SINGAPORE UNIVERSITY OF TECHNOLOGY AND DESIGN

5 December 2020 – 5 February 2021

TOPICAL REPORT

ARTIFICIAL INTELLIGENCE & DATA SCIENCE

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DATA SCIENCE

How automated machine learning could power data science?

"Many businesses seek to leverage AutoML as a tool that can bolster data scientists' productivity. It provides the ability and effectiveness of applying advanced models to everyone, including data scientists, analytics professionals, business analysts, and others."
Source: Analytics Insight

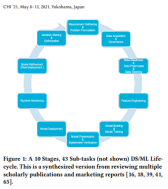
How to get started with and get better at data science in 2021.

"A step-by-step approach to getting started and developing your skills in this rapidly changing field."
Source: Towards Data Science

New Method Makes Better Predictions of Material Properties Using Low Quality Data

"By combining large amounts of low-fidelity data with the smaller quantities of high-fidelity data, nanoengineers from the Materials Virtual Lab at UC San Diego have developed a new machine learning method to predict the properties of materials with more accuracy than existing models."
Source: UC San Diego

DATA SCIENCE



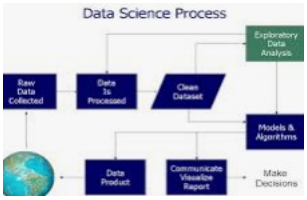
AutoDS: Towards Human-Centered Automation of Data Science

"This paper introduces AutoDS, an automated machine learning (AutoML) system that aims to leverage the latest ML automation techniques to support data science projects. Data workers only need to upload their dataset, then the system can automatically suggest ML configurations, preprocess data, select algorithm, and train the model. These suggestions are presented to the user via a web-based graphical user interface and a notebook-based programming user interface."
Source: Cornell University

A Data Science Workflow for Discovering Spatial Patterns Among Terrorist Attacks and Infrastructure

"We introduce an interactive data visualization application to explore incidents of terror at user-specified spatial and temporal levels using data from the Global Terrorism Database. The application allows a user to view historical terrorist activity on an interactive world map, with features that allow filtering and visualization in multiple forms. Additionally, we discuss a statistical modeling approach to determine the

DATA SCIENCE



2021 Trends in Data Science: The Entire AI Spectrum

"As an enterprise discipline, data science is the antithesis of Artificial Intelligence. The one is an unrestrained field in which creativity, innovation, and efficacy are the only limitations; the other is bound by innumerable restrictions regarding engineering, governance, regulations, and the proverbial bottom line."
Source: Inside Big Data

Increased Investment by Cloud and Colocation Providers Drives the Global Data Center Market

"The next decade will witness an explosion of data due to increased levels of technology deployment across the globe; this will drive the need for processing and storing data and require the construction of both large and small data centers. The advent of 4G and 5G networks and the deployment of Industry 4.0 technologies and Internet of Things (IoT) devices have caused a steady flow of data generation."
Source: Frost & Sullivan

ARTIFICIAL INTELLIGENCE

How AutoML is Accelerating Time to Value on Data Science Use Cases

"Investing in data science processes can add value in several ways – influencing critical decisions in recruitment, marketing, sales, supply chain, operations and many more. Let us take a closer look at a popular ML use case and how decision making can be improved by applying ML and deriving value from it."
Source: Inside Big Data

Data scientist analyzes evolution of COVID-19 dark web marketplaces before the vaccine

"New research carried out by City data scientist, Dr. Andrea Baronchelli, and colleagues, into the dark web marketplace (DWM) trade in products related to COVID-19, has revealed the need for the continuous monitoring of dark web marketplaces (DWMs), especially in light of the current shortage and availability of coronavirus vaccines."
Source: TechXplore

Data science and computational mathematics unite to advance predictive methods in engineering

"A well-known mathematical method, used as a predictive tool in engineering and the physical sciences for more than 70 years, has been radically redesigned in landmark research led by Cambridge engineers."
Source: University of Cambridge

ARTIFICIAL INTELLIGENCE

Artificial Intelligence beats us in chess, but not in memory

"In the last decades, Artificial Intelligence has shown to be very good at achieving exceptional goals in several fields. Chess is one of them: in 1996, for the first time, the computer Deep Blue beat a human player, chess champion Garry Kasparov. A new piece of research shows now that the brain strategy for storing memories may lead to imperfect memories, but in turn, allows it to store more memories, and with less hassle than AI. The new study, carried out by SISSA scientists in collaboration with Kavli Institute for Systems Neuroscience & Centre for Neural Computation, Trondheim, Norway, relationship between terrorist attacks and types of infrastructure within a country using zero-inflated models for count data."
Source: Wiley Online Library

How Much Automation Does a Data Scientist Want?

