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The Department of Information Systems at the City University of Hong Kong is ranked among the very best in the world. We are ranked in the top five globally for faculty members' publications in the top four information systems journals. At least five information systems faculty members at CityU are on the list of h-index for the leading Management Information Systems scholars compiled by The University of Arizona. Further, we have five faculty members on the 2020 and 2021 Stanford University lists of the top 2% most-cited scientists in the world (three are ranked in the top 1%).

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Stanford University List of Top 2% Scientists in the World



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Technological innovation and entrepreneurship boost Hong Kong's future

IS industry leaders virtual panel meeting

Interview by Professor Keng Leng Siau



KS – Keng Leng Siau
Head and Chair Professor of Information Systems, CityU



FY - Fanny Yuen
Managing Director, Financial Services, Accenture



PY - Peter Yan
CEO, Hong Kong Cyberport Management Company Limited



TC - Toa Charm
Former Chief Public Mission Officer, Hong Kong Cyberport Management Company Limited



ML - Michael Leung
Group Chief Executive Officer, BOA International Financial Group



EH - Eugene Hsia
Chief Corporate Development Officer, Hong Kong Science & Technology Parks Corporation

A virtual interview was conducted by **Professor Keng Leng Siau**, Department Head and Chair Professor of Information Systems, with a group of information systems industry leaders. The interview focused on technological innovation and entrepreneurship in Hong Kong and CityU. CityU has made great strides in this area, initiating HK Tech 300, its flagship innovation and entrepreneurship programme, and introducing HK TECH Tiger, a suite of exceptional programmes for high-flying students. Technological entrepreneurship is one of the focuses of the Department of Information Systems, and many students and alumni participate actively in the HK Tech 300 programme.

KS: What's your view on the technological entrepreneurship opportunities in Hong Kong?

FY: Hong Kong has tremendous opportunities for technological entrepreneurship. With the launch of virtual banks and new investment opportunities such as non-fungible tokens (NFTs), and also with the impact of the pandemic, people have become more digital than ever. The demand for customer-centric products and services, and the capacity for self-servicing are already flourishing in many industries.

PY: In recent years, Hong Kong policy addresses have increased

their focus on promoting innovation and technology (I&T), together with the development of the Greater Bay Area (GBA). With our country's support, I&T will become one of the new economic pillars of Hong Kong. The pandemic has reshaped the global economic landscape. FinTech has gone mainstream, virtual banks and insurers are commencing operations, and cashless payments are gaining popularity. WealthTech and robo-advisory solutions have been widely adopted, whilst RegTech has seen rapid growth. Innovation in FinTech has become essential for financial industries to continue thriving in this "new normal." Other areas such

as EdTech, HealthTech, GeronTech (to improve living standards for the elderly), and ArtTech can bring lots of opportunities.

TC: Technological entrepreneurship is definitely on the uptrend. We have around 4,000 startups, many of them high-quality. Arguably, 10+ unicorns have been born in the last five years. Large enterprises are putting more emphasis on intrapreneurship, corporate venture capital, and collaboration with startups. The innovation and technology ecosystem in Hong Kong is also becoming more mature with good support from the government, regulators, investors,

and universities. For both students and people working, there are lots of opportunities to pursue an entrepreneurship journey.

ML: Funding is perhaps one of the most critical challenges for tech startups and innovative businesses. Some local universities have started their incubation programmes. The “HK Tech 300” programme organised by CityU, for example, aims to create 300 tech startups amongst its students, alumni, staff members, and other associates in three years. It provides in stages \$100,000 seed fund, \$1million angel fund, and up to \$10 million external fund for aspiring entrepreneurs, as well as sponsored training to get started on the innovative journey. For the wider community, the Cyberport Creative Micro Fund (CCMF) and Cyberport Incubation Programme (CIP) offer generous financial support, from \$100,000 to \$1.2 million, to high-potential digital tech projects, early startups, as well as entrepreneurs looking for additional resources to accelerate their growth. On the industry side, a leading example is the “FinTech 2025” Strategy crafted by the banking regulator, the HKMA. The Chief Executive, in his election manifesto, emphasised the needs to attract and cultivate innovative talent, enhance Hong Kong’s overall competitiveness, and make the city a technological innovation hub connecting GBA to the world.

EH: Entrepreneurs create their own opportunities, usually

pursuing their passion and identifying problems that other people are not addressing. From our perspective, we’re seeing tremendous growth in biomedical technologies and artificial intelligence, as both standalone and combined disciplines. The technologies themselves are not as critical as the end applications. Proptech and Fintech are two of the biggest consumers of artificial intelligence. Advanced diagnostics and therapeutics in oncology and infectious diseases are accelerating at a tremendous rate.

KS: What are the key benefits and challenges of launching a tech startup in Hong Kong?

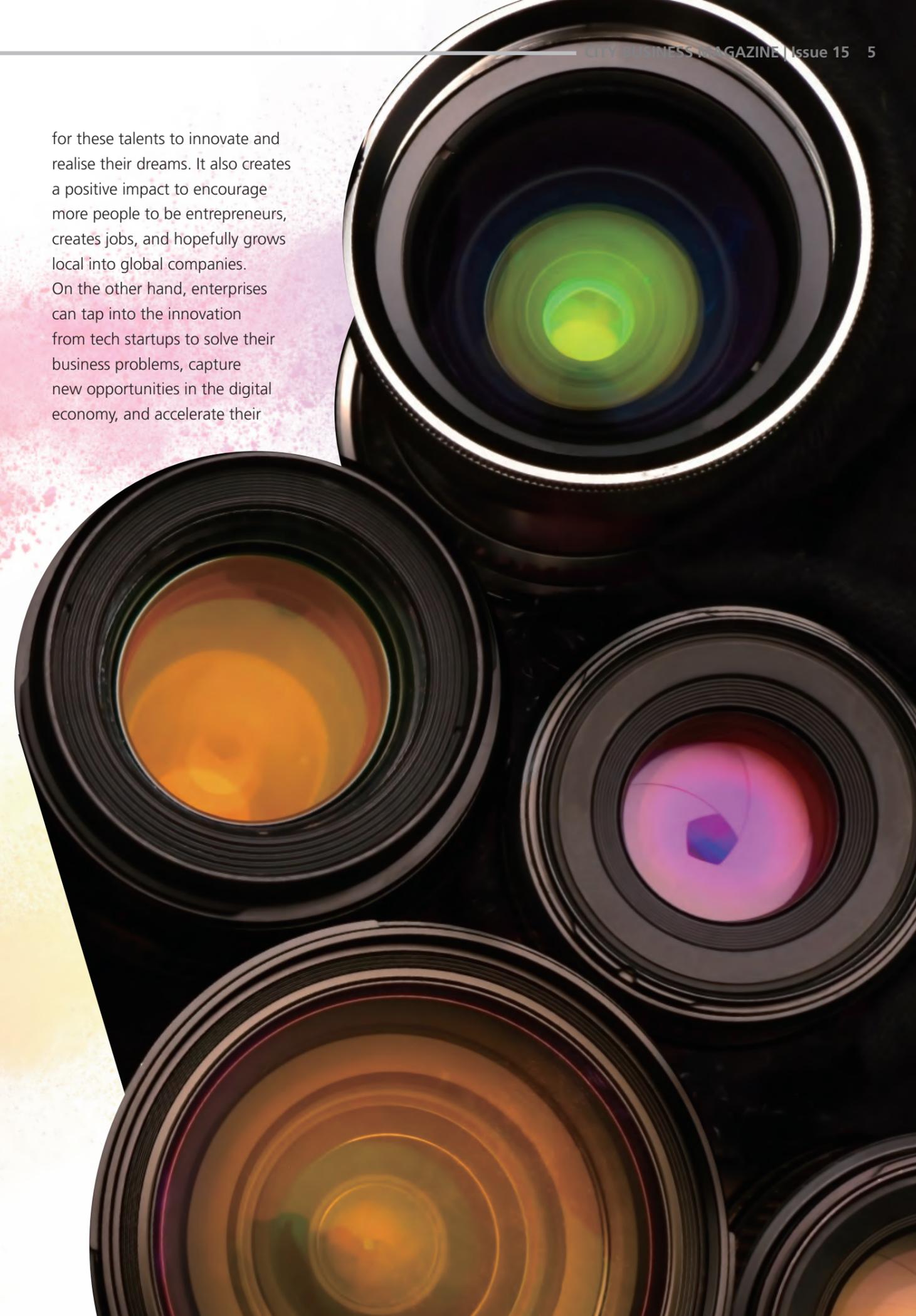
FY: The key benefits are location, being in the heart of Asia and being an integral part of the GBA. It’s easy for startups in Hong Kong to expand into both GBA and Asia Pacific. Also, being an international finance centre, Hong Kong’s tax and legal infrastructure provides a friendly environment for startups. Government support for innovation and the availability of venture funding are also important.

