MONASH University

MALAYSIA

SYNC

Artificial Intelligence

AI

ISSUE 2, MARCH 2019

Letter from **the Editor**

Welcome to the second issue of "SYNC", the research newsletter of the School of Engineering, Monash University Malaysia (MUM). We hope our very first issue themed "Towards a Sustainable Future" was an enjoyable and informative read.

This issue centers on the theme of Artificial Intelligence (AI). Inside you will find a mixture of highlights on the involvement of our academics in the industry and on research areas focused by graduate students in relation to this theme. Cutting-edge talks on the commercial use of AI were held at MUM by representatives from Toyota Central R&D and IBM, details of which can be found inside. We hope the **Feature** section fascinates you with the wonders of AI and at the same time enlighten on the challenges pertaining to the rapid development in this field.

Do not miss out **Event Highlights** where we have covered interesting events that took place in our campus. We hope you will enjoy the **Breakzone** section which comprises engaging information on AI and awesome robots in the world. For those looking to build AI skills, we feature a list of free resources to help you get started.

Do feel free to suggest and share content ideas with us and we hope to recruit new editorial members for the upcoming issue! Many thanks on your continuous support for the newsletter and we wish you will find it a good read.

Let us **SYNC - Say Yes 'N' Collaborate**

Shalini Darmaraju
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(GRS)

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Feedback and Suggestions

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Contents

Insights
Artificial Intelligence

Backed by the vision to be the leader on Artificial Intelligence (AI) in the region, we at the School of Engineering at Monash University Malaysia, are expanding teaching and research on AI. The discipline of Mechatronics now offers the unit *TRC 4901-Artificial Intelligence for Engineers* to undergraduates with elements of deep learning to enrich the content. On the other hand, researchers at the School of Engineering apply AI in a range of applications including image processing, gait monitoring and textile manufacturing. Interdisciplinary collaborations within the School are supported such as the development of prediction models for anaerobic digesters using fuzzy logic.

Moreover, academics at Monash University Malaysia actively seek out projects with the industry. This encourages a "win-win" scenario by enabling students to get a head start for skill development and employment while helping industries to experience or explore new technologies at lower costs and risks. With goals to provide a conducive environment for students to develop AI based careers and to contribute to the industry by increasing their productivity, AI is at the forefront of research efforts at Monash University Malaysia.

Associate Professor Tan Chee Pin
Head of Discipline (Mechatronics Engineering)

Data is
The New Oil

Data is the new oil* with companies reporting 10% to 30% increase in return-on-investment after having invested in Artificial Intelligence (AI). Keeping pace with the trend, academics at the School of Engineering, Monash University Malaysia research on using AI to make lives better.

Dr. Md Abdus Samad Kamal (Senior Lecturer) works extensively with industry partners in incorporating AI to improve work processes and the quality of products. Dr Kamal and Dr. Tan Chee Pin (Associate Professor and Head of Mechatronics Discipline) are currently working on the use of AI in the production of corrugated boxes. The complexity of making corrugated boxes arises due to the size of the box, labelling with inks and the mass manufacturing process. Subtle changes during the process such as temperature, moisture levels and color variations from changes in ink density affect the batch production of cardboard. This could end up in a loss for the manufacturer should any defect arise. AI could support the detection of the subtle changes and consistently maintain the batch quality.

AI is also facilitating healthcare with technology now on our phones to monitor our health. To reduce injuries, Dr Alpha Agape Gopalai (Senior Lecturer) is designing a smart shoe that monitors our walking patterns.

With driverless cars on roads, Dr. Madhavan Shanmugavel (Lecturer) works alongside Recogine Technology Sdn Bhd to develop a traffic system for vehicle monitoring and classification. Recogine Technology Sdn Bhd specialises in intelligent transportation systems. With AI being part of our future, the research community at Monash University Malaysia endeavors to enhance our lives.

For more information, visit the link
https://bit.ly/2MPQ4qL

From the Right: Dr. Alpha Agape Gopalai (R),Dr. Md. Abdus Samad Kamal (C) and Dr Madhavan Shanmugavel (L) from Mechatronics Discipline, Monash University Malaysia.

