explainable Reinforcement Learning (XRL), a relatively new subfield of Explainable Artificial Intelligence, intended to be used in general public applications, with diverse audiences, requiring ethical, responsible and trustable algorithms. In critical situations where it is essential to justify and explain the agent's behaviour, better explainability and interpretability of RL models could help gain scientific insight on the inner workings of what is still considered a black box."
Source: Elsevier

Applications of reinforcement learning in energy systems

"We classified RL papers in the literature into seven categories based on their area of application. Subsequently, publications under each category were further examined relative to problem diversity, RL technique employed, performance improvement (compared with other white and gray box models), verification, and reproducibility; many of the articles reported a 10–20% performance improvement with the use of RL."
Source: Elsevier

Variational quantum policies for reinforcement learning

"In this work, we leverage the understanding of quantum policy gradient algorithms in a number of ways. First, we investigate how to construct and train reinforcement learning policies based on variational quantum circuits. We propose several designs for quantum policies, provide their learning algorithms, and test their performance on classical benchmarking environments. Second, we show the existence of task environments with a provable separation in performance between quantum learning agents and any polynomial-time classical learner, conditioned on the widely-believed classical hardness of the discrete logarithm problem."
Source: Cornell University

NATURAL LANGUAGE PROCESSING

Natural language processing-based characterization of top-down communication in smart cities for enhancing citizen alignment

"Many city governments have implemented promising smart initiatives to make cities more efficient, livable, and ecological. To harness the full potential of smart city initiatives, it is vital for policymakers to align citizens with the project objectives. This study comprehensively characterizes and classifies top-down announcements formulated by city developers into six alignment categories (i.e., smart economy, smart people, smart governance, smart mobility, smart environment, and smart living) using natural language processing."
Source: Elsevier

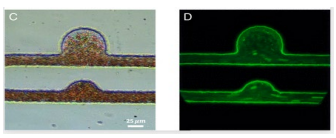
From natural language processing to neural databases

"This paper introduces neural databases, a class of systems that use NLP transformers as localized answer derivation engines. We ground the vision in NeuralDB, a system for querying facts represented as short natural language sentences. We demonstrate that recent natural language processing models, specifically transformers, can answer select-project-join queries if they are given a set of relevant facts."
Source: UCL Discovery

An intelligent patent recommender adopting machine learning approach for natural language processing: A case study for smart machinery technology mining

"Recommendation systems are widely applied in many fields, such as online customized product searches and customer-centric advertisements. This research develops the methodology for a patent recommender to discover semantically relevant patents for further technology mining and trend analysis. The proposed recommender adopts machine learning (ML) algorithms for natural language processing (NLP) to represent patent documents in vector space and to enable semantic analyses of the patent documents."
Source: Elsevier

BIOMEDICAL



Artificial intelligence velocimetry and microaneurysm-on-a-chip for three-dimensional analysis of

blood flow in physiology and disease

"Microfluidics is an important in vitro platform to gain insights into mechanics of blood flow and mechanisms of pathophysiology of human diseases. Extraction of 3D fields in microfluidics with dense cell suspensions remains a formidable challenge. We present artificial-intelligence velocimetry (AIV) as a general platform to determine 3D flow fields and a microaneurysm-on-a-chip to simulate blood flow in microaneurysms in patients with diabetic retinopathy."

Source: PNAS