SINGAPORE UNIVERSITY OF TECHNOLOGY AND DESIGN

31 December 2019 – 3 February 2020

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 | academic | reports

ARTIFICIAL INTELLIGENCE

Researchers Can Make AI Forget You

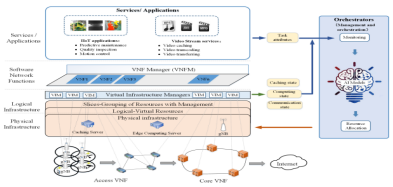
"Making a trained AI model forget you often requires retraining it from scratch with all the data but yours. This process that can take weeks of computation. Two new papers offer ways to delete records from AI models more efficiently, possibly saving megawatts of energy and making compliance more attractive."
Also read paper 1 and paper 2.
Source: IEEE Spectrum

Using artificial intelligence to enrich digital maps

"An AI model developed at MIT and Qatar Computing Research Institute that uses only satellite imagery to automatically tag road features in digital maps could improve GPS navigation, especially in countries with limited map data."
The source code of RoadTagger project is available at GitHub.
Source: MIT News

MACHINE LEARNING

ARTIFICIAL INTELLIGENCE



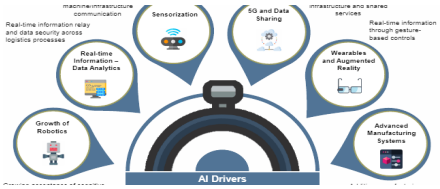
AI Inspired Intelligent Resource Management in Future Wireless Network

"In this paper, we first summarize the AI-based joint resources allocation schemes. Then, an AI-assisted intelligent wireless network architecture is proposed. Finally, based on the proposed architecture, we use deep Q-network (DQN) algorithm to figure out the complex and high-dimensional joint resource allocation problem. Simulation results show that the algorithm has good convergence characteristics, proposed architecture and the joint resource allocation scheme achieve better performance compared to other resource allocation schemes."
Source: IEEE Access

A state of the art review of intelligent scheduling

"Intelligent scheduling covers various tools and techniques for successfully and efficiently solving the scheduling problems. In this paper, we provide a survey of intelligent scheduling systems by categorizing them into five major techniques containing fuzzy logic, expert systems, machine learning, stochastic local search optimization algorithms and constraint programming."
Source: Artificial Intelligence Review

AI & INDUSTRY



Artificial Intelligence (AI) in the Global Freight Transportation Industry, Forecast to 2025

"This study analyses the key trends and applications of artificial intelligence in the freight transportation industry by mode of transport i.e. road, rail, air, and ocean freight transportation. This research also analyses the disruptive impact of artificial intelligence on freight transportation business operations and discusses its adoption prospects till 2025."
Source: Frost & Sullivan

Living in an AI World: Achievements and Challenges in Artificial Intelligence Across Five Industries

"This AI progress report analyzes these challenges and also looks at how AI is being implemented across five industries in the U.S.: healthcare, financial services, transportation, technology, and retail. It shows that while there is some variation in AI adoption across industries, there is also a depth of engagement that is highly encouraging."
Source: KPMG

Using Machine Learning to "Nowcast" Precipitation in High Resolution

"We are presenting new research into the development of machine learning models for precipitation forecasting that addresses this challenge by making highly localized 'physics-free' predictions that apply to the immediate future."
Source: Google AI Blog

ETHICS

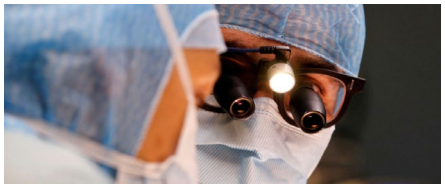
8 ways to ensure your company's AI is ethical

"While AI holds plenty of promise, it raises concerns about data misuse and privacy. Here are eight lessons to help firms ensure their AI systems don't become ethically compromised."
Source: World Economic Forum

How global tech companies can champion ethical AI

"The ethics of artificial intelligence is a critical challenge for the tech industry. Global tech companies can learn from Microsoft's Responsible AI Champs."
Source: World Economic Forum

HEALTHCARE



Here are 3 ways AI will change healthcare by 2030

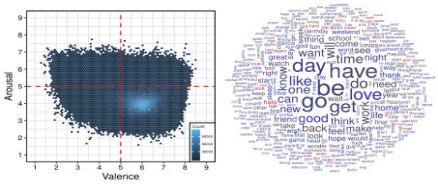
"Predictive care, networked hospitals and better experiences for patients and staff – what benefits could artificial intelligence bring to healthcare delivery?"
Source: World Economic Forum