**Source: "Data wizards help business tame seas of Information". Kate Allen Financial Times November 1, 2018*

AI Assists
Flood Management

AI computing techniques, which synergize human-inspired reasoning style of fuzzy systems with the learning and connectionist structure of neural networks, are known as the neuro-fuzzy systems (NFS).

Dr. Amin Talei, Course Coordinator, Civil Engineering Discipline, Monash University Malaysia.

These techniques are suitable for pattern recognition and to capture the input-output associations in complex nonlinear multi-variable problems. In Civil Engineering discipline of Monash University Malaysia, advanced NFS algorithms are developed for hydrological modelling applications including rainfall-runoff simulation and flood forecasting. Rainfall-runoff modelling and flood forecasting helps with flood management and can also enable effective water resources management.

For example, an accurate prediction of the flood can contribute to flood warning systems and evacuation plans. Dr Amin Talei and his team has recently developed a self-adaptive NFS model with flexible structure. This model is capable of adapting itself to the potential spatial and temporal changes in the environment, thereby performing as a robust real-time runoff-forecasting tool.

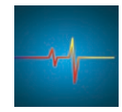
Research Focus

Research in the field of artificial intelligence at Monash University Malaysia is interdisciplinary with efforts directed to assist us in our jobs and lives. A few of the challenges being solved by graduate students are highlighted here.

Target Challenge: To decrease travel time and fuel consumption

Mr A.S.M Bakibillah

Project Focus: Development of intelligent vehicle control strategy for cooperative ecological driving at urban roads.



Target Challenge: Estimating unmeasured/unmeasurable signals in systems affected by disturbances

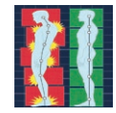
Mr Joseph Chan

Project Focus: Development of sliding mode observer schemes for non-infinitely observable descriptor systems.

Target Challenge: Rehabilitation of individuals with lower limb disability

Mr Saeed Pirbodaghi

Project Focus: Design and implementation of an assistive neuroprosthesis for gait rehabilitation.



Target Challenge: Improving postural control (balance) in human beings

Mr Jeshaiah Zhen Syuen Khor

Project Focus: Introducing sub-sensory vibration to the feet to improve foot sensitivity and balance.

Target Challenge: Simultaneous arrival of road vehicles regardless of obstacles

Mr Cham Da Ming

Project Focus: Development of cyber system (brains), physical system (brawn) and system integration to perform specified task.

Target Challenge: Efficient execution of complex tasks using multiple vehicles/robots

Ms Shalini Darmaraju

Project Focus: Development of optimised control algorithms for coordinating large scale autonomous mobile multi-agent robots.

Target Challenge: Easing low back pain

Mr Kosalishkwaran Ganeson

Project Focus: Development of AI framework to non-invasively determine the severity of disc degeneration and effects on other bones based on subject movement and lifestyle.

VA-8: Value Added Automation of Textiles

Automation is changing the landscape of the textile industry with robots such as *Sewbo*, *Kniterate* and *Lowry Sewbot,* built to automate the sewing and knitting process. A multi-university team (Monash University Malaysia, Universiti Tun Hussein Onn Malaysia, and Universiti Teknologi Malaysia), also known as the VA-8 team, is working together with Malaysia Textile and Apparel Centre (MATAC) to explore low cost automation for the local textile manufacturing industry. A seminar on "Research, Development and Commercialization (R&D&C) Value- Added Automation of Textiles", organized jointly by the VA-8 team and MATAC, was held at Monash University Malaysia on the 28th of November 2018 to discuss the landscape of Industry 4.0 in the Malaysian textile industry. The VA-8 team are developing home-grown soft robots to handle flexible fabrics. Research on automating tasks such as tagging is also conducted to improve the manufacturing process efficiency.

