SINGAPORE UNIVERSITY OF TECHNOLOGY AND DESIGN

15 August – 9 October 2020

TOPICAL REPORT

ARTIFICIAL INTELLIGENCE & DATA SCIENCE

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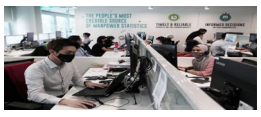
DATA SCIENCE

Hydrology data tool helps users manage water resources, protect infrastructure

"River systems are essential resources for everything from drinking water supply to power generation – but these systems are also hydrologically complex, and it is not always clear how water flow data from various monitoring points relates to any specific piece of infrastructure. Researchers from Cornell University and North Carolina State University have now developed a tool that draws from multiple databases to give water resource managers and infrastructure users the information they need to make informed decisions about water use on river networks."

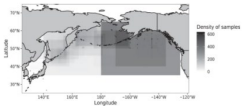
Source: NC State University News



MOM team gathering and analysing labour market data busier than usual amid Covid-19

"Since April, it has also started collecting unemployment data monthly instead of quarterly. The ministry said it will now start releasing the topline unemployment rates monthly for citizens, citizens and

DATA SCIENCE



A salmon diet database for the North Pacific Ocean

"The purpose of this database is to consolidate data into a common format to address gaps in our ecological understanding of the North Pacific Ocean, particularly with respect to salmon. This database can be used to address a variety of questions regarding salmon foraging, productivity, and marine survival. The North Pacific Marine Salmon Diet Database will continue to grow in the future as more data are digitized and become available."

Source: Nature

NIDA vision for big data science to understand the biological underpinnings of substance use disorders

"Like many other fields, biomedical research aimed at understanding how drugs of abuse alter brain biology and function to engender a state of physical dependence and/or promote the compulsive behavior that characterizes addiction is generating substantial data of various types (imaging, genetic, physiological, electronic health records, etc.) The untapped power of data emerging from these studies lies in their integration, mining and analysis (e.g., effectively integrating genome-wide molecular profiling datasets for addiction with other datasets). The interdisciplinary field of

DATA GOVERNANCE

Data governance in the 21st-century organization

"To paraphrase the Spider-Man comics, with great data comes great responsibility. So how do organizations generate value by leveraging data while avoiding the issues that stem from generating, collecting, and processing data? To shed light on this pressing question, it's important to discuss the relevance of data governance in data-driven organizations."

Source: MIT Sloane Management Review

DATA SCIENCE

Tool helps clear biases from computer vision

"Researchers at Princeton University have developed a tool that flags potential biases in sets of images used to train artificial intelligence (AI) systems. The work is part of a larger effort to remedy and prevent the biases that have crept into AI systems that influence everything from credit services to courtroom sentencing programs."

Source: Princeton University

INDUSTRY INSIGHTS

permanent residents combined, and the overall labour force. As the team steps up data collection amid Covid-19, it has to improve the way it gathers and analyses data so as to work more efficiently, said MRSD director Ang Boon Heng."
Source: Straits Times Singapore

Data science: The next frontier

"There is no escaping the importance of data today. Dr Wang says: "We are now all living in the information age, which has fast-tracked the production of electronic data. No matter which industry you work in — information technology, health, fashion, food or finance — data affects your life and career.
"Our job is to make sense of the data to make accurate predictions and simulations that can give us insights into our world like never before. Unfortunately, there is still a shortage of qualified data science professionals in the market today." Indeed, data scientist and engineer roles are among the Top 15 emerging jobs in Singapore according to the LinkedIn 2020 Emerging Jobs Report Singapore."
Source: Straits Times Singapore

Getting serious about data and data science

"Data science, including analytics, big data, and artificial intelligence, is no longer a novel concept. Nor is the important foundation of high-quality data. Both have contributed to impressive business successes — particularly among digital natives — yet overall progress among established companies has been painfully slow. Not only is the failure rate high, but companies have also proved unable to leverage successes in one part of the business to reap benefits in other areas. Too often, progress depends on a single leader, and it slows dramatically or reverses when that individual departs the company. In addition, companies are not seizing the strategic potential in their data."
Source: MIT Sloan Management Review