One of the key challenges is space – Hong Kong office rentals are expensive compared to other cities in the Asia Pacific region. Also, advisory support – startups require advice on their business plan, potential market size, and products/solutions. Ease of working with large enterprises is another issue. Large corporates will need to provide more support to adopt new service providers, including bank financing.

PY: The challenge is access to business support and resources. Entrepreneurs need business partners to facilitate commercialisation and testing. They need clients to place orders and then generate cash flow for the company. They might also need technical support during product development. Investors are essential to provide capital, while professional services providers can support companies in business development and governance. The government and Cyberport have been providing support to entrepreneurs so they can get the resources they need. A major benefit is the extensive international reach from a strategic Asia location. Hong Kong is the perfect connector between China and the rest of the world. And the city’s reputation as a global business hub and its robust economic ties with other ASEAN countries make it a great entry point for foreign investors looking for a stepping stone into Asia. Cyberport has signed MoUs in the GBA, and startups can tap resources and professional experience to accelerate access to mainland markets. Practical facilitation services range from company registration, legal and taxation, policy clarification, and business operations to talent recruitment and sourcing facilities.

TC: Benefits are twofold. On the one hand, startups gather a group of passionate talents to focus on solving a pain point and contribute to the enterprises as well as wider society. This gives a good space

for these talents to innovate and realise their dreams. It also creates a positive impact to encourage more people to be entrepreneurs, creates jobs, and hopefully grows local into global companies. On the other hand, enterprises can tap into the innovation from tech startups to solve their business problems, capture new opportunities in the digital economy, and accelerate their



digital transformation. Certainly, challenges are not easy to resolve: talent acquisition and retention, cash flow, fundraising, growing pains, collaboration with enterprises (e.g., compliance, data privacy, etc.), market expansion, etc.

ML: Many people in the startup and creative business communities lament the shortage of talent here in Hong Kong. The truth, I suppose, is that most youngsters are not confident enough to enter higher-risk startups due to reasons such as the high cost of living, so they'd rather go for jobs in more stable industries like banking and finance. Besides, many mainland graduates choose to return home for the ample opportunities there. While Hong Kong may be a great testbed for creative ideas and innovative products, as a city of 7 million people, it is not big enough for many successful startups to attain an economy of scale for sustainable growth. GBA, ASEAN, and other areas are definitely open frontiers, but startups will face severe competition as they strive to commercialise and localise their innovations for foreign markets.

EH: Hong Kong is diverse in terms of landscape, population mix, density, variety of industries, etc. – meaning that it is an optimal testbed for new ideas. If it works in Hong Kong, it will likely work elsewhere in the world with minimal modification. The GBA further extends the idea of “testbed,” offering a market ten

times the size of Hong Kong and serving as a fantastic entry to the mainland market. Hong Kong is also a springboard to the ASEAN markets. Hence, by combining GBA and ASEAN, Hong Kong is strategically placed to easily enable startups to grow regionally. Against that, the top three challenges for tech startups here currently are geopolitics, Covid, and the speed of regulatory support.

KS: Do you have any advice for tech startups in Hong Kong?

FY: Do more research on market and customer needs, market size, sustainability, and the ease of adopting and integrating the solutions.

PY: Co-creation with corporates has become increasingly popular in the I&T sector. Working closely with clients allows startups to better address their needs, and to get instant feedback in order to optimise their solutions. The FinTech PoC Subsidy Scheme is a perfect example of co-creation, with 93 projects approved in the first cohort. The government is actively promoting open data and Commercial Data Interchange (CDI). HKMA's Open API journey has arrived at phases 3 and 4. Utilising open data sources allows startups to explore business opportunities and test the feasibility of their solutions. Open APIs can help startups accelerate solutions development and focus on the core of those solutions.

TC: Customer-centric, focus, ecosystem, global mindset, and a core team are the critical success factors. Startups need to understand the real business problems of their target customers. Focus on an area for a start and do it better than anybody else. Produce a business plan and product roadmap for the next few years. Do market sizing properly. Engage with the innovation and technology ecosystem to build, grow and sustain your networks. A global mindset is also important. Can you find locations with business problems similar to those that you are working on? How can startups scale their innovation to these markets? Lastly, build a passionate, positive team with common purpose and value and tech/ business balance. The team also needs to have a “mastermind” of experienced advisors in business and tech areas.

ML: I would use the four-letter word “CORE”, as in “Core Competency”:

C: curiosity/ creativity/ courage/ commitment/ connection (or contact)
O: open-mind/ optimism/ opportunity/ objectivity
R: risk-taking/ resilience/ resolve/ resource/ result-orientation
E: energy/ enthusiasm/ empathy/ engagement

EH: Validate the market for your idea. Adopt a “First Principles” approach. Passion should be your primary driver. Work hard, really hard! Focus on having the best

quality, building the best team.

KS: What will be the next wave of innovation?

FY: Ecosystem partnership leveraging API, blockchain, and automation.

PY: AI and big data. More enterprises will realise that tonnes of data are generated in their daily operation. The development of IoT will enable further data collection. AI technology allows us to analyse these data and react quickly. Tremendous business opportunities can be discovered through this analysis. The metaverse will provide brand new experiences in gaming, entertainment, leisure, art & exhibitions, and conferences. As a leader in the entertainment and creative media industries, Hong Kong is well placed. Some Cyberport startups are exploring opportunities offered by the metaverse, for example, Animoca, OliveX, Nikopicto, etc. NFTs are best used for unique assets, which is perhaps why we hear a lot about their use in the art world. Other intangible assets such as patents, copyrights, trademarks, and other forms of intellectual property can also be turned into NFTs for rights protection and transactions.

TC: AI, big data, and machine learning have lots of innovations coming up. We are still in the “artificial narrow network” or weak AI stage. I am expecting a lot more innovation in human-machine collaboration in all industries and in

our homes as well. Metaverse has recently gained a lot of attention for a reason. Young people are early adopters, but it will go mainstream as the investment potential is very attractive. NFTs, asset tokenisation, cryptocurrency, etc., will be getting more popular. Blockchain will become as mainstream as the internet is today. On the other side of the coin, cybersecurity, RegTech, data privacy, and AI ethics will increase in importance. There are a lot more opportunities for tech startups in all these areas. All in all, there has been no better time for Hong Kong people to be a part of the innovation and technology ecosystem.