Automation Accelerates Development of Microbial Cell Factories

Pursuit of sustainability towards bio-based economy is fuelling the search to convert non-food biomass to chemicals with consolidated bioprocessing (CBP). Scientists have turned to microbes as the sustainable factory to produce desired chemicals by engineering their cell surfaces and metabolic pathways to serve the purpose. At the seminar held on 5th December 2018, Professor Akihiko Kondo (Kobe University and RIKEN, Japan) enlightened the audience on the advances in this field including their automated systems integrated with genome editing and gene cluster synthesis for the efficient construction of microbial cell factories.

The construction of efficient microbial cell factories includes the development of artificial metabolic pathways for target chemical production. A synthetic biology approach is taken by employing computer simulation and metabolic analysis to design them. The pathways are then realised through genome editing or large DNA synthesis and then incorporated into the host microbe "factories".

The large DNA synthesis involves combining all required genes for the desired metabolic pathway in one DNA and inserting it at once into the host microbe. Automation would help maintain reliability and quality of the microbial strains produced. The research at Kobe University has enabled efficient isobutanol production with microbes. The automated DNA synthesis platform is now commercially available from Synplogen with Prof. Akihiko Kondo serving as one of its directors. Automation with support from AI is hoped to reduce the research time from 1 year to 6 months for industrially usable strains that could produce high value chemicals sustainably.

The seminar was jointly organized by Advanced Engineering Platform (AEP) and School of Engineering, together with IChemE's Biochemical Engineering Special Interest Group (BESIG).

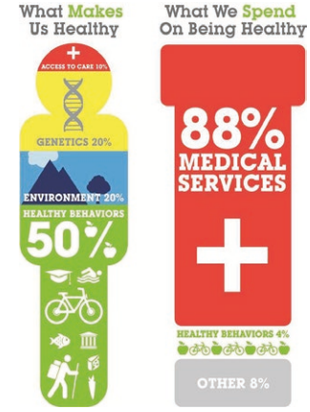
IBM's Watson Helps Doctors Personalize Medicine

Every human generates 1100 TB* of health related data over their lifetime. Mining this data for health insights could help enhance medical treatment. However, processing this enormous amount of data efficiently is a challenge. This challenge is what IBM's Watson is trained to tackle as pointed out by Mr. Jitinder Magoon, (IBM ASEAN Strategic Client Business Development Leader) in his talk at Monash University Malaysia on 23rd October 2018. Watson, a cognitive computing system, is is transforming healthcare with its extensive artificial intelligence capabilities. Its application, Watson Oncology, for cancer treatment was discussed in the talk.

1100 TB of health data generated per human in a lifetime.

Watson Oncology aids doctors by scouring through global data at a rate of 800 pages/second and provides a list of personalized treatment options for their cancer patients.

In places like Mongolia where there are few oncologists, it could be part of the clinical support system. The generated cancer treatment options have shown to have high concordance rates. Moreover, Watson's language processing abilities has enhanced patient experience including answering questions from anxious kid patients. At Thomas Jefferson Hospital, USA, cognitive hospital rooms, integrates Watson, Internet of Things (IOT), and a voice assistant, to help monitor Parkinson's patients progression and personalize their treatment. Shadowing Watson are the concerns of information safety and medicolegal issues that could delay its adoption. To mollify these concerns, Mr. Jitinder emphasized that "technology is only an enabler" with Watson as a decision supporting tool capable of compiling global data to provide personalized treatment options.



*TB - Terabytes

Image Credit:
Boston Foundation and the New England Healthcare Insititute

Watch more about Watson at
https://youtu.be/idp55-2kMc8

AI Assists Quest for New Materials at Toyota

The development of advanced materials is crucial for the storage of harvested renewable energy in the quest for sustainable economies. The search for new materials at Toyota Central R&D Labs is now being done with material informatics. This is supported by machine learning, according to Mr. Kensuke Takechi (Research Domain Leader of Material Informatics Domain) in his talk on 24th July 2018. Using the database on material composition and subsequent properties, scientists are now trying to "reverse engineer" materials based on required performance.

