

AI in Education (New StartUp Collaboration for Innovative Entrepreneurship)  
AI-based Automation Exam Paper Marking System



By Prof G.S. Yin, Dr Eddy Lam, Dr Adela Lau, Dr Lequan, Mr Johnny Wan, Mr Zedric Cheung, Mr Raymond Chan  
(<https://dslab.saas.hku.hk>)



Figure 1 ITF Project Meeting with Mach Innovation at Hong Kong Science Park. From left to right: Dr Lequan Yu, Dr Adela Lau, Prof G.S. Yin, Dr Eddy Lam, Mr Johnny Wan, Mr Zedric Cheung, Mr Raymond Chan

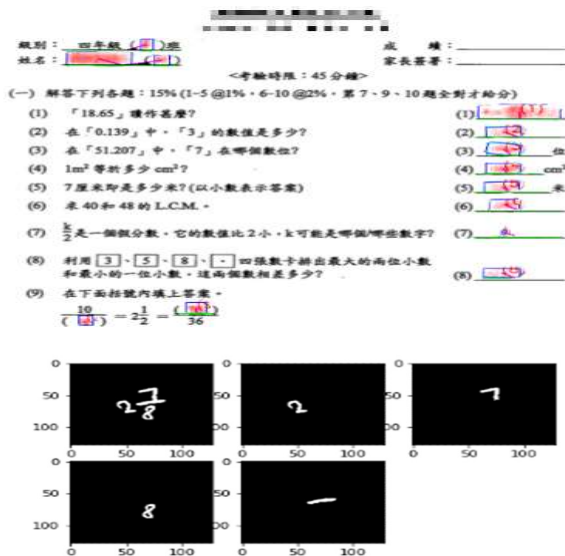


Figure 2 The result illustration for text boundary box detection (up) and text segmentation using deep learning algorithms (down)

*“Zedric and Raymond are graduates of HKU Master of Data Science and MSc in Computer Science, respectively. The three co-founders have different undergraduate backgrounds such as Economics and Finance, Mechanical and Automation Engineering. Mach Innovation applies the theories of science, technology, mathematics, and engineering to real practices and create innovation in their business. It is the ultimate goal of our STEMIP education,” said Prof. G.S. Yin, Head of HKU Department of Statistics and Actuarial Science.*

*“The Data Science Lab aims to nurture our graduates to be the research scientists and entrepreneurs. We provide mentorship, support and innovative development to current and graduated students, to equip them with the core competencies and qualities to become future great leaders, to make an impact and contribute back to the society,” said Dr Eddy Lam, Director of the HKU SAAS Data Science Lab.*

Mach Innovation is a modern AI and big data company that works with a group of professors in the HKU SAAS Data Science Lab. Its current product includes an AI-based automatic exam paper marking system that assists primary school teachers in marking the exam papers effectively and accurately. The challenges of making the scanned exam paper include image-to-text processing, boundary box detection, sentence-to-word segmentation, word recognition, word mapping and comparison. Although some existing AI models and natural language processing techniques can perform the above tasks, but there is a lack of trained AI models for mathematics and science subjects’ text and symbols.

Mach Innovation developed a new AI-based mathematics paper marking system for the schools. It used a novel model for image segmentation and recognition that can convert handwritten digits, symbols and letters into computer typed text which assists to mark the scanned exam papers automatically. The models used the cutting-edge deep learning models such as Xception, ResNet and UNet, and were trained with real handwriting data that were collected from the schools (see Figure 2 on the left column). The accuracy rate of the automatic marking is more than 97% for an end-to-end process.

In order to help teachers to better evaluate students’ performance and to accelerate their learning, Mach Innovation developed the outcome-based learning metrics and used a hierarchical clustering technique to classify and group the students with similar performance together for group-based personalised learning to boost up their learning efficiency. We have run a trial scheme with some of our school partners and will launch the system to their school phase by phase for final testing.

*“Mach Innovation uses an open platform for their business, and is engaging to work with a wide spectrum of professors and business partners. If any schools or parties are interested in our products, you are welcome to contact Mach Technology,” said Mr Johnny Wan, Zedric Cheung, and Raymond Chan, the founders of the Mach Innovation.*