"Data science and machine learning (DS/ML) are at the heart of the recent advancements of many Artificial Intelligence (AI) applications. There is an active research thread in AI, \autoai, that aims to develop systems for automating end-to-end the DS/ML Lifecycle. However, do DS and ML workers really want to automate their DS/ML workflow?... We propose new next steps for user-controlled DS/ML automation."
Source: Cornell University

Automated Experimentation Powers Data Science in Chemistry

"We propose three broad categories of data in chemistry: data on fundamental properties, data on reaction outcomes, and data on reaction mechanics. We highlight flexible, automated platforms that can be deployed to acquire and leverage these data. The first platform combines solid- and liquid-dosing modules with computer vision to automate solubility screening, thereby gathering fundamental data that are necessary for almost every experimental design. Using computer vision offers the additional benefit of creating a visual record, which can be referenced and used to further interrogate and gain insight on the data collected."
Source: American Chemical Society

Quantifying causality in data science with quasi-experiments

"Estimating causality from observational data is essential in many data science questions but can be a challenging task. Here we review approaches to causality that are popular in econometrics and that exploit (quasi) random variation in existing data, called quasi-experiments, and show how they can be combined with machine learning to answer causal questions within typical data science settings."
Source: Nature Computational Science

Matching Methods to Problems: Using Data Science and Transmission Modeling to Combat Antimicrobial Resistance

"Antimicrobial resistance is a growing worldwide crisis, declared by the World Health Organization as "one of

Enhancing European Customer Experience with Artificial Intelligence

"This study focuses on how AI is making inroads into the customer experience (CX) space. After shifting from on-premises solutions to cloud-based services, the industry is embracing AI and integrating it into various CX-related use cases and solutions. Chatbots, voicebots, behavioral applications, biometrics, cybersecurity, speech recognition, machine translation, and automated models for scheduling and forecasting within workforce management are among the many AI-powered functionalities in the CX space."
Source: Frost & Sullivan

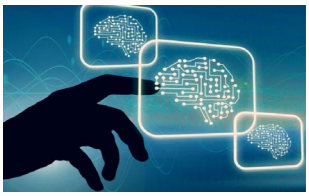
Artificial Intelligence Powering the Global Medical Imaging Market

"The medical imaging and informatics industry is evolving, with vendors launching new products and solutions every other day. As the reimbursement environment transitions from fee-for-service to value-based payment, vendors' business models and value propositions are changing. New evidence on the use of specific imaging techniques is influencing changes in the care standard."
Source: Frost & Sullivan

Growth Opportunities In Artificial Intelligence

"This edition of IT, Computing and Communications (ITCC) Technology Opportunity Engine (TOE) provides a snapshot of the emerging ICT led innovations in artificial intelligence. This issue focuses on the application of information and communication technologies in alleviating the challenges faced across industry sectors in areas such as smart buildings, automotive, healthcare, and military."
Source: Frost & Sullivan

FORECAST



These five AI developments will shape 2021 and beyond

has just been published in Physical Review Letters."
Source: Scuola Internazionale Superiore di Studi Avanzat

Artificial Intelligence that can run a simulation faithful to physical laws

"A research group led by Associate Professor YAGUCHI Takaharu (Graduate School of System Informatics) and Associate Professor MATSUBARA Takashi (Graduate School of Engineering Science, Osaka University) have succeeded in developing technology to simulate phenomena for which the detailed mechanism or formula are unexplained. They did this by using artificial intelligence (AI) to create a model, which is faithful to the laws of physics, from observational data."
Source: Kobe University

Artificial intelligence improves control of powerful plasma accelerators

"Experiments led by Imperial College London researchers, using the Science and Technology Facilities Council's Central Laser Facility (CLF), showed that an algorithm was able to tune the complex parameters involved in controlling the next generation of plasma-based particle accelerators."
Source: Imperial College London

Top AI Trends to Watch in 2021

"Surviving the Covid-19 pandemic during 2020 has triggered a fast change in consumer trends. Complex security and privacy concerns, the ethical use of Artificial Intelligence, and the increasing impact of climate change will drive industries to incorporate systemic risk into their long-term planning."
Source: Interesting Engineering

Researchers use artificial intelligence to ID mosquitoes

"Rapid and accurate identification of mosquitoes that transmit human pathogens such as malaria is an essential part of mosquito-borne disease surveillance. Now, researchers have shown the effectiveness of an artificial intelligence system -- known as a Convoluted Neural Network -- to classify mosquito sex, genus, species and strain."
Source: Science Daily

Using light to revolutionize artificial intelligence

"The World Robotics report shows that Europe is the region with the highest robot density globally, with an average value of 114 units per 10,000 employees in the manufacturing the principal threats to global public health today." The emergence and spread of antimicrobial resistance is a multifaceted problem that spans all aspects of healthcare, and research efforts to advance the field must likewise employ investigators with a diverse set of expertise and a variety of approaches and study designs who recognize and address the unique challenges of infectious-disease and antimicrobial-resistance research."
Source: Oxford Academic

Data science assisted investigation of catalytically active copper hydrate in zeolites for direct oxidation of methane to methanol using H2O2

"To investigate the active structures of the Cu zeolites, 15 structural variables, which describe the features of the zeolite framework and reflect the composition, the surface area and the local structure of the Cu zeolite active site, are collected from the Database of Zeolite Structures of the International Zeolite Association (IZA). Also analytical studies based on inductively coupled plasma-optical emission spectrometry (ICP-OES), X-ray fluorescence (XRF), N2 adsorption specific surface area measurement and X-ray absorption fine structure (XAFS) spectral measurement are performed."
Source: Nature Scientific Reports