The system used at Toyota Labs is based on convolution neural networks (CNNs) trained with SEM images and selected descriptors such as atomic positions, electron positions (described with voxels) and material property (mechanical, electrical etc). With a target to optimize materials for batteries, material informatics has helped speed up the development with 9 materials found in a year at the lab in contrast to 4 materials per year globally. Despite the challenges such as the need for faster data processing and high precision prediction, material development powered by AI would enable us to "personalize" materials for desired applications.

**SEM - Scanning Electron Microscope*

Watch more about CNNs at *https://youtu.be/ixF5WNpTzCA*

Announcements

New Graduate Research Coursework Units!

There are two new Graduate Research coursework units to be offered starting 2019! For more information contact mum.soe.research@monash.edu

ENG6009 Communicating research in engineering

This is a newly established unit that is only available in School of Engineering, Monash University Malaysia, to be offered starting Semester 1, 2019. Unlike conventional on-campus units, ENG6009 will have its classes during Week 0, Mid-semester break and SWOT Vac. The mode of teaching for this unit will be a total of 24 hours of crash lectures with workshops for students to practice what they have learnt. The unit content includes writing a literature review, putting together a research article, presentation, oral defense and more.

ENG6410 Research practice in engineering

Slated to start from Semester 2, 2019 to
(i) Introduce structure of scientific arguments and demonstrate how knowledge of this structure can enable critical thinking and scientific communication;
(ii) Make graduate researchers aware of the complex social process that modern science is and lastly
(iii) Introduce aspects such as research funding, planning and budgeting research projects, research metrics, technology development, commercialisation, intellectual property and patents, current socio-political views of science and scientists. This unit will be held throughout the 12 weeks of the semester.

GRS Consumable funding is now open for application!

For GRS whose project is not supported by funding and require funds to progress, the School of Engineering offers consumable funding to support you! For more information on what this fund covers and the procedures to apply, please refer to Engineering Graduate Research Students Moodle page and download relevant forms. If you have trouble accessing the Moodle page, please email Mr. Lam Mun Heng (lam.mun.heng@monash.edu) to request for access.

Vice-Chancellor's International Inter-Campus PhD Travel Grant is now open!

The Vice-Chancellor's International Inter-Campus PhD travel grant provides research students with funding of AUD $3,000 for a visit up to 4 weeks to connect and collaborate with researchers across Monash campuses. Application deadlines are:
Round 1 - 11 Mar 2019
Round 2 - 27 May 2019
Round 3 - 19 Aug 2019
For more information, please visit the link https://www.intranet.monash/graduate-research/handbook-admin-forms/vc-phd-travel-grant

Inside the AI Buzz

Way back in 1956, at the seminal event of the Darthmouth Summer Research Project, "thinking machines" were named "Artificial Intelligence" (AI). Today, AI processes, analyzes and acts upon the massive amounts of data in a smarter and more efficient way than humans could do. So what exactly constitutes AI?

According to an article on Forbes, there are two types of AI to perform tasks and act dynamically, namely applied AI and generalized AI. Some tasks that AI are being designed to handle include speech recognition, perception, vision for facial or gesture recognition and object manipulation. Applied AI simulates human thoughts to do a specific task independently using tools like machine learning. An example of applied AI is Google's *Quick, Draw!* that tries to recognize your doodles and virtual assistants like *Siri*, *Alexa* or *Cortana*. On the other hand, generalized AI uses machine intelligence such as deep learning to perform any task like we do. Examples of generalized AI are IBM's *Watson* and Google's *AlphaGo*. Driverless cars and robots like *Sophia* are an advanced form of AI that employ multiple tools to perform tasks.

Healthcare is an industry that's being revolutionized by AI. The startup, Arterys, uses AI to compare Magnetic Resonance Imaging (MRI) scans in 15 seconds (down from 45 minutes that a human takes to do the same). Toyota's partner robots such as *Human Support Robot* and the social robot- *Pocobee* are facilitating care for the elderly and people with special needs. *Eve*, an AI robot scientist at the University of Cambridge, UK was able to find that triclosan, commonly found in toothpaste, could be used as an anti-malarial drug. Deep learning research at UC San Francisco and UC Berkeley have shown that Alzheimer's could be predicted from brain scans years before its diagnosis. Scientists have also used AI to find why some kids struggle at school.