ML: In the information technology space, I believe the rapid increases in computing power, data storage, and network bandwidth will fuel the next wave of innovations, in what is commonly referred to as the “4th Industrial (or Intellectual?) Revolution.” In everyday life, we will see Web 4.0, including accelerated deployments of blockchain/ DLT, smart contracts, etc., in DeFi (Decentralised Finance), as well as advanced VR, AR, ER, and MR technologies in applications such as NFT and metaverse. This new generation of applications will respond to human emotion, sentiment, and privacy in interactive and immersive virtual environments in ways that we have never experienced before.

EH: It depends on whether it's “incremental” innovation or

“curve-jumping” innovation. Incremental innovations happen every day in every sector. It is very rare that we see curve-jumping innovations because they require tremendous tenacity to be successful.

KS: Is there anything else you would like to share with our readers?

ML: I have been the chair or a member of judging panels of many startup and innovation awards in the past few years. I am excited to see so many wonderful ideas and projects winning well-deserved prizes and funding support. Time and again, I saw some familiar faces coming back in front of me after a year or two, presenting yet another great idea and a new plan. I wholeheartedly admire their courage, creativity, and conviction. I look forward to seeing more young disruptors and entrepreneurs gathering their “CORE” spirits and strengths, and keeping Hong Kong a leading place for tech startups and innovative businesses for GBA and around the world. Keep trying, and we'll get there!

EH: There is nothing as difficult – or as rewarding – as being an entrepreneur. Before you start your own venture, make sure you have thoroughly studied the Dunning-Kruger effect. Understand where you are on the curve.

Ethical AI: Our future may depend on it

By Professor Keng Leng Siau

An earlier version of this article, "Artificial Intelligence (AI) Ethics: Ethics of AI and Ethical AI," with co-author Weiyu Wang, Missouri University of Science and Technology, was published in the *Journal of Database Management*, March 2020.

Artificial intelligence-based technology has already achieved many great things. Facial recognition, medical diagnosis, and self-driving cars spring to mind. AI promises enormous benefits for economic growth, social development, as well as human well-being and safety improvement. However, the low-level of explainability, data biases, data security, data privacy, and ethical problems of AI-based technology pose significant risks to users, developers, and society in general. Above all, as AI advances, a critical issue is how to address the associated ethical and moral challenges.

What should ethical AI look like? In the simplest form, we may define

an ethical AI as one that does no harm to humans. But, what is harm? What constitutes human rights? Many questions need to be answered before we can design and build ethical AI. Ethical sensitivity training is required to make good ethical decisions. In theory, AI should be developed to recognise ethical issues. If AI is capable of making decisions, how can we design and develop an AI system that is sensitive to ethical issues? Unfortunately, it is not easy to implement in practice or to realise. Long-term and sustained efforts are needed. Nonetheless, understanding and realising the importance of developing ethical AI and starting to work on it step by step are needed.

Corporations initiating ethics of AI

Many institutions, such as Google, IBM, Accenture, Microsoft, and Atomium-EISMD, have started working on formulating ethical principles to guide the development of AI. In November 2018, the Monetary Authority of Singapore (MAS), together with Microsoft and Amazon Web Services, launched the FEAT principles (i.e., fairness, ethics, accountability, and transparency) for the use of AI. Academics, practitioners, and policymakers are working together to widen the engagement to establish ethical principles for AI design, development, and use. Alongside the frameworks and principles, protective guardrails are needed to ensure ethical behaviors. Good governance is necessary

to enforce the implementation and adherence to those ethical principles, and a legal void is waiting to be filled by regulatory authorities. Either based on case law or accomplished via legislative and regulatory obligations, these legal and regulatory instruments will be critical to the good governance of AI, which helps to implement and enforce the ethics of AI to enable the development of ethical AI.

Regulation – governments and governance

To protect the public, the US has long enacted regulatory instruments, such as rules against discrimination, equal employment opportunity, the Health Insurance Portability and Accountability Act Title II, the Commercial Facial Recognition Privacy Act, and the Algorithmic Accountability Act. All these instruments would be useful in guiding the development of legal and regulatory policies and frameworks for AI ethics. In addition to the legal and government rules, self-regulation plays an important role. Communication and information disclosure can help society as a whole to ensure the development and deployment of ethical AI. Fostering discussion forums and publishing ethical guidelines by companies, industries, and policymakers can help educate and train the public in understanding the benefits of AI, and dispelling myths and misconceptions about AI. Besides,

having a better knowledge of legal frameworks on human rights, strengthening the sense of security, and understanding the ethical issues related to AI can foster trust in AI and enable the development of ethical AI.

Transforming AI into ethical agents

There are three potential ways to transform AI into ethical agents: train AI to be "implicit ethical agents," "explicit ethical agents," and "full ethical agents." Implicit ethical agents mean constraining the machine's actions to avoid unethical outcomes. Explicit ethical agents mean stating precisely what action is allowed and what is forbidden. Full ethical agents mean machines, as humans, have consciousness, intentionality, and free will. An implicit ethical agent can restrict the development of AI. An explicit ethical agent is currently getting the most attention and is considered to be more practical. A full ethical agent is still an R&D initiative, and one is not sure when this will become a reality. When realised, the way we treat an AI agent that has consciousness, moral sense, emotion, and feelings will be another ethical consideration. For instance, is it ethical to "kill" (shut down) an AI agent if it replaces human jobs or even endangers human lives? Is it ethical to deploy robots in a dangerous environment? These questions are intertwined with human ethics and moral values.

Embracing ethical AI

The President-elect of the European Commission made clear in her recently unveiled policy agenda that the cornerstone of the European AI plan will be to ensure that "AI made in Europe" is more ethical than AI made anywhere else in the world. US agencies such as the Department of Defense and the Department of Transportation have also launched initiatives to ensure the ethical use of AI within their respective domains. In China, the government-backed Beijing Academy of Artificial Intelligence has developed the Beijing AI Principles which rival those of other countries. The Chinese Association for Artificial Intelligence has also developed its own ethics guidelines. Many non-European countries, including the US, have signed on to the Organisation for Economic Co-operation and Development's (OECD) AI Principles that focus on "responsible stewardship of trustworthy AI."

Trade-off between AI ethics and AI advancement

Still, the makers and researchers of AI are most likely to pay attention to hard performance metrics, such as speed and reliability, or softer performance metrics, such as usability and customer satisfaction. Nebulous concepts like ethics are not yet the most urgent consideration – especially with the intense competition between companies and between nations. Further, some consumers may

pay lip service to AI. For example, among consumers who said they distrust the internet, only 12% report using technological tools, such as virtual private networks, to protect their data, according to a

worldwide Ipsos survey (CIGI-Ipsos, 2019). Instead, the most important factors influencing consumers' purchasing decisions are still price and quality. Right now, consumers care more about what AI can do rather than whether AI's actions are ethical. This situation may put companies and institutions that are developing AI in a trade-off situation – whether to focus on AI advancement to realise profit maximisation, or to focus on AI ethics to ensure societal benefits from AI innovations.

Future of humanity may depend on the ethical development of AI

Understanding and addressing ethical and moral issues related to AI is still in the infancy stage. AI ethics is not simply about “right or wrong,” “good or bad,” and “virtue and vice.” It is not even a problem that can be solved by a small group of people. However, ethical and moral issues related

to AI are critical and need to be discussed now. This article aims to call attention to the urgent need for various stakeholders to pay attention to the ethics and morality of AI agents. While attempting to formulate the ethics of AI to enable the development of ethical AI, we will also understand human ethics better, improve existing ethical principles, and enhance our interactions with AI agents in this AI age. AI ethics should be a central consideration in developing AI agents and not an afterthought. Our future depends on the correct development and implementation of AI ethics!

