AI Robotics Vision and Automation Technology Challenges Competition

Organised by the
HKU SAAS Data Science Lab
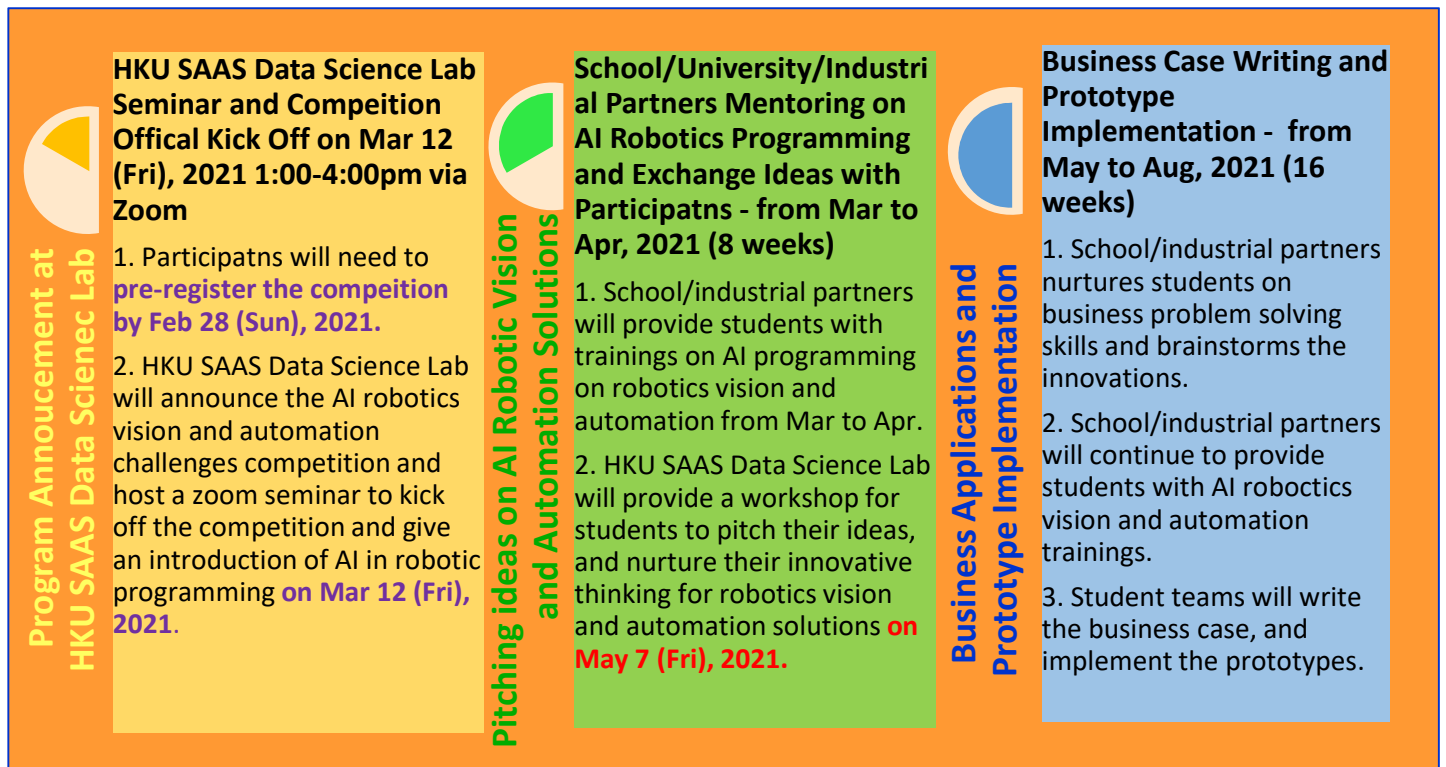
Department of 統計及精算學系
Statistics & Actuarial Science
THE UNIVERSITY OF HONG KONG