Do you use AI everyday? If you say NO, think again. You are actively using AI from voice assistants, Google.com, Youtube, ride-sharing apps, toys (Tamagotchi), video games (Minecraft, RuneScape) to even the recommendations like online shopping or social networks. Innovations combining augmented reality (AR) with AI are enhancing our experiences like Brush Monster making kids enjoy brushing their teeth or shopping with Amazon's AR view. Industries also use AI for tasks such as manufacturing fault prediction (Volvo), product development (Coca Cola, BMW), energy management (GE Power, Stem, HST Solar), financial services (American Express), retail (Amazon), agriculture (Nature Fresh Farms with Intel), food (TOMRA) and even customer service (Disney). Few examples of AI transforming industries are highlighted next.

Do you use AI everyday?
If you say NO,
Think Again.

Besides using AI for personal care, its application for automation is enhancing industrial workplaces. Manufacturing is another sector facing the revolution known as Industry 4.0. Combining AI with other technologies such as Internet of Things (IOT), automation of manufacturing can now make things more efficient. *Sewbot* is an example of automation for the textile industry while *Chef Watson* joined hands with human chefs bringing new culinary delights to the plate. From AI powered smart city energy management (Singapore) to detection of expensive leaks in municipal water systems (Canada), development of productive smart cities is close to reality. While AI has contributed in pushing forward mankind into a new industrial age, it does come with challenges or consequences.

The strength of a nation lies with its production and its expertise. With Industry 4.0, robots are now taking over these jobs and these robots have no rights, don't form unions, demand overtime or wages. Experts say it won't be long before they completely take over labour jobs around the globe with just the top authorities controlling over the rest. Education sector would play a major role to prepare the society for this change. Another challenge lies in the possibility of AI malfunctioning. AI is a collection of algorithms where the system jumps from one condition to another. Now out of these million possibilities, we let the AI to make the best possible decision. So assuming the algorithm has a success rate of say 99.99%, it works 9999 times out of 10,000. However, we still need to consider what if one day, it does reach that 1/10,000. For example, a self-driving car running over pedestrian due to these "errors" is something we must prepare for. Another challenge with AI is the lack of trust.

Humans build their sense of reliability mainly on 'trust', while an AI will tend to use probability or past data to plan out the best possible scenario. As human beings, we tend to simplify complicated things by mainly trusting the other person with the task based on their capacity. But can we trust an intelligent being that lacks emotions from the very beginning?

There are also concerns over the misuse of AI. Did you know there is a pledge to stop the design of lethal autonomous weapons? To date this pledge has been signed by 244 organizations and 3187 individuals. Despite countless declarations like these and an international charter to control AI towards the betterment of humankind, we still cannot take out the possibility of it falling in the wrong hands.

AI is now evolving at an enormous rate. According to study by the U.N. World Intellectual Property Organization (WIPO), the USA and China are leading the field. The USA tech giant IBM has the biggest AI patent portfolio, with 8,920 patents. China accounts for 17 of the top 20 academic institutions involved in patenting AI with a strong focus on deep learning. The ubiquitous growth of AI and its applications are enabling smarter and efficient processes to lead better lives. Channeling the potential of AI in the right way will lead to development of smarter, efficient and economic cities with possibilities to close the gaps within our societies, uplift all strata of our communities and maybe build nations with bridges across them.

Did you know there is a pledge to stop the design of lethal autonomous weapons?