Empowering the data science scientist

"At its core, data science is about integrating the right methods, tools, and technology from different disciplines for the sole purpose of solving a complex data-driven problem in a particular domain such as economics, engineering, or medicine. All data science challenges start with a question. What is the best investment strategy? When will this bridge need to be replaced? Why do some people have adverse reactions to a drug? A key question is "where do these questions come from?""
Source: Springer Link

Data, measurement, and causal inferences in machine learning: opportunities and challenges for marketing

"The emergence of digital data and the methods used to analyze them are revolutionizing marketing research. The vast quantity of data offers marketing researchers countless opportunities to better predict and potentially explain consumer behavior. Yet, as we will argue in this paper, marketing

"Despite the travesties of 2020, artificial intelligence has quickened its progress. Baidu upped its performance across vaccines, autonomous vehicles, language processing, and quantum computing."
Source: MIT Technology Review

Now Tech: AI Consultancies, Q1 2021

"You can use AI consultancies to accelerate impact and time-to-value with AI, de-risk AI-driven business activities and offers, and upskill your enterprise to become AI native. But to realize these benefits, you'll first have to select from a diverse set of vendors that vary by size, functionality, geography, and vertical market focus. CIOs should use this report to understand the value they can expect from an AI consultancy and to select one based on breadth of services."
Source: Forrester

Artificial Intelligence (AI) Market Size 2021 Global Industry Trends, Future Growth, Regional Overview, Market Share, Revenue, and Forecast Outlook till 2025

"Artificial Intelligence (AI) Market report covers size, share and forecast (value and volume) by regions, top players, product types and applications, with historical data along with forecast from 2021 to 2023; The report covers an in depth description, competitive scenario, wide product portfolio of key vendors and business strategy adopted by competitors along with their SWOT analysis, revenue, sales and Porter's Five Forces Analysis."
Source: Market Watch

Artificial Intelligence (AI) in Manufacturing Industry 2021 Market Analysis Research Report by Trends, Size, Share, Growth Drivers, Challenges and Forecast to 2026 | Industry Research Biz

"The Exhaustive Study for Artificial Intelligence (AI) in Manufacturing Market report covers the market landscape and its growth prospects over the coming years. The report also includes a discussion of the Covid-19 Impact."
Source: 21WFMJ

Summary of AI Provisions from the National Defense Authorization Act 2021

"On January 1, 2021, the U.S. Congress finalized and approved the WILLIAM M. (MAC) THORNBERRY

industry. For more facts about robots watch IFR´s video news about Europe in one minute."
Source: Institut National De La Recherche Scientifique

Using artificial intelligence to find new uses for existing medications

"Scientists have developed a machine-learning method that crunches massive amounts of data to help determine which existing medications could improve outcomes in diseases for which they are not prescribed. The intent of this work is to speed up drug repurposing, which is not a new concept."
Source: Ohio State University

Artificial intelligence helps scientists develop new general models in ecology

"The World Robotics report shows that Europe is the region with the highest robot density globally, with an average value of 114 units per 10,000 employees in the manufacturing industry. For more facts about robots watch IFR´s video news about Europe in one minute."
Source: University of Helsinki

Artificial Intelligence Finds Surprising Patterns in Earth's Biological Mass Extinctions

"A new study applies machine learning to the fossil record to visualise life's history, showing the impacts of major evolutionary events. This shows the long-term evolutionary and ecological impacts of major events of extinction and speciation."
Source: Tokyo Institute of Technology

These are the countries where AI is aiding productivity the most

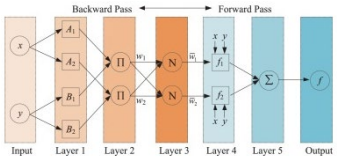
"Labor productivity in developed countries can increase by 40% due to the influence of AI, according to analysis from Accenture and Frontier Economics…Despite this, 15% of companies in the global automotive industry recorded an AI-related decline of 3 to 10% in 2019 according to McKinsey."
Source: World Economic Forum

AI could make weather forecasts more accurate. Here's how

"Artificial intelligence could analyze past weather patterns to predict future events, more efficiently and potentially more accurately than current methods. The newly developed global weather model bases its predictions on the past 40 years of weather data, rather than on detailed physics calculations."
Source: World Economic Forum

researchers should not prematurely abandon cognitive and methodological procedures that have been refined during centuries of philosophical and scientific thought."
Source: Taylor & Francis Online

ARTIFICIAL INTELLIGENCE



Evaluating the performances of several artificial intelligence methods in forecasting daily streamflow time series for sustainable water resources management

"Accurate runoff forecasting plays an important role in guaranteeing the sustainable utilization and management of water resources. Artificial intelligence methods can provide new possibilities for runoff prediction when the underlying physical relationship cannot be explicitly obtained. However, few reports evaluate the performances of various artificial intelligence methods in forecasting daily streamflow time series for sustainable water resources management by far."
Source: Elsevier