Less scatterbrained scatterplots for data science

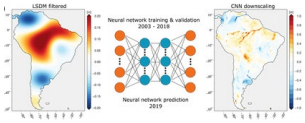
"By depicting data as a mass of points across two axes, scatterplots are effective in visualizing trends, correlations, and anomalies. But using them for large datasets often leads to overlapping dots that make them more or less unreadable. Researchers from MIT's Computer Science and Artificial Intelligence Laboratory (CSAIL) say they've solved this with a new open-source system that makes it possible to create interactive scatterplots based on large-scale data science evolved from the necessity to extract knowledge and insights from increasingly large and/or complex datasets using new quantitative and analytical approaches. Intra/inter-university and multi-disciplinary collaborations are encouraged for data science projects."
Source: Nature

ACADEMIC

Artificial intelligence, drug repurposing and peer review

"The COVID-19 pandemic has transformed the way scientific and clinical results are shared and disseminated. According to a recent analysis, an average of 367 COVID-19 papers are being published every week, with a median time from submission to acceptance of just 6 days (compared with 84 days for non-COVID-19 content)1. These unprecedented peer review turnaround times — and in some cases relaxed editorial standards — are justifiable in a context where new information may accelerate knowledge and solutions to the emerging global medico-socio-economic disaster, but they also risk the release of preliminary or flawed publications that can mislead research and development efforts, compromise clinical practice and misinform policy makers. What can be done to compensate for inadequate peer review in the context of a pandemic?"
Source: Nature

DEEP LEARNING



Self-Validating Deep Learning for recovering Terrestrial Water Storage from gravity and altimetry measurements

"Quantifying and monitoring terrestrial water storage (TWS) is an essential task for understanding the Earth's hydrosphere cycle, its susceptibility to climate change, and concurrent impacts for ecosystems, agriculture, and water management. Changes in TWS manifest as anomalies in the Earth's gravity field, which are routinely observed from space. However, the complex underlying distribution of water masses in rivers, lakes, or groundwater basins remains elusive. We combine machine learning, numerical modeling, and satellite altimetry to

Growth opportunities in artificial intelligence, robotic process automation, and internet of things

"Research Summary: This edition of IT, Computing and Communications (ITCC) Technology Opportunity Engine (TOE) provides a snapshot of the emerging ICT led innovations in artificial intelligence, robotic process automation, and Internet of Things. This issue focuses on the application of information and communication technologies in alleviating the challenges faced across industry sectors in areas such as smart cities, energy & utilities, retail, ICT and education."
Source: Frost & Sullivan

Growth opportunities in advanced analytics, sales enablement, and artificial intelligence

"Research Summary
This edition of IT, Computing and Communications (ITCC) Technology Opportunity Engine (TOE) provides a snapshot of the emerging ICT led innovations in artificial intelligence, sales enablement, and augmented reality. This issue focuses on the application of information and communication technologies in alleviating the challenges faced across industry sectors in areas such as healthcare, manufacturing, sales automation, and computer modeling."
Source: Frost & Sullivan

REVIEW

New UNESCO report on Artificial Intelligence and Gender Equality

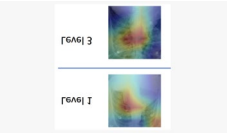
"UNESCO just released its new report on Artificial Intelligence and Gender Equality, which sets forth proposed elements of a Framework on Gender Equality and AI for further consideration, discussion and elaboration amongst various stakeholders."
Source: UNESCO

Artificial intelligence & quantum information science r&d summary: fiscal years 2020-2021

"Artificial intelligence (AI) and quantum information science (QIS) are key industries of the future that

datasets that have upwards of billions of distinct data points."
Source: TechXplore

MACHINE LEARNING



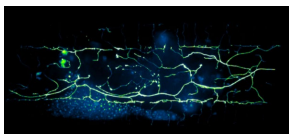
Anticipating heart failure with machine learning