Sources
Forbes: 27 Incredible Examples Of AI And Machine Learning In Practice

The Star Online - U.S., China take the lead in race for artificial intelligence - U.N., 2019

Bestlifeonline.com - 20 Types of Artificial Intelligence You Use Every Single Day And Don't Know It

ScienceDaily - research articles

Image Credits:
Pixabay
Toyota Pocobee
Amazon Alexa

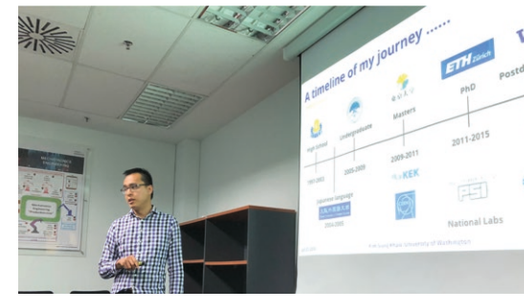
A Travelling Researcher: How is it like to

Travel Across Continents to Chase Your Dreams

Ever wondered what you could do to travel as a researcher? Dr. Khaw Kim Siang, currently a postdoctoral research associate at the University of Washington (UOW), USA shared his journey as a researcher with the graduate research students at his talk on the 27th of July 2018.

Starting off as one of the bottom 5% in school and an avid gamer, he was motivated by his teacher to work up to the top 5% in high school and became a passionate researcher in the field of particle physics. With MEXT scholarship, he travelled to Japan for his undergraduate studies and got his PhD at ETH Zurich. At his current postdoc position in CENPA Fermilab, UOW, he is working on Muon g-2 experiments, a 5th generation high precision experiment to measure muon properties.

Dr. Khaw enlightened the crowd about sub-atomic particles that have yet to appear in the Standard Model of particle physics. He also shared the challenges he faced conducting cutting-edge research in a leading particle physics facility including coordinating with 200 collaborators over the globe which has led him to be a "travelling researcher".



Women Leaders in Making

On the 19th of June 2018, female academics, graduate research students and alumni gathered for the first edition of Future Women Leaders Conference in School of Engineering & Information Technology, Monash University Malaysia. The aim was to support women who are actively involved in education and research and promote gender diversity within the academic environment.

The event started off with a keynote speech from Prof. Cordelia Selomulya (Faculty of Engineering, Monash University) on her journey becoming an academic. She shared her tips on CV preparation, securing a job and progressing in an academic career. A/P Wang Xin, Dr. Lau Ee Von and A/P Poh Phaik Eong then went on to share their experience on building research profile, achieving work-life balance and also building an academic career with significant engagement portfolio. The audience then had the opportunity to interact with forum panelists (Dr. Chang Wei Sea, Dr. Vivi Anggraini, Dr. Liang Shiuan-Ni and Dr. Irene Chew) to find out their success stories and have their CVs reviewed before the session ended with a networking dinner.

One of the participants said that the event gave her a chance to learn from strong women in the field while encouraging her to be more confident and resilient to balance work and personal life.

Building Nation
Towards Clean Energy

A one day workshop entitled "Building Nation Towards Clean Energy: Guidelines and Promotion of Solar PV Technologies" was organized by the School of Engineering and Advanced Engineering Platform (AEP) on 25th October 2018. The workshop was conducted in collaboration with Plus Solar Systems Sdn. Bhd. and supported by various agencies such as Sustainable Energy Development Authority (SEDA), the Institution of Engineers Malaysia (IEM), the Institution of Mechanical Engineers (IMechE), Engineers Australia (EA) as well as Energy Institute (EI).

In her keynote address, the acting CEO of SEDA, Dr. Chen Wei Nee briefed the participants on the technological innovation and government policy towards achieving a sustainable ecosystem in renewable energy generation. To make renewable energy systems more attractive and cost competitive compared to fossil fuels, it is crucial for Malaysia to establish collaborative links between research institutions, corporate companies, government and public.

Plus Solar highlighted their collaboration with universities and presented the market trends of solar photovoltaic panels in Malaysia. Rapid advancement of this technology and increased demand drives the market, thus contributing to the job prospects and economy in Malaysia. Potential issues such as recycling the panels were also discussed. Unique to this workshop, participants visited a green energy rated building with installed solar panels in Cyberjaya.

Workshop organising committee: Prof. Soh Ai Kah, A/P Hung Yew Mun, Dr. Arshad Salema, Dr. Tan Boon Thong, Dr. Tan Ming Kwang, Dr. Manh-Vu Tran, Dr. Mohd Zulhilmi Paiz and Ms. Mohanapriya Iyadorai.