Artificial Intelligence and Management: The Automation–Augmentation Paradox

"Taking three recent business books on artificial intelligence (AI) as a starting point, we explore the automation and augmentation concepts in the management domain. Whereas automation implies that machines take over a human task, augmentation means that humans collaborate closely with machines to perform a task. Taking a normative stance, the three books advise organizations to prioritize augmentation, which they relate to superior performance."
Source: Academy of Management

Customer experiences in the age of artificial intelligence

"Artificial intelligence (AI) is revolutionising the way customers interact with brands. There is a lack of empirical research into AI-enabled customer experiences. Hence, this study aims to analyse how the integration of AI in shopping can lead to an improved AI-enabled customer experience. We propose a theoretical model drawing on the trust-commitment theory and service quality model. An online survey was distributed to customers who have

NATIONAL DEFENSE AUTHORIZATION ACT FOR FISCAL YEAR 2021 (FY21 NDAA). Numerous provisions of consequence related to artificial intelligence (AI) were included in the final conference report of the NDAA. Here, we summarize the AI aspects of the 4,517 page bill so you don't have to. This explainer provides a step-by-step rundown of every provision in the final conference report that speaks to AI."
Source: Stanford University

INSIGHTS & ANALYSIS

Fourth Quarter and 2020 Annual Review of Artificial Intelligence and Automated Systems

"In 2020, companies and regulators faced unprecedented challenges as they navigated the COVID-19 crisis and a rapidly evolving set of issues and policy proposals on the regulation of Artificial Intelligence and Automated Systems ("AI"). After a slow start, the second half of 2020 saw a noticeable surge in AI-related regulatory and policy proposals as well as growing international coordination. We may be seeing an inflection point in AI governance, and 2021 is poised to bring consequential legislative and policy changes."
Source: Gibson Dunn

DECIDE-AI: new reporting guidelines to bridge the development-to-implementation gap in clinical artificial intelligence

"As an increasing number of clinical decision-support systems driven by artificial intelligence progress from development to implementation, better guidance on the reporting of human factors and early-stage clinical evaluation is needed."
Source: Nature Medicine

Who Is Winning the AI Race: China, the EU, or the United States? — 2021 Update

"The nations that lead in the development and use of artificial intelligence (AI) will shape the future of the technology and significantly improve their economic competitiveness, while those that fall behind risk losing competitiveness in key industries. As a result, more than 30 nations have created national AI strategies to improve their prospects.

Why it's vital that AI is able to explain the decisions it makes

"AI algorithms cannot explain the thought processes behind their decisions, yet if they could, humans might learn from their intelligent problem-solving…This is something which researchers hope to translate into explaining solutions to humans."
Source: World Economic Forum

SLAS Technology special collection on AI in process automation available now

"This SLAS Technology special collection targets the use of artificial intelligence (AI) techniques and technologies as applied specifically to drug discovery, automated gene editing and machine learning. As AI becomes increasingly more prevalent in research, medicine and even everyday life, laboratory automation has gone beyond hardware advancements toward new levels of precision and complexity."
Source: EurekAlert!

MACHINE LEARNING

"Liquid" machine-learning system adapts to changing conditions

"MIT researchers have developed a type of neural network that learns on the job, not just during its training phase. These flexible algorithms, dubbed "liquid" networks, change their underlying equations to continuously adapt to new data inputs."
Source: MIT

A framework to evaluate the cognitive capabilities of machine learning agents

"Over the past decade or so, computer scientists have developed machine learning (ML) techniques that perform remarkably well on a variety of tasks. While these algorithms are designed for artificially replicating human cognitive skills, there is still a lack of tools to compare their capabilities with those of humans."
Source: TechXplore

Can Artificial Intelligence Map Our Moods?

"A Stanford researcher uses machine learning to identify mood swings through social media."
Source: Stanford University

used an AI- enabled service offered by a beauty brand."
Source: Elsevier

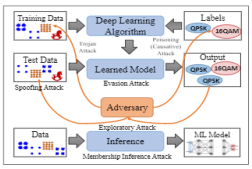
Mediating artificial intelligence developments through negative and positive incentives

"Starting from a baseline model that describes a broad class of technology races where winners draw a significant benefit compared to others (such as AI advances, patent race, pharmaceutical technologies), we investigate here how positive (rewards) and negative (punishments) incentives may beneficially influence the outcomes. We uncover conditions in which punishment is either capable of reducing the development speed of unsafe participants or has the capacity to reduce innovation through over-regulation."
Source: Plos One

Ensemble learning of diffractive optical networks

"A plethora of research advances have emerged in the fields of optics and photonics that benefit from harnessing the power of machine learning. Specifically, there has been a revival of interest in optical computing hardware due to its potential advantages for machine learning tasks in terms of parallelization, power efficiency and computation speed. Diffractive deep neural networks (D2NNs) form such an optical computing framework that benefits from deep learning-based design of successive diffractive layers to all-optically process information as the input light diffracts through these passive layers."
Source: Nature Light

MACHINE LEARNING



Adversarial Machine Learning for 5G Communications Security

"This paper identifies the emerging attack surface of adversarial machine learning and corresponding attacks launched against wireless communications in the context of 5G systems. The focus is on attacks against (i) spectrum sharing of 5G communications with incumbent users such as in the Citizens Broadband Radio Service (CBRS) band and (ii) physical layer authentication of 5G User Equipment (UE) to support network slicing."