HKU SAAS Data Science Lab of the Department of Statistics & Actuarial Science (https://saasweb.hku.hk/datasci), The University of Hong Kong is organizing an AI robotics vision and automation technology challenges competition for secondary school/undergraduate/graduated students, and companies (https://saasweb.hku.hk/datasci/competitions.php). The aim of this competition is to promote development of artificial intelligence (AI) robotics vision and automation technologies at the school level and the industry level. The competition encourages students and companies to develop innovative AI robotics solutions with AI, data science and statistical tools for solving current hot topics/problems in robotics vision and automation. The competition also serves as a platform for local secondary schools, institutions, and industries to share knowledge, innovation and experience on the application of AI robotics technologies for solving business problems, enhancing businesses' competitiveness, and creating business insights for industries in social science, smart city, healthcare, education, and Internet of Things (IoT).

Program Overview	**AI Robotics Vision and Automation Technology Challenges** • An AI robotics vision and automation technology challenges competition is organized by HKU SAAS Data Science Lab, targeting at secondary school/university students, and the industry. • The competition is sponsored by a list of industrial partners that was stated in the competition website. • The HKU SAAS Data Science Lab provides current AI robotics vision and automation problems/challenges for students and companies to solve and discover robotics innovation in statistics, AI and data science disciplines. Students and companies will give a presentation to the judging panel how they would solve the problem, and create innovative robotics application to demonstrate their solution. • The participants' school/university teachers, and industrial partners will provide mentoring on innovation creation, techniques and skills of solving robotics problems, and project report writing for participants. • The HKU SAAS Data Science Lab will nurture students and companies on innovation development, business insights creation, and entrepreneurship. • The winning team will gain an award certificate.
Objective	• Identify talented students in the statistics, AI, and data science. • Resolve current robotics vision and automation problems, and create insights for various industries such as social science, smart city, healthcare, education, and Internet of Things (IoT). • Generate new ideas and innovations with AI robotics vision and automation technologies to increase business competitiveness. • Have practical hands-on experience on AI robotics vision and automation programming. • Take social responsibility to nurture students and companies on applying AI robotic technologies for solving business problems, creating innovation, and building entrepreneurial skills.
Business Benefit	**Students and Companies** • Know your talents/company strengths and learn the skills for solving a business problem with statistics, AI, and/or data science technologies. • Apply theories and concepts into real practices. • Have hands-on experience on AI robotics vision and automation. • Extend your social, school, and industrial networks, and learn entrepreneurship's thinking processes. • Gain award certificates opportunities. **The University of Hong Kong** • Nurture students and companies with real AI robotics problems and innovation development. • Promote applied statistics, AI, and data science in robotics applications. • Take social responsibility to nurture students and companies on innovation development and entrepreneurship. **High School, university teachers and industrial partners** • Nurture students and companies to apply statistical, AI, and/or data science methods on robotics problems.

Timeline

1. School/University/Industrial Partners' Timeline

Program Annoucement at HKU SAAS Data Scienec Lab

HKU SAAS Data Science Lab Seminar and Compeition Offical Kick Off on Mar 12 (Fri), 2021 1:00-4:00pm via Zoom

1. Participatns will need to **pre-register the compeition by Feb 28 (Sun), 2021.**

2. HKU SAAS Data Science Lab will announce the AI robotics vision and automation challenges competition and host a zoom seminar to kick off the competition and give an introduction of AI in robotic programming **on Mar 12 (Fri), 2021**.

Pitching ideas on AI Robotic Vision and Automation Solutions

School/University/Industrial Partners Mentoring on AI Robotics Programming and Exchange Ideas with Participatns - from Mar to Apr, 2021 (8 weeks)

1. School/industrial partners will provide students with trainings on AI programming on robotics vision and automation from Mar to Apr.