"Many health issues are tied to excess fluid in the lungs. A new algorithm can detect the severity by looking at a single X-ray. A group led by researchers at CSAIL has developed a machine learning model that can look at an X-ray to quantify how severe the edema is, on a four-level scale ranging from 0 (healthy) to 3 (very, very bad)."
Source: MIT News

Machine learning homes in on catalyst interactions to accelerate materials development

"A machine learning technique rapidly rediscovered rules governing catalysts that took humans years of difficult calculations to reveal--and even explained a deviation. The University of Michigan team that developed the technique believes other researchers will be able to use it to make faster progress in designing materials for a variety of purposes. "This opens a new door, not just in understanding catalysis, but also potentially for extracting knowledge about superconductors, enzymes, thermoelectrics, and photovoltaics," said Bryan Goldsmith, an assistant professor of chemical engineering, who co-led the work with Suljo Linic, a professor of chemical engineering."
Source: EurekAlert

DEEP LEARNING



Researchers demonstrate how deep learning can advance study of neural degeneration

""Researchers want to study the mechanisms that drive neural degeneration, with the long-term goal of finding ways to slow or prevent the degeneration associated with age or disease," says Adriana San Miguel, corresponding author of a paper on the work and an assistant professor of chemical and biomolecular engineering at NC State. "Our work here shows that deep learning can accurately build a downscaling neural network that recovers simulated TWS from synthetic space-borne gravity observations. A novel constrained training is introduced, allowing the neural network to validate its training progress with independent satellite altimetry records. We show that the neural network can accurately derive the TWS in 2019 after being trained over the years 2003 to 2018. Further, we demonstrate that the constrained neural network can outperform the numerical model in validated regions."
Source: Advancing Earth and Space Science

Deep learning takes on synthetic biology

"DNA and RNA have been compared to "instruction manuals" containing the information needed for living "machines" to operate. But while electronic machines like computers and robots are designed from the ground up to serve a specific purpose, biological organisms are governed by a much messier, more complex set of functions that lack the predictability of binary code. Inventing new solutions to biological problems requires teasing apart seemingly intractable variables - a task that is daunting to even the most intrepid human brains. Two teams of scientists from the Wyss Institute at Harvard University and the Massachusetts Institute of Technology have devised pathways around this roadblock by going beyond human brains"
Source: EurekAlert

MACHINE LEARNING

Modeling cannabinoids from a large-scale sample of Cannabis sativa chemotypes

"In this work a data set of 17,600 cultivars tested by Steep Hill Inc., is examined using machine learning techniques to interpolate missing chemotype observations and cluster cultivars into groups based on chemotype similarity. The results indicate cultivars cluster based on their chemotypes, and that some imputation methods work better than others at grouping these cultivars based on chemotypic identity. Due to the missing data and to the low signal to noise ratio for some less common cannabinoids, their behavior could not be accurately predicted. These findings have implications for characterizing complex interactions in cannabinoid biosynthesis and will power economic growth and strengthen national security for years to come. The Trump Administration recognizes the strategic importance of these emerging technologies and has taken decisive action to advance America's AI and QIS leadership.
In February 2020, President Trump's Fiscal Year (FY) 2021 Budget put the United States on a path to double Federal research and development (R&D) spending in nondefense AI and QIS by FY2022.
This report provides a summary of Federal R&D spending in nondefense artificial intelligence and quantum information science for Fiscal Years 2020 – 2021. It demonstrates that the Administration is well on its way to fulfilling the President's request to double investment."
Source: White House

The 2020 State of AI and Machine Learning Report

"The 2020 State of AI and Machine Learning report illustrates the current state of artificial intelligence and machine learning, showcasing where the industry is as a whole in 2020 compared to 2019. The 2020 report is the output of a cross-industry, large-organization study of senior business leaders and technologists. It details where organizations are within the AI journey and provides a comprehensive look at how they are implementing AI within their business — from the types of data they leverage to the tools they use and budgets they have. For readers who might be in the middle of their own AI projects, this report helps them understand the broader context of their work, what their peers are experiencing, and what dials to turn for AI success."
Source: APPEN