To date, the United States has emerged as the early frontrunner in AI, but China is challenging its lead."
Source: Information Technology and Innovation Foundation

Council of Europe's Work in progress

"Policy, recommendations, declarations, guidelines and other legal instruments issued by Council of Europe bodies or committees on artificial intelligence. (Updated 4 February 2021)"
Source: Council of Europe

Scientists use machine learning to accelerate discovery of materials for use in industrial processes

"New research led by researchers at the University of Toronto and Northwestern University employs machine learning to craft the best building blocks in the assembly of framework materials for use in a targeted application."
Source: University of Toronto

Machine learning helps retrace evolution of classical music

"Researchers in EPFL's Digital and Cognitive Musicology Lab in the College of Humanities used an unsupervised machine learning model to 'listen to' and categorize more than 13,000 pieces of Western classical music, revealing how modes – such as major and minor – have changed throughout history."
Source: Ecole Polytechnique Federale de Lausanne

Machines Are Learning From Each Other, But It's A Good Thing

"Machine learning (a subset of artificial intelligence) involves the advancement of computer algorithms that evolve and improve over time through learned experience. Because these machines learn through repetition, these models are built on training data or sample sets of data. This training develops in the machine the ability to act without relying on a specific program."
Source: Forbes

Deep Vision: Near-Infrared Imaging and Machine Learning Can Identify Hidden Tumors

"Near-infrared hyperspectral imaging combined with machine learning can visualize tumors in deep tissue and covered by a mucosal layer, scientists show"
Source: Tokyo University of Science

Machine-learning model helps determine protein structures

"Cryo-electron microscopy (cryo-EM) allows scientists to produce high-resolution, three-dimensional images of tiny molecules such as proteins. This technique works best for imaging proteins that exist in only one conformation, but MIT researchers have now developed a machine-learning algorithm that helps them identify multiple possible structures that a protein can take."
Source: EurekAlert!

Source: Cornell University

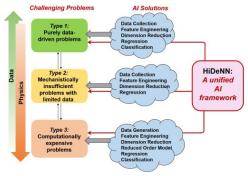
Introduction of a time series machine learning methodology for the application in a production system

"This paper proposes a three-step machine learning methodology to empower process experts with limited knowledge in machine learning: 1) data exploration through clustering, 2) representation of the production systems behaviour through specially structured neural networks and 3) querying this representation through evolutionary algorithms to achieve decision support through online optimization or scenario simulation."
Source: Elsevier

On the Validity of Machine Learning-based Next Generation Science Assessments: A Validity Inferential Network

"This study provides a solid validity inferential network to guide the development, interpretation, and use of machine learning-based next-generation science assessments (NGSAs). Given that machine learning (ML) has been broadly implemented in the automatic scoring of constructed responses, essays, simulations, educational games, and interdisciplinary assessments to advance the evidence collection and inference of student science learning, we contend that additional validity issues arise for science assessments due to the involvement of ML."
Source: Springer Link

DEEP LEARNING



Hierarchical Deep Learning Neural Network (HiDeNN): An artificial intelligence (AI) framework for computational science and engineering

"In this work, a unified AI-framework named Hierarchical Deep Learning Neural Network (HiDeNN) is proposed to solve challenging computational science and engineering problems with little or no available physics as well as with extreme computational demand. The detailed construction and mathematical elements of HiDeNN are introduced and discussed to show the flexibility of the framework for diverse problems from disparate fields."

"Ghost particle" ML model permits full quantum description of the solvated electron

"Now, joint work from teams at the University of Zurich and EPFL and colleagues has resulted in a highly accurate machine-learning (ML) model that is inexpensive enough to allow for a full quantum statistical and dynamical description, giving an accurate determination of the structure, diffusion mechanisms, and vibrational spectroscopy of the solvated electron."
Source: National Centre of Competence in Research

DEEP LEARNING

Scientists propose new way to detect emotions using wireless signals

"Previous research has used similar non-invasive or wireless methods of emotion detection… For this study the scientists instead employed deep learning techniques, where an artificial neural network learns its own features from time-dependent raw data, and showed that this approach could detect emotions more accurately than traditional machine learning methods."
Source: Queen Mary University of London

Deep learning-based assessment of student engagement could aid classroom research

"Researchers at University of Tübingen and Leibniz Institute für Wissensmedien in Germany, as well as University of Colorado Boulder, have recently investigated the potential of machine-learning techniques for assessing student engagement in the context of classroom research. More specifically, they devised a deep-neural-network-based architecture that can estimate student engagement by analyzing video footage collected in classroom environments."
Source: TecXplore

Deep Learning at the Speed of Light

"An ambitious new strategy that's coming to the fore this year is to perform many of the required mathematical calculations using photons rather than electrons. In particular, one company, -Lightmatter, will begin marketing late this year a neural-network
Source: Elsevier

Deep learning encodes robust discriminative neuroimaging representations to outperform standard machine learning