The original version of this article is available here:



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In search of alternative data

By Dr Alvin Leung

Dr Alvin Leung is Associate Professor at the Department of Information Systems where his research interests lie at the intersection of IS and Finance. Alvin's excellence in research and teaching work was recently recognised through his receiving the Innovative CityU-Learning Award 2021, Dean's Research Excellence Award, and The President's Award. Here he charts the way in which alternative data is giving us ever more precise views of corporate performance.

Conventional corporate financial data has historically provided investors with insights on past performance and prospects for the future. In the old days, such data was useful to investors particularly when business growth was relatively steady. Accounting statements showed the momentum of growth and to some extent foreshadowed future trends. However, in the modern era markets are more dynamic. The development of new technologies such as artificial intelligence and the advent of pandemics means business environments are full of uncertainty. Investors have begun to doubt whether records of past activities are an adequate guide to the future.

Alternative data for turbulent times

Fortunately, alternative data is emerging to give investors a fuller picture of corporate performance. These go beyond corporate filings, earnings releases, and fundamental datasets. They include various sources of non-financial data, which provide timely new signals to investors in understanding corporate performance. Such sources may include, web scraped data, geolocation data from mobile phones, and even weather forecasts¹. In times of turbulence, alternative data are more useful than conventional financial data.

From dot-com to data analytics

In the late 1990s investors were crazy for internet stocks.

Companies recruited many IT people and established websites with the hope of jumping onto the dot-com bandwagon. If investors simply relied on conventional financial data, it was hard to distinguish peaches from lemons among the numerous dot-com companies because stock markets were irrational and financial statements could not predict future trends. The failure to evaluate dot-com companies properly led to subsequent dot-com bubbles. The burst of dot-com bubbles made people think more carefully about whether we needed alternative data. Complementary to conventional financial data such as quarterly sales, number of offline stores, and number of employees, alternative data such as web visits,

number of unique visitors, length of stay on e-commerce websites, click-through rate of online advertisements, etc. were seen as increasingly useful to evaluate firm performance². With the emergence of data analytics, such kinds of data became easily accessible on web servers, and business intelligence tools made data analysis much easier and faster.

Variety, volume, velocity

Big data are released not just by firms, but come from various sources such as third-party e-commerce websites, suppliers, social media, and across the Internet of Things. Such data is characterised by the 3Vs of variety, volume, and velocity, and these days are abundant. The critical question is how and what data are useful for investors to evaluate corporate performance?

Exploiting search data

As a part of FinTech research, one research objective is to identify such alternative data and demonstrate their business value. We were among the first to explore

alternative data to understand investors' stock preferences³. The intuition came from the fact that people search before they transact. Search volume may reflect investors' intention to a stock⁴. By analysing co-search data from infomediaries such as Yahoo! Finance, it was possible to identify investors' collective preferences. The granularity of the co-search data was more precise than traditional transactional data from brokerage firms. And its timeliness provided infomediaries and brokerage firms opportunities to give suitable recommendations to investors based on their past search preferences.

The significance of co-movement

We also showed that co-search data could reveal investment habitats that demonstrate returns co-movement, that is stock returns moving in the same direction. Such habitats were first discovered by using conventional historical stock data. Current research shows that alternative data can achieve a more timely, precise, and granular analysis. Co-attention data also

reveals new business opportunities. By observing the amount of co-attention intensity among listed companies with economic linkages such as supplier-buyer relationships, we show that it is possible to use current partner stock returns to predict future returns of focal stocks if there is a lack of co-attention. The intuition comes from the slow information propagation among stocks with low volume of co-attention⁵. Therefore positive (or negative) events diffuse slowly among economically linked stocks, giving rise to opportunities for using partner stock returns to predict future stock returns of focal firms.

Social media increasingly important

So, knowing the economic linkages between the two companies allows us to develop a prediction model. If Intel announces huge sales in processors, we can foresee that Lenovo is likely to have positive earnings news because Intel is its major suppliers of processors. If Lenovo investors generally lack co-attention to Intel, Lenovo's stock returns may not rise immediately.

Instead, it appears some time later when Lenovo also makes positive earnings announcements. Co-attention volume is one important element of stock predictions. We also show that other alternative data such as reads, shares, comments, and news from social media play equally important roles⁶. Using the concept of eigenvector centrality, we develop a composite measure called Eigen Attention Centrality (EAC) to predict future stock returns. Note that EAC is an important model behind PageRank, which is a patented algorithm used by Google Search in their search engines. We find that EAC outperforms conventional financial data in prediction accuracy. The critical success factors lie in the diversity of data sources, not in co-attention volume alone. Furthermore, they show that social media play a more important role for information diffusion than conventional data such as financial news. Through discussion on social media, information flows become faster and the collective wisdom on social media make investors more judicious in investing.

The wisdom of crowds

Over time, we observe exponential growth in financial social media such as Seeking Alpha and StockTwits. They are important channels for investors to exchange ideas and develop collective intelligence, which is also known as the "wisdom of crowds." In the era of big data, there are numerous sources of alternative data. The implementation of 5G networks, the launch of Open API (Application Programming Interface) Framework released by the Hong Kong Monetary Authority, and the development of Hong Kong as a Smart City are all providing academic researchers and investors with new opportunities to exploit new sources of alternative data. In the near future, we expect more alternative data to come into existence to transform the business world. As the co-founder of Paypal, Max Levchin, said, "The world is now awash in data and we can see consumers in a lot clearer ways."

Note: The article is based on the papers "Network Analysis of Search Dynamics: The Case of Stock

Habitats" published in Management Science, "Cosearch Attention and Stock Return Predictability in Supply Chains" published in Information Systems Research, and "Developing a Composite Measure to Represent Information Flows in Networks: Evidence from a Stock Market" published in Information Systems Research.

Reference:



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Gamification attracts learners to Massive Open Online Courses

By Dr Alvin Leung, Dr Ron Kwok and Professor Wei Thoo Yue

The article is based on the paper "Could Gamification Designs Enhance Online Learning through Personalization? Lessons from a Field Experiment" by Dr Alvin Leung, Dr Ron Kwok and Professor Wei Thoo Yue at the Department of Information Systems, and their co-author Professor Radhika Santhanam from the University of Oklahoma.

Massive Open Online Courses (MOOCs) provide the general public with the convenience of acquiring new skills and knowledge on the internet. Different from traditional classroom teaching, students enjoy the freedom to learn at their own time, place, and pace with little or even no instructor intervention. They also have the flexibility to choose courses offered by different educational institutions via MOOC platforms (e.g., Coursera, edX, and Udacity), mostly free of charge. Class Central estimates that there were 220 million active MOOC learners in 2021 with over 950 universities offering around 19,400 courses and issuing 1,670 micro-credentials¹. Some universities even partner with MOOC providers. Arizona State University allows

learners to transfer the credits they earned in edX MOOCs for the first year of study in undergraduate programmes². The COVID-19 pandemic has amplified the growth of MOOCs even further. Due to travel restrictions and the inflexibility of face-to-face teaching and learning, MOOCs have significantly transformed students' style of online learning.

MOOC dropout rate alarmingly high

Despite so many advantages, do students really benefit from the flexible learning environment of such courses? Many technology-mediated learning (TML) studies show that the lack of instructor monitoring and peer interactions make students less motivated

to keep at their learning³⁻⁵. The dropout rate for MOOCs is alarmingly high, ranging from 91% to 93%⁶. The main reason for these high rates is a lack of self-regulated learning (SRL). According to Zimmerman (2000), SRL is a cyclical loop that regulates students' learning behaviour⁷. There are three phases of learning, namely, forethought (learners set their learning goals and plans), performance and volitional control (learners pay attention to their learning tasks and self-observe their learning progress to optimise their efforts), and self-reflection (learners reflect on and evaluate their learning progress against their goals)^{4,7}.