2. HKU SAAS Data Science Lab will provide a workshop for students to pitch their ideas, and nurture their innovative thinking for robotics vision and automation solutions **on May 7 (Fri), 2021.**

Business Applications and Prototype Implementation

Business Case Writing and Prototype Implementation - from May to Aug, 2021 (16 weeks)

1. School/industrial partners nurtures students on business problem solving skills and brainstorms the innovations.

2. School/industrial partners will continue to provide students with AI robloctics vision and automation trainings.

3. Student teams will write the business case, and implement the prototypes.

2. Participants' (Students and Companies) Timeline

Business Case and Prototype Submission

Competition Registration, Pitching Ideas, and Prototype Implementation in Spring and Summer 2021

1. **Participatns should register by 25th Apr (Sun), 2021**

2. **Participants will pitch their ideas via zoom on May 7 (Fri), 2021,** and will obtain feedback from HKU Data Science Lab's staffs and school/university teachers.

3. Participants will design and implement the programs, prepare the demo, and upload the presentaton on youtube from March to July, 2021.

4. **Participants submit the business case, presentation and demo on youtube by Aug 29 (Sun), 2021.**

Business Case and Prototype Evaluation

Business Case and Prototype Evaluation in Sep 2021

1. Judging panel from the HKU SAAS Data Science Lab/Industrial partners will evaluate the submissions **by Sep 12 (Sun), 2021.**

2. Winners will be annouced **by Sep 19 (Sun), 2021.**

3. HKU SAAS Data Science Lab will arrange award certificate presentation ceremony to the winning teams **by Sep 30 (Thur), 2021.**

Business Case Punlications

Business Cases Publication in Fall 2021

1. HKU SAAS Data Science Lab polishes the business case writing if the students' case report is in high standard.

2. HKU SAAS Data Science Lab **publishes the polished business cases in their website and/or potential conference/journal with the participants.**

The Problems (choose one or more)

	Category
1	**Social Science** Use AI robotics vision and automation technology to resolve and improve some current social issues (e.g. traffic congestion, pollutions vs conservation, elderly living conditions, etc).
2	**Smart City** ● Use AI technologies to help retail business, shopping malls, building management, etc., (e.g. better customer services, minimize payment counter queueing, energy saving and security surveillance for building management, etc) to improve customer service and/or product offerings. ● Use AI technologies to optimize buildings' operational efficiency and occupants' experience through an integrated solution in order to achieve increase efficiency, resiliency, sustainability, comfort and safety.
3	**Healthcare** ● Use AI technologies to improve the healthcare business (e.g. personal health, social distancing monitor, disease screening and diagnostics, therapy operations, etc). ● Use AI technologies to enable patients (or their carers) to track and modify lifestyle attributes critical in the prevention and early interception of potentially more serious health conditions. ● Use AI technologies to enable consumers to easily detect their own (or those in their care) health conditions, to aid in the timely and appropriate preventative or treatment intervention.
4	**Education** Use different AI robotics and/or intelligent machines in STEM Education to cultivate the interest of school/university students or company trainings in AI study.
5	**Internet of Things (IoT)** Use AI technologies to improve the intelligence of smart home solutions through sensing technologies.

Hardware and Software commonly used in AI, IoT and school STEM projects
(Participants are not limited to use the following robot simulator or robots for programming)

Robot Simulator
NVIDIA Isaac SDK https://developer.nvidia.com/isaac-sdk
SimSpark: http://simspark.sourceforge.net/
Gazebo: http://gazebosim.org/
Webots: https://cyberbotics.com/