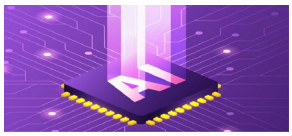
MARKET REPORT

Artificial Intelligence Chip Market Forecast Report 2020 - 2027 - Top Key Players Analysis

"Artificial Intelligence Chip Market by Technology (Machine Learning, Natural Language Processing, Context-Aware Computing, Computer Vision), By Hardware (Processor, Memory, Network), By Industry (Healthcare, Manufacturing, Automotive, Agriculture, Retail, Security, Human Resources, Marketing, Law, Fintech) and By

identify physical symptoms of neural degeneration; can do it more quickly than humans; and can distinguish between neural degeneration caused by different factors."
Source: NC State University News

NEURAL NETWORKS



A simple neural network upgrade boosts ai performance

"If you are a developer creating a new machine learning application, you typically build on top of an existing neural network architecture, one that is already tuned for the kind of problem you are trying to solve—creating your own architecture from scratch is a difficult job that's typically more trouble than it's worth. Even with an existing architecture in hand, reengineering it for better performance is no small task. But one team has come up with new neural network module that can boost AI performance when plugged into four of the most widely used architectures."
Source: IEEE Spectrum

New data processing module makes deep neural networks smarter

"Artificial intelligence researchers at North Carolina State University have improved the performance of deep neural networks by combining feature normalization and feature attention modules into a single module that they call attentive normalization (AN). The hybrid module improves the accuracy of the system significantly, while using negligible extra computational power."
Source: NC State University News

ROBOTS

Why AI needs a physical body to reach its potential

"Researchers in the College of Information Sciences and Technology have developed an algorithm to train an adversarial bot, which was able to automatically discover and exploit weaknesses of master game bots driven by reinforcement learning algorithms used in popular online games."
Source: World Economic Forum

GAME BOTS

improving phenotypical classification of Cannabis cultivars."
Source: University of Colorado

From substitution to redefinition: A framework of machine learning-based science assessment

"This study develops a framework to conceptualize the use and evolution of machine learning (ML) in science assessment. We systematically reviewed 47 studies that applied ML in science assessment and classified them into five categories: (a) constructed response, (b) essay, (c) simulation, (d) educational game, and (e) inter-discipline. We compared the ML-based and conventional science assessments and extracted 12 critical characteristics to map three variables in a three-dimensional framework: construct, functionality, and automaticity. The 12 characteristics used to construct a profile for ML-based science assessments for each article were further analyzed by a two-step cluster analysis. The clusters identified for each variable were summarized into four levels to illustrate the evolution of each."
Source: Wiley Online Library

A High Throughput and Unbiased Machine Learning Approach for Classification of Graphene Dispersions

"Significant research to define and standardize terminologies for describing stacks of atomic layers in bulk graphene materials has been undertaken. Most methods to measure the stacking characteristics are time consuming and are not suited for obtaining information by directly imaging dispersions. Conventional optical microscopy has difficulty in identifying the size and thickness of a few layers of graphene stacks due to their low photon absorption capacity. Utilizing a contrast based on anisotropic refractive index in 2D materials, it is shown that localized thickness-specific information can be captured in birefringence images of graphene dispersions. Coupling pixel-by-pixel information from brightfield and birefringence images and using unsupervised statistical learning algorithms, three unique data clusters representing flakes (unexfoliated), nanoplatelets (partially exfoliated), and 2D sheets (well-exfoliated) species in various laboratory-based and commercial dispersions of graphene and graphene oxide are identified."
Source: Wiley Online Library

Region – Global Opportunities & Forecast, 2020-2027"
Source: GMI Research

COVID-19

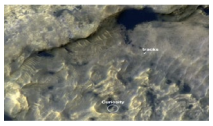
What AI can–and can't–do in the race for a Coronavirus vaccine

"In an achievement that would have startled biomedical researchers merely a year ago, vaccines against COVID-19 were already being tested in humans this past March, less than three months after the initial outbreak was identified in China. Many of those vaccines owed their speedy start to the power of artificial intelligence (AI)… The precious few molecules that could end the COVID pandemic are hidden by millions that can't. Can AI help find them in time?"
Source: IEEE Spectrum