Self-regulated learning enhanced

Given that SRL is a key to success in MOOCs, how do we nurture it? Gamification, which advocates the use of game elements (e.g., virtual points, leaderboards, progress bars) in routine activities (e.g., learning and office works), is a possible solution. However, there are many failure cases of gamification in different scenarios including TML^{8,9}. It is generally believed that the one-size-fits-all design of gamification does not fit everyone. In the context of MOOCs, learners have their own learning goals; According to goal-orientation theory^{10,11}, the orientations can be classified into roughly three types, namely, mastery (i.e., developing competency by mastering challenging situations), performance-approach (i.e., seeking positive judgments by demonstrating one's superior performance), and performance-avoidance (i.e., avoiding negative judgements by evading one's inferior performance). Can we develop meaningful game design elements that can match learners' goal orientations, which in turn, help sustain learners' SRL?

Gamification improves learning experience

In our recent study, we demonstrate the importance of personalised gamification¹². We classify gamification into two dimensions, namely, message goal framing (i.e., framing a message either positively or negatively to learning goals) and

type of comparison (i.e., personal or social comparison of one's learning accomplishments against the goals). With the use of trace analytics, we objectively determine learners' actual learning behaviours, including SRL. Implementing a field experiment, we find that positive social gamification matches well for learners with high performance-approach goal orientation, whereas positive personal gamification is the best fit for learners with high performance-avoidance goal orientation to motivate them to engage in SRL. Furthermore, we find that learners with high mastery goal orientations are self-driven and do not require any gamification to help them sustain their SRL. On the contrary, some gamification designs may crowd out the intrinsic motivations of these learners. In particular, positive personal gamification significantly reduces learners' SRL. Furthermore, we show that SRL is the key to successful learning outcomes, which are measured by knowledge test performance and practical test skills.

Our research has significant implications in the design of personalised gamification to motivate unenthusiastic learners to learn in an environment without instructors. It also highlights an important message — a good match between gamification design and learner goal orientations is essential for fostering meaningful engagement and achieving effective learning outcomes in a MOOC environment. With appropriate use of gamification, it is possible to reduce the significant drop out rate from MOOCs and improve learners' overall learning experience.

References:



From Left:
Dr Alvin Leung, Associate Professor
Dr Ron Kwok, Associate Professor
Professor Wei Thoo Yue, Professor
 Department of Information Systems

Does Hong Kong need a cybersecurity law?

By Dr Tianjian Zhang

Dr Tianjian Zhang is an Assistant Professor in the Department of Information Systems. His research interests are in cybersecurity, fintech, and technology diffusion.

Cybersecurity and data privacy are clearly on the minds of many, from ordinary citizens who think twice before sharing their personal information on LeaveHomeSafe app, to government officials who have been calling for a comprehensive cybersecurity law in the city. Currently, there is no stand-alone cybersecurity law in Hong Kong. What we do have is the Personal Data (Privacy) Ordinance, which was first introduced in 1996, but this does not cover all circumstances where personal data is compromised online. Given the legislative vacuum, the wealth of personal data in Hong Kong's financial sectors, and the city's ambition to become Asia's data hub, it seems that a cybersecurity law is long overdue. However, before rushing to pass a Hong Kong version of the General Data Protection Regulation (GDPR), there are several aspects that legislators need to consider.

What would a cybersecurity law look like?

First, what would a cybersecurity law in Hong Kong look like? If it is anything like the General Data Protection Regulation (GDPR) enacted by the EU in 2016, it would require companies to be transparent about the collection and processing of personal data, minimise both the amount of data and the time during which the data are stored in the company, ensure the security of the data, and be legally accountable in case of a data breach. California has recently adopted a version similar to the GDPR (California Consumer Privacy Act). But there is no similar federal level law in the US. The most comprehensive cybersecurity law in the US addresses the accountability of data controllers. From 2002 to 2018, all 50 states in the US passed a security breach notification law (SBNL), which requires companies to notify consumers in cases of data breaches. Even then, so far there has been no success in making the state-

level SBNL into a federal-level law.

Security breach notification law or comprehensive cybersecurity law?

If Hong Kong were to embark on cybersecurity law, it appears some version of SBNL would face fewer legislative roadblocks than a comprehensive law like GDPR. Also, with the new National Security Law recently passed in the city, legislators would want to get a feel for public opinion before pursuing another broad legislative agenda. Given Hong Kong citizens' concern over personal privacy and the lack of trust in the government, a comprehensive cybersecurity law could be mistakenly viewed as an effort to monitor citizens, and look like an overreach by the local or even the central government. In contrast, a clear-cut SBNL which punishes companies in case of data breaches is much more straightforward and likely would be better received by the general

public. More importantly, it would more quickly achieve the intended goal of protecting ordinary citizens.

How does a SBNL work?

Second, we need to understand whether and how cybersecurity law can be effective in Hong Kong. Past studies have shown that SBNL can indeed reduce identity theft (Romanosky et al. 2011). These mandatory data breach disclosure laws put a potential legal and financial burden on companies if they fail to protect consumers' private data. Apart from dipping in the stock price after publicly disclosing a data breach, companies' reputations would also suffer along with losses in sales growth (Kamiya et al. 2021). With data breaches becoming more costly under the law, SBNL pushes companies to boost their cybersecurity infrastructure and related practices in order to minimise these incidents. For SBNL to be effective in a city like Hong Kong, it needs to clearly stipulate the scope of the law. If a local company loses overseas' consumer data, or a foreign country loses data locally, should both incidents be reported in Hong Kong? Given the limited scope of the city compared to a vast state or countries in the EU, it is perhaps more important to clarify these details early on in a Hong Kong's version of SBNL.

What is the downside?

Third, legislators should also consider the unintended consequences of cybersecurity laws. Given the stringent nature

of such laws, a well-intentioned legislation could slow down the digital transformation of the city.

Past studies have shown that privacy laws aiming to protect patients' personal data have ended up reducing the adoption rate of electronic medical records, which subsequently increased the infant mortality rate (Miller and Tucker 2011). Recent studies suggest that cybersecurity laws decrease the level of IT adoption in firms (Wang et al. 2019). This is possibly due to two reasons. First, companies that wish to engage in digital infrastructure investment will need to invest more in cybersecurity, given the new regulation. If the cost-benefit analysis shows that a digital project has become less profitable, companies may choose to abandon it. Second, given the severe shortage in cybersecurity talents, companies may not be able to gather enough cybersecurity expertise for a digital project, even if it makes economic sense. If either of the two disincentives emerges, cybersecurity laws could diminish the growth of digital transformation. Given the potential negative effect on IT adoption rates, IT service providers would enjoy fewer business opportunities. Consequently, it would take a toll on the employment of IT service providers. A study by my co-authors and I finds that SBNL has a (short-term) negative effort on employment in large IT service providers (Zhang et al. 2019). While we are hopeful that cybersecurity laws will have long-term benefits to the digital economy, it is crucial to

quantify the economic cost of the legislation.

Final thought

In a way, cybersecurity laws are like environmental protection laws — they protect the digital environment just as environmental laws protect the natural environment. In developing our economy, it is vital to ensure the quality of our air and water through mandatory protective legislation. In digital transformation, cybersecurity is ultimately necessary to ensure the healthy growth of the digital economy. It is worth noting that just as a Clean Air Act could diminish employment (Greenstone 2002), cybersecurity laws have been proven to have a similar downside. Given the clear trend in digitisation and data demand in Hong Kong, a cybersecurity law seems to be only a matter of time. We hope that by considering the type of cybersecurity law, its upsides and the downsides, legislators in Hong Kong can have a comprehensive picture when drawing a blueprint of the cybersecurity law of Hong Kong.