Early Career
Researcher Workshop

Monash University Malaysia Early Career Researcher (ECR) Network aims to provide ECRs at the Malaysia campus an organised platform and a supportive community for exchanging ideas and creating research collaborations. It also aims to help its members advance their professional careers. Monash University defines an Early Career Researcher as one who has been awarded a PhD or an equivalent research qualification within the past ten years, or who has the equivalent of up to ten cumulative years of research experience, allowing for career interruptions arising from professional or personal issues.

Early Career Researchers are integral to the success of Monash University and our aspirations to build and maintain world class research leadership. Apart from the frequently organised networking tea, the School of Engineering conducted a one-day ECR workshop on 22nd October 2018.

The workshop provided the ECRs with the untold insights on publication strategies and grants. Additionally, participants discussed case studies and various scenarios in supervision practices. More exciting activities will be held in 2019 to accelerate ECRs progression in academic careers through discussion and collaboration with senior colleagues throughout the campus.We would like to thank the panelists - Prof. Tey Beng Ti, Prof. Chai Siang Piao, A/P Wu Ta Yeong, A/P Poh Phaik Eong and A/P Narayanan Ramakrishnan, for sharing their extensive experience with the ECRs.

Break Zone

Did You Know?

• According to PricewaterhouseCoopers (PwC) report, AI will contribute around 15.7 trillion dollars to the global economy by 2030.

• *Alexa*, the smart speaker by Amazon uses consumer buying behaviour as part of its AI program to learn about its customers and then list out the potential products for purchasing.

• According to Ray Kurzweil (American inventor), by 2029, AI will be at about the same level of intelligence as an adult human.

• The Nosedive episode in 'Black Mirror' discusses the implications of social credit system and how it ruins human relationship. It has now become a shocking reality when China introduced a social and legal credit system similar to the concept.

• Henn-na Hotel in Japan, world's first hotel staffed by robots (pictures on the right) fired most of its "employees" and is planning to replace them with humans until further upgrades take place.

• Google has taught AI to bake cookies – the buttery biscuit kind. IBM's *Watson* was also trained to fight cybercrime (as well as cook a panini, detect cancer and make film trailers).

Henn-na Hotel Conceirge
Photos courtesy -
A/P Poh Phaik Eong

Famous Quotes

"You're already a cyborg. Most people don't realize they're already a cyborg. That phone is an extension of yourself"

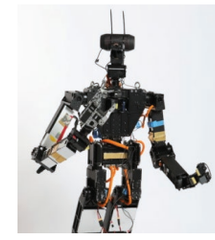
- **Elon Musk, CEO Tesla**

"Some people call this artificial intelligence, but the reality is this technology will enhance us. So instead of artificial intelligence, I think we'll augment our intelligence."

- **Ginni Rometty, CEO IBM**

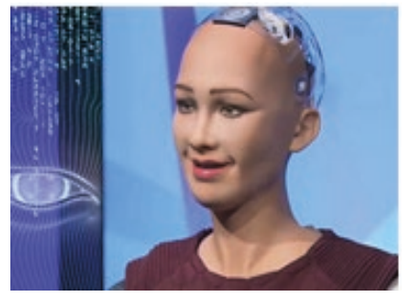
Awesome Robots

Boston Dynamics' Atlas does parkour (a back flip!)
Watch it here - https://youtu.be/LikxFZZO2sk

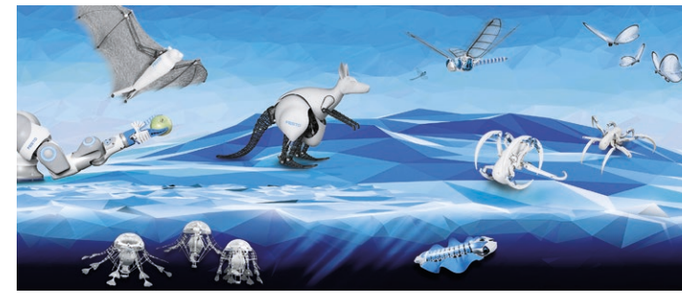


THOR-RD: Tactical Hazardous Operations Robot for disaster relief at RoMeLa Labs
https://youtu.be/LvzMq1QHhwo