Real Robot
Hardware
1. Nvidia Jetson https://www.nvidia.com/en-us/autonomous-machines/embedded-systems/
   - All CPU+GPU, single-board computer for small, medium to large scale AI and IoT projects
   - Medium to High Cost
2. Raspberry Pi https://www.raspberrypi.org/
   - Mostly CPU, single-board computer for small to medium scale AI and IoT projects
   - Low to Medium Cost
3. Arduino https://www.arduino.cc/
   - CPU only, single-board computer for small to medium IoT projects
   - Low Cost
Software
4. Scratch https://scratch.mit.edu/
   - Easy to learn programming concept and understand application logic
   - Coding time consumption and not powerful for large application development
   - Not used by AI industry for real-world application development
5. Python https://www.python.org/
   - Take time to learn and need mature coding skill
   - Rich opensource libraries and frameworks available freely for AI development
   - The most popular programming language for AI development

Scoring Criteria

	Scoring Criteria		
1	Solution to problem	• How well the evaluation and reviews of the current potential solutions are discussed? (Knowledgeable) • How well does the solution resolve the problem? (Problem Solving Skill) • How relevant is the solution to the problem? (Critical Thinking) • What value can the solution add? (Business Insights)	20%
2	Innovation	• How innovative is the solution? (Innovation) • Any companies in the market have provided similar solutions? (Knowledgeable) • Traditional approach versus non-traditional approach? (Critical Thinking) • Has the solution applied any latest technologies in statistics, AI, and/or data science? (Knowledgeable)	20%
3	Commercialization	• Can the solution be commercialized practically (cost, timeline)? (Global Outlook) • How much commercial value can the solution bring (revenue)? (Business Insight)	20%
4	Design and Features	• How well has the solution leveraged the design? (Problem solving) • How good is the user experience in the application design? (Problem Solving)	40%

Roles & Responsibilities

Roles and Responsibilities	
HKU SAAS Data Science Lab, Department of Statistics and Actuarial Science, The University of Hong Kong (about the competition)	• Provide mentoring for students and companies on statistics, AI and data science programming, and innovative idea. • Provide 2 or 3 judges to serve on the judging panel. • Set up website for program competition and registration. • Print the award certificates. • Provide award certificates for winners. • Manage marketing and publications if any.
Teachers in high schools/universities/ industrial partners (sponsors/supporting organisations)	• Recommend robotic software to students or companies if known. • Provide technical trainings and consultations to students or companies if available. • Student or company recruitment and internal communications. • Market the competition event in campus, the company, or the association. • Provide souvenirs and/or company problems for the competition if any. • Manage marketing and publications if any.

Prizes

Prizes	
First prize	• Souvenir • Innovation and Business Insight Award Certificates
Second prize	• Souvenir • Global Outlook and Critical Thinker Award Certificates
Third prize	• Souvenir • Knowledgeable Award Certificates
Best Business Concept	• Souvenir • Problem Solver Award Certificates
Other groups	Team Spirit and Risk Taker Award Certificates

Contacts for Enquiry

| Contact for Enquiry	
HKU SAAS Data Science Lab, Department of Statistics and Actuarial Science, The University of Hong Kong (about the competition)	Contact Person: Dr Adela Lau Email: datasci@hku.hk Website: https://saasweb.hku.hk/datasci/competitions.php

List of Sponsors/Supporting Organizations

**StartmeupHK
Invest Hong Kong**
www.startmeup.hk

Kinth Technology Ltd
http://www.kinthtechnology.com

Marvel Digital Ai Limited
http://ai.marveldigital.com/
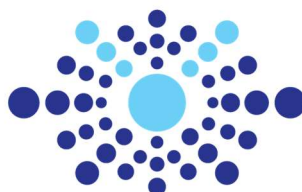
Vision Real Capital Limited
https://visionrealcapital.com

**Asian Financial Risk
Think Tank**
https://wemp.app/accounts/
7c3cc70a-86af-4b8b-bb31-
eed271a1281d

**OneNet (Risk Assessment,
Audit, Startups
Consultation, Training and
Solutions)**
https://onenet99.wixsite.com/onenet

**Academy of Professional
Certification**
https://apcaudit12.wixsite.com/apcert

Registration Form

Please submit the pre-registration/competition application by 28th Feb 2021 and 25th Apr 2021 respectively via the link of https://saasweb.hku.hk/datasci/register/. If you have questions, please email to Dr Adela Lau at email datasci@hku.hk. The business case and prototype submission deadlines are on 29th Aug 2021.