References



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Preparing students for the AI age

By Professor Keng Leng Siau

An earlier version of this article was published as "Education in the age of AI How will technology shape learning?" in The Global Analyst, March 2018.

Artificial Intelligence is threatening to replace massive numbers of jobs worldwide. A McKinsey Global Institute Report from 2017 estimates that by 2030, automation may displace between 400 million and 800 million individuals. These people will need to switch job categories and learn new skills. That is up to one-fifth of the global workforce!

The chief AI threat is to jobs with structured routines. An MIT report from 2020 finds that for every robot added per 1,000 workers in the US, wages decline by 0.42%, and the employment-to-population ratio goes down by 0.2 percentage points. As of 2020, about 400,000 jobs have been lost. Companies such as DHL and Pizza Hut are already experimenting with driverless trucks. In the past, technological advancement has consistently generated more new jobs than it destroys. Many are wondering if it will be the same this time.

Jobs such as telemarketers, retail salespersons, insurance underwriters, claims representatives, loan officers, credit analysts, bank tellers, truck drivers, fast-food cooks, and financial analysts are most likely going to be hit the worst. But jobs involving unstructured tasks will be harder to replace, for example, jobs related to merger of companies or professions such as psychiatrists and psychologists, where each case is unique.

Higher education is a legacy setup

How will higher education be impacted? Above all, students will need to learn skills that augment and complement AI. Competing directly with AI will be futile. Machines can compute faster, operate 24/7, and continuously improve (theoretically, in perpetuity). Although higher education has been evolving and updating curricula constantly, from many perspectives it is still archaic. The teaching materials, the way of evaluating students' performances,

and the boundary for theoretical knowledge and experiential learning are a legacy setup. These may need to change in the AI age.

Creativity is critical

Undoubtedly, a strong background in traditional hard skills such as writing, mathematics, and science still has its place in the academic and professional worlds. However, the new focus will be on soft skills such as creativity, problem-solving, collaboration, communication, interpersonal skills, leadership, empathy, and adaptability. These are becoming more critical as, for the moment, they are beyond the purview of most AI systems. It is, thus, important for higher education to help students develop these skills, which will require a complete analysis and revamp of existing curricula. Right now, soft skills are not generally the emphasis of the Science, Technology, Engineering, and Mathematics (STEM) disciplines and are more closely aligned with the focus of liberal arts and humanities degrees.

Another obvious impact of AI on higher education is likely to be enrollment. In many western countries, government funding for higher education is declining, and in the US, student loan interest rates are going up. Some are predicting that up to 50% of colleges in the US will collapse by 2030. In the future, liberal arts and humanities majors such as philosophy, psychology, sociology, and language literature may become popular as they are more "AI-proof." In short, the status quo in higher education is not an option. Higher education institutions must transform how and what they teach.

"Humanics" - the USP for humans?

A new academic discipline called human literacy or "humanics" has been proposed by Joseph Aoun to complement technological literacy and data literacy disciplines. Humanics builds on human strengths such as creativity, entrepreneurship, ethical thinking, and cultural agility to give humans a competitive edge over current AI. Technological literacy will enable students to appreciate and embrace technologies, and understand how

AI works. Data literacy, such as data analytics, should be an important skill students should learn in school. Companies will be looking for students with expertise in data analytics since this skill requires independent thinking, various data interpretation techniques, and analytical thinking. AI can do the computations but cannot easily interpret or understand the results.

Job for life: out Lifelong learning: in

With the expected replacement of many jobs by AI and the creation of new job categories, retraining and skills development will be needed to prepare displaced workers for new careers. A job for life is a thing of the past. Lifelong learning is the reality. To continue to succeed in the workplace, workers will need to constantly acquire new skills and knowledge. Higher education institutions must provide lifelong learning opportunities to their students and alumni to re-educate and retool. Workers may prefer employers over colleges for additional education, and this will provide new opportunities for higher education institutions to partner with companies and

organisations to provide retraining. Courses can be taken in modules that may be aggregated and count towards a certificate or degree. Online and distance courses can address the needs for retraining and skill enhancement for working professionals, and provide a less disruptive approach compared to on-campus education.

Surfing the age of AI

The AI age is going to be unsettling, transformative, and revolutionary. We will need to leverage and strengthen the traits that distinguish us from robots. One can either adapt and excel in the AI age or risk becoming redundant. Higher education has a critical role to play. As educators, we must rise to the challenge to prepare students for the AI revolution and enable them to successfully surf the AI age.



Professor Keng Leng Siau
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Unmasking the darknet

By Dr Xueyan Yin

Dr Xueyan Yin is an Assistant Professor at the Department of Information Systems where her research focuses on digital media data analytics such as multimedia content design, use of internet water army and game-based promotion strategy. She applies numerous research methods including machine learning and econometrics analysis and aims to pursue projects with high-societal and practical impact.

In recent years, cyber threat intelligence (CTI) has matured as an industry with a multitude of companies generating operational intelligence for their client firms to prevent potential attacks. Up until now, CTI has largely operated on the so called "darknet." This is a hidden network infrastructure that overlays the publicly available internet, and can only be accessed with specific software or communication protocols. Modern darknets such as Tor, I2P, and ZeroNet provide security, anonymity, and censorship-resistance by utilising multi-hop layers or Peer-to-Peer (P2P) networks.

Darknet services can serve illicit content

Darknet services serve both legal and illegal purposes. Most content is believed legal, including "clearnet" websites (e.g., BBC and Facebook) that provide darknet access to protect users from site blocking and network surveillance

and sharing of legal materials involving copyright infringement. However, Moore & Rid (2016) indicate that 29.7% of Tor darknet services serve illicit content, including drugs, finance, extremism, and hacking. These services are commonly in the form of blogs, sharing platforms, or discussion forums.

CTI is big business

Given the global increase in crippling cyberattacks, many organisations are considering adopting CTI. According to Mordor Intelligence, the CTI market was valued at USD 5.28 billion in 2020 and is expected to reach USD 13.9 billion by 2026. Through CTI, organisations can learn hackers' attack strategies and methodologies and deploy preventive approaches whilst building awareness and understanding of threat trends.

Where should CTI operate?

Regarding the scope of CTI, the first question that comes to mind is defining the data source. Everything that is publicly available and accessible via a search engines forms part of the surface web, and a lot of hacking content is available here. For example, hackers have extensively posted tutorials of their malicious tools on YouTube, allowing the content to be accessed worldwide. Companies should consider whether the contents of the surface web are already efficient in predicting real-world attacks. In other words, no need to go to the darknet community.

Is analysing text sufficient?

The second question is what kinds of data should be included? The CTI community has primarily focused

on analysing texts posted by hackers such as forum discussions and malicious product listings, and the social network structure among hackers. Descriptions of malicious product listings on darkNet marketplaces are studied to identify emerging cyber threats. Customer reviews of malicious product sellers are analysed to identify key hackers (Li 2014). Jargon in online hacker language is examined to better understand hacker communication (Benjamin 2015).

However, an emerging form of hacker communication, hacking videos, has been rarely analysed. Hackers are increasingly using videos to transmit hacking information and spread recruitment for hacktivist campaigns. The video format allows hackers to communicate procedures and

ideas more effectively than text-based communication and is particularly useful for hacking tutorials and soliciting hacking group members.