"Recent critical commentaries unfavorably compare deep learning (DL) with standard machine learning (SML) approaches for brain imaging data analysis. However, their conclusions are often based on pre-engineered features depriving DL of its main advantage — representation learning. We conduct a large-scale systematic comparison profiled in multiple classification and regression tasks on structural MRI images and show the importance of representation learning for DL."
Source: Nature Communications

Deep learning-enabled medical computer vision

"A decade of unprecedented progress in artificial intelligence (AI) has demonstrated the potential for many fields—including medicine—to benefit from the insights that AI techniques can extract from data. Here we survey recent progress in the development of modern computer vision techniques—powered by deep learning—for medical applications, focusing on medical imaging, medical video, and clinical deployment."
Source: Nature Digital Medicine

An Empirical Study on Deployment Faults of Deep Learning Based Mobile Applications

"Deep Learning (DL) is finding its way into a growing number of mobile software applications… However, existing efforts in SE research community mainly focus on the development of DL models and extensively analyze faults in DL programs. In contrast, faults related to the deployment of DL models on mobile devices (named as deployment faults of mobile DL apps) have not been well studied. Since mobile DL apps have been used by billions of end users daily for various purposes including for safety-critical scenarios, characterizing their deployment faults is of enormous importance. To fill the knowledge gap, this paper presents the first comprehensive study on the deployment faults of mobile DL apps."
Source: Cornell University

Deep learning for in vivo near-infrared imaging

"This work presents a deep-learning–based approach to transform a blurred NIR-I image to a much higher-

accelerator chip that calculates with light. It will be a refinement of the prototype Mars chip that the company showed off at the virtual Hot Chips conference last August."
Source: IEEE Spectrum

It's Too Easy to Hide Bias in Deep-Learning Systems

"The world around us is increasingly choreographed by such algorithms. They decide what advertisements, news, and movie recommendations you see. They also help to make far more weighty decisions, determining who gets loans, jobs, or parole. And in the not-too-distant future, they may decide what medical treatment you'll receive or how your car will navigate the streets."
Source: IEEE Spectrum

Method finds hidden warning signals in measurements collected over time

"A new deep-learning algorithm could provide advanced notice when systems — from satellites to data centers — are falling out of whack."
Source: MIT

Demystifying deep learning

"The remarkable feats of deep learning make it seem magical and out of reach. Yet, at heart, any deep learning model is just a combination of simple mathematical components. In this post, I will (try to) show you how deep learning works by building it piece by piece."
Source: TechTalks

NEURAL NETWORKS

A technique to estimate emotional valence and arousal by analyzing images of human faces

"Researchers at Samsung AI and Imperial College London have recently developed a deep-neural-network-based system that can estimate emotional valence and arousal with high levels of accuracy simply by analyzing images of human faces taken in everyday settings."
Source: TechXplore

Concept whitening: A strategy to improve the interpretability of image recognition models

"Researchers from the Prediction Analysis Lab at Duke University, led by Professor Cynthia Rudin, have recently devised a technique that clarity image like in NIR-IIb, leading to an image closely resembling the ground truth. The deep-learning–enabled high-resolution NIR imaging could facilitate basic biomedical research and empower diagnostics and imaging-guided surgery in the clinic."
Source: Proceedings of the National Academy of Sciences

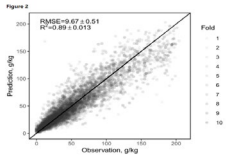
Deep Learning applications for COVID-19

"This survey explores how Deep Learning has battled the COVID-19 pandemic and provides directions for future research on COVID-19. We cover Deep Learning applications in Natural Language Processing, Computer Vision, Life Sciences, and Epidemiology. We describe how each of these applications vary with the availability of big data and how learning tasks are constructed. We begin by evaluating the current state of Deep Learning and conclude with key limitations of Deep Learning for COVID-19 applications."
Source: Springer Link

A deep learning model for mass screening of COVID-19

"The objective of this research is to develop a convolutional neural network model 'COVID-Screen-Net' for multi-class classification of chest X-ray images into three classes viz. COVID-19, bacterial pneumonia, and normal. The model performs the automatic feature extraction from X-ray images and accurately identifies the features responsible for distinguishing the X-ray images of different classes."
Source: Wiley Online Library

NEURAL NETWORKS



Automated spectroscopic modelling with optimised convolutional neural networks

"Convolutional neural networks (CNN) for spectroscopic modelling are currently tuned manually, and the effects of their hyperparameters are not analysed. These can result in sub-optimal models. Here, we propose an approach to tune one-dimensional CNN (1D-CNNs) automatically. It consists of a parametric representation of 1D-CNNs and an optimisation of hyperparameters to maximise a model's performance."
Source: Nature Scientific Reports

Deep Neural Networks for Estimation and Inference

could improve the interpretability of deep neural networks. This approach, called concept whitening (CW), was first introduced in a paper published in Nature Machine Intelligence."
Source: TechXplore

Evolvable neural units that can mimic the brain's synaptic plasticity

"Researchers at Korea University have recently tried to reproduce the complexity of biological neurons more effectively by approximating the function of individual neurons and synapses. Their paper, published in Nature Machine Intelligence, introduces a network of evolvable neural units (ENUs) that can adapt to mimic specific neurons and mechanisms of synaptic plasticity."
Source: TechXplore

COMPUTING SYSTEMS

New study investigates photonics for artificial intelligence and neuromorphic computing

"Scientists have given a fascinating new insight into the next steps to develop fast, energy-efficient, future computing systems that use light instead of electrons to process and store information - incorporating hardware inspired directly by the functioning of the human brain. A team of scientists, including Professor C. David Wright from the University of Exeter, has explored the future potential for computer systems by using photonics in place of conventional electronics."
Source: EurekAlert!