IST researchers exploit vulnerabilities of AI-powered game bots

"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: Penn State University News

COSMIC



Scientists use AI to find tiny craters on Mars

"All these years, NASA scientists have laboriously sifted through spacecraft images to identify and classify markings on Mars. Now they're using a new "classifier," powered by artificial intelligence. What takes a human 40 minutes takes the AI tool an average of just 5 seconds."
Source: EarthSky

CYBERSECURITY

3 ways criminals use artificial intelligence in cybersecurity attacks

"Three cybersecurity experts explained how artificial intelligence and machine learning can be used to evade cybersecurity defenses and make breaches faster and more efficient during a NCSA and Nasdaq cybersecurity summit."
Source: Tech Republic

BlackBerry announces "industry first" AI-powered unified endpoint security platform

"BlackBerry has announced a new cybersecurity product that it says is the industry's first AI-powered unified endpoint security system. The company, which provides intelligent security software and services to enterprises and governments, said in a press release that the product called BlackBerry Cyber Suite delivers a zero-touch end user experience with "AI-based security capabilities

SCOTI: Science Captioning of Terrain Images for data prioritization and local image search

"In order to improve the degree of automation and the efficiency of these processes, we propose a system leveraging machine learning for planetary rovers to actively look for scientifically interesting and valuable features according to text instructions from scientists and prioritize the images captured onboard with those features for downlink. Such an image prioritization mechanism can also be naturally applied to content-based image search through text description in any local planetary image data server, allowing scientists to search for images with desired features without going through them one by one. Besides theoretical and engineering details of our proposed approach, we also present both quantitative and qualitative evaluation of the system along with some concrete examples."
Source: Elsevier

Using Machine Learning to Identify Adverse Drug Effects Posing Increased Risk to Women

"Adverse drug reactions are the fourth leading cause of death in the US. Although women take longer to metabolize medications and experience twice the risk of developing adverse reactions compared with men, these sex differences are not comprehensively understood. Real-world clinical data provide an opportunity to estimate safety effects in otherwise understudied populations, i.e., women. These data, however, are subject to confounding biases and correlated covariates. We present AwareDX, a pharmacovigilance algorithm that leverages advances in machine learning to predict sex risks. Our algorithm mitigates these biases and quantifies the differential risk of a drug causing an adverse event in either men or women."
Source: Science Direct

Evidence for supercritical behaviour of high-pressure liquid hydrogen

"Here we present a theoretical study of the phase diagram of dense hydrogen that uses machine learning to 'learn' potential-energy surfaces and interatomic forces from reference calculations and then predict them at low computational cost, overcoming length- and timescale limitations. We reproduce both the re-entrant melting behaviour and the polymorphism of the solid

and visibility across mobile, desktop, apps and people."
Source: Tech Republic

HEALTHCARE

AI won't replace radiologists, but it will change their work. Here's how.

"AI will reshape how radiologists work, shifting their detection of medical conditions from an active to a proactive approach. Understanding these changes can give a better picture of how work will change for radiologists in the near term."
Source: World Economic Forum

Artificial intelligence platform diagnoses dystonia with high accuracy in 0.36 seconds

"New study showed DystoniaNet AI deep learning platform detected cases of dystonia from an MRI with 98.8 percent accuracy. There is currently no diagnostic test for dystonia… DystoniaNet utilizes deep learning, a particular type of AI algorithm, to analyze data from individual MRI and identify subtler differences in brain structure. The platform is able to detect clusters of abnormal structures in several regions of the brain that are known to control processing and motor commands. These small changes cannot be seen by a naked eye in MRI, and the patterns are only evident through the platform's ability to take 3D brain images and zoom into their microstructural details."
Source: Massachusetts Eye And Ear Infirmary News

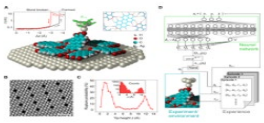
CONTACT TRACING

Can AI make bluetooth contact tracing better?