Hacking video needs to be analysed

Analysing hacking videos enriches the existing CTI by introducing hacking content (e.g., attack vectors and hacking campaigns) that is not available in the text-based hacker community content and social networks. The increasing presence of hacking videos, transmitted through traditional social media on the surface web to broad audiences, is having a profound impact on the cybersecurity landscape. Hack video on the surface web may better represent the contents on the darknet than text-based sources. As such, there is an urgent need for hacking video analytics to facilitate research into

understanding the role of hacking videos and developing CTI from these videos.

Cyberthreats in Hong Kong closely follow the global threat trend. Ransomware and cryptomining have been the two most common types of cyber threats over the past few years. Organisations based in Hong Kong can also benefit from building CTI which can improve an organisation's security protection and prevent data breaches.

References:



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In his own words

Interviewing Sunny Kok from Green Tomato

Interview by Eric Collins

Sunny Kok is the founder and CEO of Green Tomato Limited, a Hong Kong-based digital innovation consultancy which provides enterprise technology solutions to multinational clients. Here he talks about how the industry and his business have transformed over the past two decades. Sunny is a winner of College of Business Distinguished Alumni Award 2022.

Who are you?

I am a 100% "Made in Hong Kong product!" I can describe myself as a lucky guy because my dad got his own business when I was still a child. I remember the first time that I owned a computer, an "Apple II," in my primary school time and I even made my own mouse using a soap container. I was quite amazed about what a computer could do at that time. Then when I was in form 4/5 my father's business failed, and I had to work very hard for the exams, and finally landed a place in the CityU's BBA Information Systems.

Your first job?

After I graduated I found a job in

a very small company, only three people. I remember I needed to pick up my printer from home to take back to the office. My boss didn't have the budget to buy a printer and print the contract for me! After one year I met Johnny Wong and we formed what is nowadays called Green Tomato in 2003 and then I took over the CEO job in 2006.

Why Green Tomato?

"Green" stands for keeping fresh and ever-growing, and then "Tomato" for seasoning everyday life. So, you can find tomatoes in a western recipe or Chinese recipe, you can name it as a fruit or vegetable but whatever you call it, it is full of vitamins, and there are benefits to health and you can use it for seasoning in everyday life. So, when you put these two together it means we are an ever-growing tomato. Then in short form, GT meaning "Grow Together."

Your first breakthrough?

We founded Green Tomato and then we started to do the web on mobile and after the iPhone launch

in 2009, we did R&D on the apps. I think we were the first company to jump from web to mobile. We were just ten something people but the expansion was quite amazing because the App Store was launching. We launched three very early apps in the App Store in Hong Kong and one of them, Hong Kong Movie, is still very popular. And then our employee numbers jumped by a factor of ten.

What happened next?

Originally, we worked with app development, and we had collaborations with Apple Computers, even building apps for their internal use. Then we started to help our clients build the apps and this was the journey. After that we tried to invest in our own ecosystem in Hong Kong to provide a one-stop shop for the whole journey.

And nowadays?

We call ourselves a digital transformation consultancy. We have something like 400 people with offices in Hong Kong, China, Taiwan and Japan. We help our

clients from design and discovery phases, do the stakeholder interviews, identify the problems that they have, using the design thinking process, and then through development, testing and deployment. After we have invested in the business, we can enrich the journey.

How do you add value?

Say, we have some data company right now helping us. After launching the services, we help them to collect the data to enrich the user experience. Maybe we have some marketing leads that can help get more people to use the apps or the website by providing some online traffic to them. So, we try to live up to the name Green Tomato. We try to be ever-growing, to be fruitful, to give enough vitamins to our clients. This is our nature and we work hand-in-hand with our clients to co-create products. Of course, in this process the clients teach us their own expertise. Many are multinationals in areas like banking, finance, insurance. If you ask me the detail about their vertical domain, of course, I'm not



▲ GT Group new office grand opening

the expert. We are the technical arm that is helping them. We try to use agile methodology to work hand-in-hand to develop something new and the ultimate goal is to bring impactful experience to the world.

The current generation?

I think they are luckier than us because information is everywhere. I've got friends who have learnt diving and cooking through YouTube. In our generation we only had books. These days many have a self-growing mindset. Our time was a little bit harsher, and therefore perhaps we struck harder. When I was starting out, I learnt from my boss. Now never! You will hear: "Please go on to YouTube and take a look."

How are you changing?

The new generation has much more experience in areas like the metaverse. I try my best to understand, really hard, but they

just tell me "It's something like the game I am playing, and wearing the glasses is so cool." But I feel a little bit old, so I really need to learn from them. Young people are much more willing to learn, and can teach me a lot of things.

Is the Pandemic a boost?

Yes, definitely, because everyone is looking online. But we also have our own challenges to face. Like, how can we work securely from home serving clients such as banks? The pandemic is something that we cannot avoid. We have to develop a new type of management. Right now, me and my team have a chat room always open. Every morning at 10 we start by saying good morning. If you think you need me to cheer up or maybe if you need to chat, just click in and then you will find me sitting here. This is not a possible in a physical office because I need to walk around the whole office. We have to accept the pandemic in a wider way, in a

cleverer way, and change with it.

So, back to the office?

Yes, our office has a very beautiful swimming pool! Seriously, yes, that's the place where we normally mingle, and also where the clients have some project teams. There's more warmth. You can feel the temperature, the people, the conversation. Also in this pandemic a lot of people find it is impossible to work from home. You know in Hong Kong the flats are so small. So even in this situation they like to go into the office and they are welcome. We try to give our colleagues the feeling of home. Just make sure they protect themselves.

The next big thing?

Everyone is talking about the metaverse. I don't know if it is true, my comment is wait until they've got a very good hardware, not the goggles. And IoT is another big thing – you can see all the vehicles on internet. Then definitely we have

a small team trying to understand more about the cryptocurrency about the blockchain thing, and also about some of the NFT stuff. You know blockchain was not originally designed for trading. It was about saving resources or the steps that we need to encounter when maybe selling out flats. So, we try to twist it back to the use that it should have.

A less digital future?

Oh yes. I always welcome the sun shining on my face and no mobile on. But I think I can't live without the internet! I have friends who are moving to Lantau island and have their own cows to produce milk. But seems like I would rather go



▲ Sunny (right) shares his story at CityU HK TECH Tiger Welcoming Ceremony 2021

online to order my meal, because it really is more convenient than doing all that stuff by ourselves. We wanted to send a little gift to our 400 employees. How did we do it? GOGO Van.

In 5 years' time?

I hope I can have an internship opportunity. I am trying to find a new boss to take care of me. It implies that the company can self-grow. If Accenture would like to hire me I would go. Basically, I can't figure out how these big companies manage more than 100,000 people. That is a mystery to me. I would like to learn from them that the system that they are building, how to measure the efficiencies.

All of this at the moment is trial and error without any references. I just want to be a small person in a big company and then feel the expectation and the experience that I have.

Advice to students?

In our company we have a value called **GREAT**. **G**rowth, **R**esponsibility, **E**xcellence **A**mbition, **T**eamwork. This stands for mindset changing, not hard skills. Hard skills you can reach easily in this information-rich world. But I am always thinking of growth, and how to get equipped with an entrepreneurial mindset.

Team building and staff activities at Green Tomato



When global systems don't fit local realities, employees may resist and find other ways to get their work done!

By Professor Robert Davison



Corporate policy often requires that employees use specific IT applications regardless of whether those applications actually fit employees' needs. If the fit is not good, employees may choose to work around those aspects of the IT that they deem inadequate, particularly if non-compliant applications provide greater capability to support their work. We investigated how employees in the Hong Kong warehouse of a global retail firm, which we call Scatex (with 200,000 employees worldwide), coordinate their efforts to develop and maintain workarounds that are not compliant with corporate policy, yet which are essential for performing work efficiently and for producing effective outcomes, including satisfying customers. At the time of the research (in mid-2018), the employees had developed, applied and fine tuned these workarounds for 18 months.