INDUSTRY PLAYERS

40 years of cognitive architectures: core cognitive abilities and practical applications

"In this paper we present a broad overview of the last 40 years of research on cognitive architectures. To date, the number of existing architectures has reached several hundred, but most of the existing surveys do not reflect this growth and instead focus on a handful of well-established architectures. In this survey we aim to provide a more inclusive and high-level overview of the research on cognitive architectures."
Source: Artificial Intelligence Review

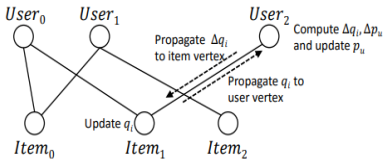
DATA ANALYTICS



The individual dynamics of affective expression on social media

"Understanding the temporal dynamics of affect is crucial for our understanding human emotions in general. In this study, we empirically test a computational model of affective dynamics by analyzing a large-scale dataset of Facebook status updates using text analysis techniques."
Source: EPJ Data Science

MACHINE LEARNING



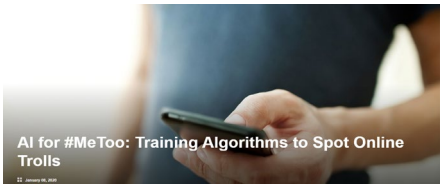
Distributed Graph Computation Meets Machine Learning

"TUX^2 is a new distributed graph engine that bridges graph computation and distributed machine learning. TUX^2 inherits the benefits of elegant graph computation model, efficient graph layout, and balanced parallelism to scale to billion-edge graphs, while extended and optimized for distributed machine learning to support heterogeneity in data model, Stale Synchronous Parallel in scheduling, and a new Mini-batch, Exchange, GlobalSync, and Apply (MEGA) model for programming."
Source: IEEE Transactions on Parallel and Distributed Systems

AI Year in Review: Highlights of Papers from IBM Research in 2019

"As we look forward to a continued strong focus in 2020 on further developing and advancing AI for enterprise applications, some of which are described in our 2020 AI predictions, we reflect back on some of our key topics and notable papers in 2019. The more complete set of AI papers is available on our IBM Research AI publications site."
Source: IBM Research Blog

ALGORITHMS



AI for #MeToo: Training Algorithms to Spot Online Trolls

"Researchers at Caltech have demonstrated that machine-learning algorithms can monitor online social media conversations as they evolve, which could one day lead to an effective and automated way to spot online trolling."
Source: Caltech

INTERNET OF THINGS

Source: Britannica ImageQuest

A review on intelligent process for smart home applications based on IoT: coherent taxonomy, motivation, open challenges, and recommendations

"Innovative technology on intelligent processes for smart home applications that utilize Internet of Things (IoT) is mainly limited and dispersed. The available trends and gaps were investigated in this study to provide valued visions for technical environments and researchers."
Source: Artificial Intelligence Review

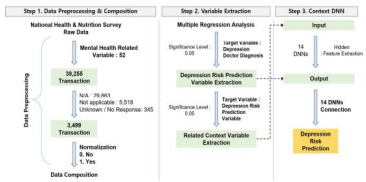
DATA CULTURE

Source: Britannica ImageQuest

The Need of Industry to Go FAIR

"Many companies are still in the early phases of internal data 'FAIRification', providing opportunities for SMEs and academics to apply and develop their expertise on FAIR data in collaborations and public-private partnerships … In this opinion article we reflect on some industry specific challenges of FAIR implementation to be dealt with when choices are made regarding 'Industry GOing FAIR'."
Source: Data Intelligence

NEURAL NETWORKS



Context Deep Neural Network Model for Predicting Depression Risk using Multiple Regression

"Research on Mental healthcare using artificial intelligence do conduct on prediction based on patients' voice, word choice, and conversation length. However, there is not much research on situation prediction in order to prevent depression. Therefore, this study proposes the context-DNN model for

predicting depression risk using multiple-regression."
Source: IEEE Access

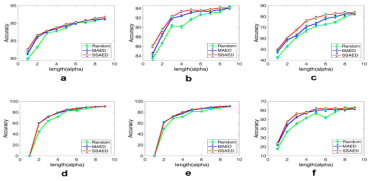
Fast 2D Convolution Algorithms for Convolutional Neural Networks