New study investigates photonics for artificial intelligence and neuromorphic computing

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Source: University of Exeter

Tweaking AI software to function like a human brain improves computer's learning ability

"We study deep neural networks and their use in semiparametric inference. We establish novel nonasymptotic high probability bounds for deep feedforward neural nets. These deliver rates of convergence that are sufficiently fast (in some cases minimax optimal) to allow us to establish valid second-step inference after first-step estimation with deep learning, a result also new to the literature."
Source: Wiley Online Library

Efficient densely connected convolutional neural networks

"The World Robotics report shows that Europe is the region with the highest robot density globally, with an average value of 114 units per 10,000 employees in the manufacturing industry. For more facts about robots watch IFR´s video news about Europe in one minute."
Source: Elsevier

Novel leakage detection and water loss management of urban water supply network using multiscale neural networks

"Due to the acceleration of urbanization, water supply pipe networks often lack the planning. Using the series number of the pipes as category label will result in too many classification categories, and requires many training data to achieve detected accuracy. Therefore, this paper proposes novel leakage detection model based on density based spatial clustering of applications with noise (DBSCAN) and multiscale fully convolutional networks (MFCN) (DBSCAN-MFCN) to manage the water loss."
Source: Elsevier

Visual number sense in untrained deep neural networks

"Number sense, the ability to estimate numerosity, is observed in naïve animals, but how this cognitive function emerges in the brain remains unclear. Here, using an artificial deep neural network that models the ventral visual stream of the brain, we show that number-selective neurons can arise spontaneously, even in the complete absence of learning. We also show that the responses of these neurons can induce the abstract number sense, the ability to discriminate numerosity independent of low-level visual cues."
Source: Science Advances

NATURAL LANGUAGE PROCESSING

"In the journal Frontiers in Computational Neuroscience, Maximilian Riesenhuber, PhD, professor of neuroscience, at Georgetown University Medical Center, and Joshua Rule, PhD, a postdoctoral scholar at UC Berkeley, explain how the new approach vastly improves the ability of AI software to quickly learn new visual concepts."
Source: EurekaAlert!

Team creates hybrid chips with processors and memory to run AI on battery-powered devices

"Now, a team that includes Stanford computer scientist Mary Wootters and electrical engineer H.-S. Philip Wong has designed a system that can run AI tasks faster, and with less energy, by harnessing eight hybrid chips, each with its own data processor built right next to its own memory storage."
Source: EureAlert!

FAKE NEWS

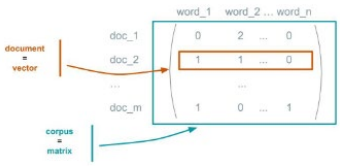
When a Story is Breaking, AI Can Help Consumers Identify Fake News

"Warnings about misinformation are now regularly posted on Twitter, Facebook, and other social media platforms, but not all of these cautions are created equal. New research from Rensselaer Polytechnic Institute shows that artificial intelligence can help form accurate news assessments — but only when a news story is first emerging."
Source: Rensselaer Polytechnic Institute

ECONOMICS

When AI is Used to Set Prices, Can Inadvertent Collusion be a Result?

"Key Takeaways:
Machine learning can be an effective tool to set competitive prices.
Artificial intelligence has its limits on how to set the most effective prices due to variables beyond the seller's control.
Over the long term, supracompetitive pricing can result."
Source: INFORMS



Customer satisfaction and natural language processing

"This study uses natural language processing in order to increase knowledge concerning customer satisfaction... This study also shows the link between the level of satisfaction and the number of themes addressed, thus challenging traditional approaches that do not seem to distinguish the discursive differences between satisfied and dissatisfied customers. Finally, this investigation lays the foundations for automatic and personalized processing of customer comments."
Source: Elsevier

Predicting Discharge Disposition Following Meningioma Resection Using a Multi-Institutional Natural Language Processing Model

"BACKGROUND: Machine learning (ML)-based predictive models are increasingly common in neurosurgery, but typically require large databases of discrete variables for training. Natural language processing (NLP) can extract meaningful data from unstructured text. OBJECTIVE: To present an NLP model that predicts nonhome discharge and a point-of-care implementation."
Source: Oxford Academic

REINFORCEMENT LEARNING

Creating Pro-Level AI for a Real-Time Fighting Game Using Deep Reinforcement Learning

"Reinforcement learning combined with deep neural networks has performed remarkably well in many genres of games recently…Through the curriculum, three different styles of agents were created by reward shaping and were trained against each other. Additionally, this paper suggests data skipping techniques that could increase data efficiency and facilitate explorations in vast spaces. Since our method can be generally applied to all two-player competitive games with vast action spaces, we anticipate its application to game development including level design and automated balancing."
Source: IEEE Xplore

AUTONOMOUS VEHICLE

AI trained to read electric vehicle charging station reviews to find infrastructure gaps

"Although electric vehicles that reduce greenhouse gas emissions attract many drivers, the lack of confidence in charging services deters others. Building a reliable network of charging stations is difficult in part because it's challenging to aggregate data from independent station operators. But now, researchers reporting January 22 in the journal Patterns have developed an AI that can analyze user reviews of these stations, allowing it to accurately identify places where there are insufficient or out-of-service stations."
Source: EurekAlert!