Origami Inspired Artifical Muscles at Wyss Institute, Harvard University, USA
https://youtu.be/_tKI8BUHFLo



Hanson Robotics AI Sophia goes deep at Q&A
Watch it here - https://youtu.be/T4q0WS0gxRY



Animal Inspired Robots at Festo
https://youtu.be/mzS3YPLJNnE

Building Your AI Skills

Want to keep pace with the field of AI? Get started with these free resources to develop your AI skills.

Machine Learning (ML) with Google AI Centre

Free resources available to get you started on ML at **ai.google/education** along with free tools at **ai.google/tools**

Get started on Data Science

According to Tech Republic, the top 10 skills for data scientist include *Python, R, SQL, Hadoop, Java, SAS, Spark, MATLAB, Hive* and *Tableau*. Get started for free at **Codecademy** for some of these languages. Monash University also offers an introductory course on R via myDevelopment.

Explore Massive Open Online Courses (MOOCs)

edX and **coursera** offers self-paced open courses on Artificial Intelligence from top universities around the world. Microsoft also offers various courses on AI through **edX** with the option to get certified online.

Machine Learning and Deep Learning with MATLAB

As a Monash University student, access free **MATLAB** tutorials by registering on MATLAB Academy with your Monash email. As an open source alternative, check out **Octave** and its wiki page for tutorials.

Learn hands-on skills with learning kits

Get yourself some hands-on with economic kits from Arduino and Raspberry Pi. Robot kits, such as Lego Mindstorm and Tetrix, are also available and are simple to learn.

The Robotarium

The Robotarium project at Georgia Tech University provides a remotely accessible swarm robotics research platform freely accessible at **www.robotarium.gatech.edu**.

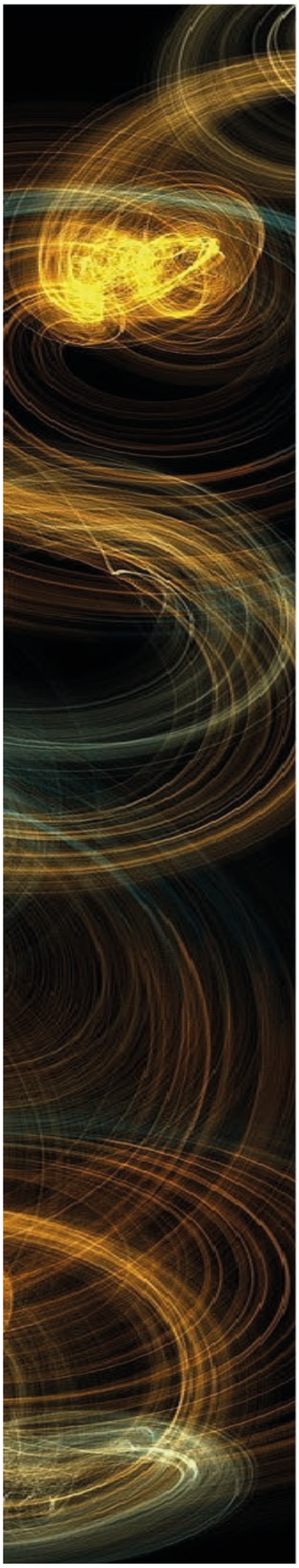
Hackathons

AWS Hackday 2019

Amazon Web Services has launched a “hack for good” challenge to accelerate digitalization in 4 areas - health tech, agritech, smart city and fintech. Closing Date: 17 March 2019

Fishackathon 2019

Develop digital solutions for sustainable fisheries.
Check out information at
https://fishackathon.co/
Follow them #CodeForFish
Event Date: 5 - 6 October 2019



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AEC
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