Requirement of Submission	
Number of Participates in Each Team:	2-4 people
Format of Project Report	Number of words: The business case writing should have minimum 2000 words (around 5 pages) and not more than 4000 words (around 8 pages). Case Writing Format: Chapter 1 Project Background (200-400 words) Chapter 2 Problems (100-200 words) Chapter 3 Current solutions and its limitations and why AI robotics vision and automation technology that can solve the problems and limitations (400 – 800 words) Chapter 4 Your proposed solutions (800 – 1600 words) Chapter 5 Conclusions (100 – 200 words) Chapter 6 Future work (400 – 800 words) Chapter 7 References and Acknowledgement (not count as the word count limits) Prototype Format: The python program and an AI robotic demonstration in YouTube (set as unlisted)
Pre-registration Deadline	Date: 28th Feb 2021
Competition Application Deadline	Date: 25th Apr 2021
Project presentation video record in YouTube (unlisted), and report submission:	Date: 29th Aug 2021 Submission: Email URL to Dr Adela Lau at datasci@hku.hk

Terms of Participation

PLEASE READ THESE TERMS OF PARTICIPATION CAREFULLY.

By participating in the Competition through submitting a Competition entry form, the participant/team shall be deemed to have accepted and agreed to be bound by all the Terms of Participation set out herein.

1a. The "AI Robotics Vision and Automation Technology Challenges Competition" ("the Competition") is organized by HKU SAAS Data Science Lab ("the Organizer") and sponsored/supported by a list of industrial partners that was stated in the competition website.

1b. The "solutions" to be submitted are defined as workable prototype, mobile or web applications. All entries should be accompanied by a proposed business concept write up with illustration(s) such as proposed business plan, possible business opportunity, market potential, estimated demand or revenue projection.

2. To enter the Competition, each participant shall submit their entry ("Competition entry" or "Competition entries" respectively) to Dr Adela Lau via email datasci@hku.hk. Each Competition entry must be submitted in digital format.

3. Each participant may be a team comprising of up to 2-4 individuals (reference to "Participant" shall be taken to mean the individual submitting an entry or the individuals comprising the team submitting an entry).

Competition Period

4. Competition entry submission begins on 28th February 2021 at hours EST time and ends on 1st Aug 2021. The Organizer reserves the right to extend the deadline of the Competition if required.

Eligibility

5. The Competition is open to all students in secondary school and university, and the companies.

Intellectual Property Rights

6a. Each participating team acknowledges that they are the sole author and owner of all rights, title and interest subsisting in their submitted Competition entries (including intellectual property rights) for the entries submitted.

6b. Each participant warrants that their submitted Competition entry is their original work and idea.

6c. Competition entries that do not fulfil the above criteria will be deemed ineligible and will be disqualified.

Publicity

7a. Each participant consents to the public disclosure of his/her name, photographs, and other details as submitted in the Competition entry form, as the case may be, for administering the Competition and for publicity purposes. Each participant consents to the use of any data provided by such participant for any

future publicity effort by the Organizer or by any third party acting on behalf of the Organizer, without any payment or compensation thereof. Such use includes, but is not limited to the following purposes:

- operating, administering and promoting the Competition;
- displaying the Participant's Competition entry on any media or community space; and
- for the issuing of any media release or media pitches with the Competition entries.

7b. If you refuse any one of the above terms, you need to inform Dr Adela Lau at email datasci@hku.hk by the competition application deadline.

Social Media integration

HKU SAAS Data Science Lab	- HKU Seminar - HKU SAAS Data Science website and the leaflet - Any social media and HKU's internet platforms used for marketing and promotion purposes
Sponsor/ Supporting Organisations	- Sponsor/supporting organisation's website - Social media