HEALTHCARE

Machine learning tool used to predict early symptoms of schizophrenia in relatives of patients

"University of Alberta researchers have taken another step forward in developing an artificial intelligence tool to predict schizophrenia by analyzing brain scans. In recently published research, the tool was used to analyze functional magnetic resonance images of 57 healthy first-degree relatives (siblings or children) of schizophrenia patients. It accurately identified the 14 individuals who scored highest on a self-reported schizotypal personality trait scale."
Source: University of Alberta

New neural network enables easy screening of sleep apnoea in patients with cerebrovascular disease

"A new neural network developed by researchers at the University of Eastern Finland and Kuopio University Hospital enables an easy and accurate assessment of sleep apnoea severity in patients with cerebrovascular disease. The assessment is automated

Understanding Human-AI Cooperation Through Game-Theory and Reinforcement Learning Models

"This research conducts an empirical study to understand how different modern reinforcement learning algorithms and game theory scenarios could create different cooperation levels in human-machine teams. Three different reinforcement learning algorithms (Vanilla Policy Gradient, Proximal Policy Optimization, and Deep Q-Network) and two different game theory scenarios (Hawk Dove and Prisoners dilemma) were examined in a large-scale experiment. The results indicated that different reinforcement learning models interact differently with humans with Deep-Q engendering higher cooperation levels."
Source: University of Hawai'I at Manoa

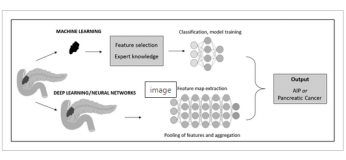
Controlling the Risk of Conversational Search via Reinforcement Learning

"In this work, we propose a risk-aware conversational search agent model to balance the risk of answering user's query and asking clarifying questions. The agent is fully aware that asking clarifying questions can potentially collect more information from user, but it will compare all the choices it has and evaluate the risks."
Source: Cornell University

Development of an Artificial Intelligence System to Design of Structures using Reinforcement Learning: Proof of Concept

"In this study, an AI system with the RL algorithm is developed to design optimized truss structures (with continuous and discrete cross-section choices) under a set of given constraints. Also, we proposed a unique reward function system to consider the constraints in structural design problems. From a set of two examples, we confirmed that the proposed AI system could design truss structures and also evolve as it gains experience. Therefore, it is possible to develop an AI system that can learn from experience and design the structure by itself without little human intervention."
Source: Aerospace Research Central

HEALTHCARE



and based on a simple nocturnal pulse oximetry, making it possible to easily screen for sleep apnoea in stroke units."
Source: EurekAlert!

Artificial intelligence in pancreaticobiliary endoscopy

"AI applications in endoscopy are expected to reduce inter-operator variability, improve the accuracy of diagnosis, and assist in therapeutic decision-making in real time. AI-based literature must however be interpreted with caution given the limited external validation. A multidisciplinary approach combining clinical and imaging or endoscopy data will better utilize AI-based technologies to further improve patient care."
Source: Wiley Online Library

Artificial intelligence in upper GI endoscopy - current status, challenges and future promise

"Researchers currently lack large volume, well-annotated, high-quality datasets in gastric cancer, dysplasia in Barrett's esophagus and early esophageal squamous cell cancer. This review will look at the latest studies of AI in upper GI endoscopy, discuss some of the challenges facing researchers, and predict what the future may hold in this rapidly changing field."
Source: Wiley Online Library

Artificial intelligence for anterior segment diseases: Emerging applications in ophthalmology

"There is now emerging evidence demonstrating the application of AI to the diagnosis and management of a variety of anterior segment conditions. In this review, we provide an overview of AI applications to the anterior segment addressing keratoconus, infectious keratitis, refractive surgery, corneal transplant, adult and paediatric cataracts, angle-closure glaucoma and iris tumour, and highlight important clinical considerations for adoption of AI technologies, potential integration with telemedicine and future directions."
Source: British Journal of Ophthalmology

SUSTAINABILITY

Urban water resource management for sustainable environment planning using artificial intelligence techniques

"In this paper, Adaptive Intelligent Dynamic Water Resource Planning (AIDWRP) has been proposed to sustain the urban areas' water

environment. Here, an adaptive intelligent approach is a subset of the Artificial Intelligence (AI) technique in which environmental planning for sustainable water development has been modeled effectively. Artificial intelligence modeling improves water efficiency by transforming information into a leaner process, improving decision-making based on data-driven by combining numeric AI tools and human intellectual skills."
Source: Elsevier