"Machine learning shows some promise in boosting contact tracing technologies meant for detecting nearby phones... Bluetooth Low Energy (BLE) technology was not originally designed to use Bluetooth signals from phones to accurately estimate the distance between phones. But the technology has been thrown into the breach to help hold the line for contact tracing during the pandemic. The main reason why many countries have gravitated toward Bluetooth-based apps is that they generally represent a more privacy-preserving option compared

phase. Simulations using our machine-learning-based potentials provide evidence for a continuous molecular-to-atomic transition in the liquid, with no first-order transition observed above the melting line. This suggests a smooth transition between insulating and metallic layers in giant gas planets, and reconciles existing discrepancies between experiments as a manifestation of supercritical behaviour."
Source: Nature

REINFORCEMENT LEARNING



Autonomous robotic nanofabrication with reinforcement learning

"Here, we present a strategy to work around both obstacles and demonstrate autonomous robotic nanofabrication by manipulating single molecules. Our approach uses reinforcement learning (RL), which finds solution strategies even in the face of large uncertainty and sparse feedback. We demonstrate the potential of our RL approach by removing molecules autonomously with a scanning probe microscope from a supramolecular structure. Our RL agent reaches an excellent performance, enabling us to automate a task that previously had to be performed by a human. We anticipate that our work opens the way toward autonomous agents for the robotic construction of functional supramolecular structures with speed, precision, and perseverance beyond our current capabilities."
Source: Science Advances

NEURAL NETWORKS

Decidual Vasculopathy Identification in Whole Slide Images Using Multiresolution Hierarchical Convolutional Neural Networks

"We introduce a hierarchical machine learning approach for the automated detection and classification of DV lesions in digitized placenta slides, along with a method of coupling learned image features with patient metadata to predict the presence of DV. Ultimately, the approach will allow many more placentas to be screened in a more standardized manner, providing

to using location-based technologies such as GPS."
Source: IEEE Spectrum

RISK MANAGEMENT

Rethinking risk and compliance for the Age of AI

"Artificial Intelligence (AI) has become an imperative for companies across industries. Despite the hype, AI is creating business value and, as a result, is rapidly being adopted around the world. Last year, the McKinsey Global Survey reported "a nearly 25 percent year-over-year increase in the use of AI in standard business processes". The transformative power of AI is already affecting a range of functions, including customer service, brand management, operations, people and culture, and more recently, risk management and compliance... However, early experience shows that AI can create new types of risks for businesses."
Source: World Economic Forum

AI & JOBS

How man and machine can work together in the age of AI

"In reskilling employees for the AI age, we can choose to try to be better than robots or to complement them. We should be aiming for a middle-ground, getting the best from both parties' potential.
The future of machine learning should be about how humans and machines can form the best teams."
Source: World Economic Forum

AI & LEARNING

MIT undergraduates pursue research opportunities through the pandemic

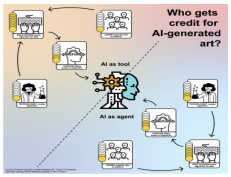
"Working remotely this summer, students worked to better understand human intelligence and to advance machine learning applications."
Source: MIT News

feedback about which cases would benefit most from more in-depth pathologic inspection. Such computer-assisted examination of human placentas will enable real-time adjustment to infant and maternal care and possible chemoprevention (eg, aspirin therapy) to prevent preeclampsia, a disease that affects 2% to 8% of pregnancies worldwide, in women identified to be at risk with future pregnancies."
Source: Elsevier

Committee machines—a universal method to deal with non-idealities in memristor-based neural networks

"A popular approach is to realise artificial neural networks in hardware by implementing their synaptic weights using memristive devices. However, various device- and system-level non-idealities usually prevent these physical implementations from achieving high inference accuracy. We suggest applying a well-known concept in computer science—committee machines—in the context of memristor-based neural networks. Using simulations and experimental data from three different types of memristive devices, we show that committee machines employing ensemble averaging can successfully increase inference accuracy in physically implemented neural networks that suffer from faulty devices, device-to-device variability, random telegraph noise and line resistance. Importantly, we demonstrate that the accuracy can be improved even without increasing the total number of memristors."
Source: Nature

ECONOMICS IN AI



Who Gets Credit for AI-Generated Art?