"Convolutional Neural Networks (CNN) are widely used in different artificial intelligence (AI) applications. Major part of the computation of a CNN involves 2D convolution. In this paper, we propose novel fast convolution algorithms for both 1D and 2D to remove the redundant multiplication operations in convolution computations at the cost of controlled increase of addition operations."
Source: IEEE Transactions on Circuits and Systems I: Regular Papers

Introducing neuromodulation in deep neural networks to learn adaptive behaviours

"In this paper, we take inspiration from cellular neuromodulation to construct a new deep neural network architecture that is specifically designed to learn adaptive behaviours. The network adaptation capabilities are tested on navigation benchmarks in a meta-reinforcement learning context and compared with state-of-the-art approaches."
Source: PLOS ONE

ALGORITHMS



A novel active learning algorithm for robust image classification

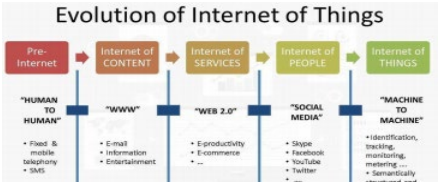
"Training samples need to be labeled before being used to train classification model, which usually takes too much labor and material resources. Recently, this problem has attracted widespread attention. In order to reduce the workload of labeling samples, we propose a novel active learning methodology, which uses locally linear reconstruction coefficients to construct semi-supervised data manifold adaptive kernel space."
Source: IEEE Access

A Bayesian machine scientist to aid in the solution of challenging scientific problems

"To deal with increasing amounts of data, we need 'machine scientists' that are able to extract these models automatically from data. Here, we

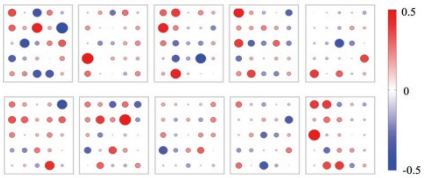
introduce a Bayesian machine scientist, which establishes the plausibility of models using explicit approximations to the exact marginal posterior over models and establishes its prior expectations about models by learning from a large empirical corpus of mathematical expressions."
Source: Science Advances

CYBERSECURITY



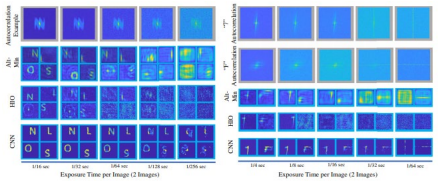
Harnessing Artificial Intelligence Capabilities to Improve Cybersecurity
"Here, we explore AI's potential in improving cybersecurity solutions, by identifying both its strengths and weaknesses. We also discuss future research opportunities associated with the development of AI techniques in the cybersecurity field across a range of application domains."
Source: IEEE Access

HEALTHCARE



Clinical state tracking in serious mental illness through computational analysis of speech
"Individuals with serious mental illness experience changes in their clinical states over time that are difficult to assess and that result in increased disease burden and care utilization. It is not known if features derived from speech can serve as a transdiagnostic marker of these clinical states. This study evaluates the feasibility of collecting speech samples from people with serious mental illness and explores the potential utility for tracking changes in clinical state over time."
Source: PLOS ONE

DEEP LEARNING



Deep-inverse correlography: towards real-time high-

resolution non-line-of-sight imaging

"Low signal-to-noise ratio (SNR) measurements, primarily due to the quartic attenuation of intensity with distance, are arguably the fundamental barrier to real-time, high-resolution, non-line-of-sight (NLoS) imaging at long standoffs. To better model, characterize, and exploit these low SNR measurements, we use spectral estimation theory to derive a noise model for NLoS correlography."
Source: Optica

Deep learning for proactive network monitoring and security protection

"The work presented in this paper deals with a proactive network monitoring for security and protection of computing infrastructures. We provide an exploitation of an intelligent module, in the form of a as a machine learning application using deep learning modeling, in order to enhance functionality of intrusion detection system supervising network traffic flows."
Source: IEEE Access

Deep learning-based super-resolution of 3D magnetic resonance images by regularly spaced shifting

"Super-resolution (SR) techniques manage to increase the image resolution, being especially effective those based on examples that determine a correspondence between patterns of low resolution and high resolution. Deep learning neural networks have been applied in recent years to estimate this association with very competitive results. In this work, the starting point is a convolutional neuronal network to which a regularly spaced shifting mechanism over the input image is applied, with the aim of substantially improving the quality of the resulting image."
Source: Neurocomputing