"The recent sale of an artificial intelligence (AI)-generated portrait for $432,000 at Christie's art auction has raised questions about how credit and responsibility should be allocated to individuals involved and how the anthropomorphic perception of the AI system contributed to the artwork's success. Here, we identify natural heterogeneity in the extent to which different people perceive AI as anthropomorphic. We find that differences in the perception of AI anthropomorphicity are associated with different allocations of

responsibility to the AI system and credit to different stakeholders involved in art production. We then show that perceptions of AI anthropomorphicity can be manipulated by changing the language used to talk about AI—as a tool versus agent—with consequences for artists and AI practitioners. Our findings shed light on what is at stake when we anthropomorphize AI systems and offer an empirical lens to reason about how to allocate credit and responsibility to human stakeholders."
Source: Science Direct

HEALTHCARE

Illuminating the dark spaces of healthcare with ambient intelligence

"Advances in machine learning and contactless sensors have given rise to ambient intelligence—physical spaces that are sensitive and responsive to the presence of humans. Here we review how this technology could improve our understanding of the metaphorically dark, unobserved spaces of healthcare. In hospital spaces, early applications could soon enable more efficient clinical workflows and improved patient safety in intensive care units and operating rooms. In daily living spaces, ambient intelligence could prolong the independence of older individuals and improve the management of individuals with a chronic disease by understanding everyday behaviour. Similar to other technologies, transformation into clinical applications at scale must overcome challenges such as rigorous clinical validation, appropriate data privacy and model transparency. Thoughtful use of this technology would enable us to understand the complex interplay between the physical environment and health-critical human behaviours."
Source: Nature

Synthesizing Skin Lesion Images Using Generative Adversarial Networks

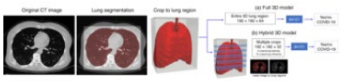
"In this thesis, we will try to reduce the problem of low amounts of data in machine learning by artificially creating more data using generative models, more specifically Generative Adversarial Network (GAN). We will create synthetic images of skin lesions, expanding the original data set. In addition to generating visually accurate synthetic data, our goal is to

improve machine learning models by adding synthetic training data."
Source: University of Bergen

Reconstructing lost BOLD signal in individual participants using deep machine learning

"Signal loss in blood oxygen level-dependent (BOLD) functional neuroimaging is common and can lead to misinterpretation of findings. Here, we reconstructed compromised fMRI signal using deep machine learning. We trained a model to learn principles governing BOLD activity in one dataset and reconstruct artificially compromised regions in an independent dataset, frame by frame. Intriguingly, BOLD time series extracted from reconstructed frames are correlated with the original time series, even though the frames do not independently carry any temporal information… Deep machine learning thus presents a unique opportunity to reconstruct compromised BOLD signal while capturing features of an individual's own functional brain organization."
Source: Nature

COVID 19



Artificial intelligence for the detection of COVID-19 pneumonia on chest CT using multinational datasets

"Chest CT is emerging as a valuable diagnostic tool for clinical management of COVID-19 associated lung disease. Artificial intelligence (AI) has the potential to aid in rapid evaluation of CT scans for differentiation of COVID-19 findings from other clinical entities. Here we show that a series of deep learning algorithms, trained in a diverse multinational cohort of 1280 patients to localize parietal pleura/lung parenchyma followed by classification of COVID-19 pneumonia, can achieve up to 90.8% accuracy, with 84% sensitivity and 93% specificity, as evaluated in an independent test set (not included in training and validation) of 1337 patients. Normal controls included chest CTs from oncology, emergency, and pneumonia-related indications. The false positive rate in 140 patients with laboratory confirmed other (non COVID-19) pneumonias was 10%. AI-based algorithms can readily identify CT scans with COVID-19 associated pneumonia, as well as distinguish non-COVID related pneumonias with high specificity in diverse patient populations."

Source: Nature Communications