The software that the employees worked around is Microsoft's Navision, an enterprise system that is used to manage a variety of working processes, such as order and inventory management, inbound shipping (from suppliers) and outbound shipping (to customers). We learnt that the implementation was severely delayed because the local management office had long argued that unique characteristics of the local environment had a poor fit with Navision. These objections were acknowledged by Scatex's global ERP project team, yet were not addressed in the initial phase of Navision implementation.

We interviewed 31 employees in the warehouse at all levels (from warehouse manager downwards) and asked them to describe their work, explain the role of Navision in this work, describe problems that they encountered with Navision, before moving on to the workarounds that they used to resolve those problems. Their responses revealed extensive workaround behaviour and a singular reliance on Microsoft Excel in place of Navision. They explained that Navision did not include the functionality to perform certain tasks, so they used Excel to do so. For instance, inventory control staff extracted data from Navision, then manipulated it with Excel in order to pick and pack customer orders before delivery. Meanwhile, customer delivery staff extracted data from Navision, manipulated it with an Excel plan for delivery and created a delivery list for the outsourced delivery contractors. The warehouse manager estimated that 30-40% of processes required workarounds.

It was notable that employees coordinated the workarounds carefully for quality and reliability. They developed a training manual for workarounds with standard operating procedures. The workarounds are expected to persist indefinitely as Scatex indicated that customisation of Navision is not an option. Finally, the workarounds were developed "in full view," without any attempt to conceal them.

Read the full paper:



How buyers consolidate product recommendations from various online sources

Expert opinion paired with recommendation agent more influential in buyers' product choice decisions

By Dr David Xu

In recent years, e-commerce has continued to proliferate, and a large number of product choices are available online. A lot of people aren't just looking at reviews, or expert opinions alone. Websites are increasingly providing product recommendations from multiple sources to help their customers reduce product uncertainty and choose a suitable product from a wide variety of alternatives. Remarkably, there hasn't been much research into this very real-world behaviour.

This study evaluates an increasingly common behaviour, people seeking recommendations from multiple sources, and explains how and why people integrate these different sources to make product choices. What recommendation source or sources combined has a greater influence on shoppers' purchase decisions? Opinions from fellow consumers, product experts who possess recognised product knowledge and provide objective product opinions, or online recommendation agents (RAs) that assist online shoppers by eliciting their product preferences and making product recommendations that satisfy such preferences?

Product recommended by more sources the better?

The traditional belief is that shoppers would pick a product that is recommended by a greater (vs. lesser) number of recommendation sources. Through three online experiments with over 800 participants from North America, we challenge this belief and point out that it is based on how many dimensions of product uncertainty (fit, description, and performance uncertainties) are best reduced collectively by these recommendation sources.

Expert opinion paired with recommendation agent more influential

The convergent recommendations of RA and experts triumph over others and are comparable to convergent recommendations among all three sources. The reason is that RAs best reduce product fit uncertainty, and experts best reduce product description and performance uncertainties. Experts and RAs complement each other by reducing all three dimensions of product uncertainty. The recommendation convergence between RAs and experts leads to the greater

acceptance of the jointly recommended tablet products. This convergence was greater than that between experts and consumers, between RAs and consumers, or the recommendations from any single source.

Those online merchants that can implement only two sources due to resource or budget constraints must incorporate RAs and experts into their websites, as they play complementary roles in reducing product uncertainty. The present study's findings are relevant to practitioners who sell search products, such as electronic products (e.g., laptops, and TVs), office stationery (e.g., printers), and home appliances (e.g., dishwashers and refrigerators).

Incorporate more sources into e-commerce websites

As one practical implication, online merchants are advised to incorporate multiple sources into their websites, as about 80% of the participants in the study tend to access two or three recommendation sources. Hence, providing only one source may result in losing customers.

Integration of multiple sources into one website offers several benefits. First, online shoppers make an informed decision by having different points of view that help them understand the different choices available. Second, shoppers can save the trouble of searching on multiple external websites and appreciate the groundwork that website owners do for online shoppers to facilitate their product choice selection.

Solicit experts only from reputable channels

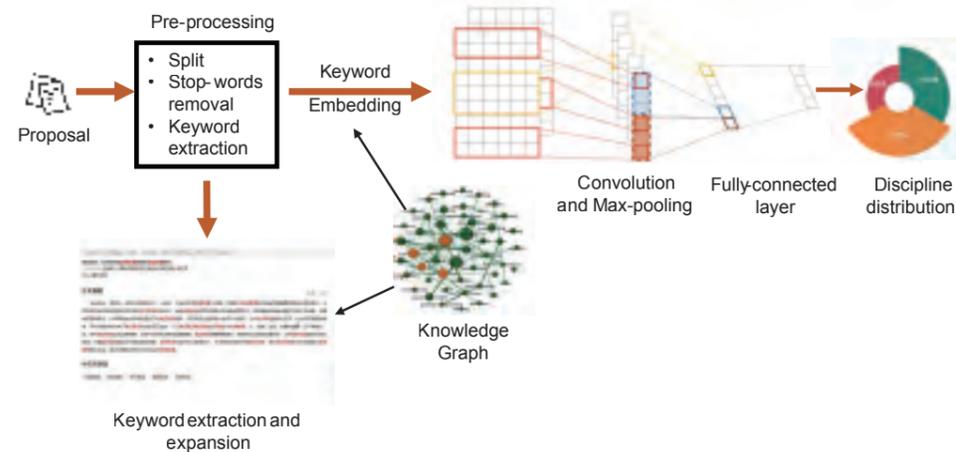
The other implication for e-commerce merchants is that experts should be solicited from publicly available and reputable channels such as CNET and Consumer Reports to make the expert recommendations valuable. They are less biased towards the website. Self-appointed experts may be perceived to have affiliation with websites and be biased. Hence, a website should avoid appointing private experts or training its own staff to be experts.

Read the full paper:



An AI approach to extreme labeled scientific text classification

By Professor Jian Ma



Extreme labeled scientific text classification is an important and challenging task in research management and technology transfers. Based on the practical needs in research and innovation, we have proposed an artificial intelligent (AI) approach to assist users in classifying scientific text (e.g., research projects, papers and patents) into extreme labels (e.g., 1,000 discipline area codes).

As shown in the above Figure, the proposed AI approach uses research knowledge graph, natural language processing (NLP) and deep learning methods to classify scientific text with extreme multi-labels in the following steps.

1. Knowledge graph construction. A research knowledge graph is constructed based on over 70 million scientific text (i.e., funded projects and research papers with titles, abstracts and disciplines/ keywords,) the relationships between research entities (e.g., researchers, projects, papers, disciplines and keywords) are mined and extracted, including the co-occurrence relationship between keywords, the collaboration and citation networks among researchers, the affiliation with projects and publications, etc.
2. Text preprocessing and keyword extraction. An English-Chinese bilingual natural language process tool is developed and used to conduct word segmentation, stop word filtering, and keyword extraction to generate the important keyword on a given scientific text.
3. Keyword embedding based on research knowledge graph. The keyword co-occurrence network is used to learn the word embedding with the method of graph

representation, where the trained word embedding is used to represent the keywords in the target text.

4. Text classification based on convolutional neural networks. The word embedding of the target text can be inputted into the neural network. The neural network model of TextCNN is employed to extract the scientific text features. The neural network parameters is trained based on the scientific text with discipline codes.

Using over 100,000 scientific text (e.g., projects and publications) with labeled discipline code classifications, we have conducted experiments to evaluate the performance of scientific text classification in terms of three evaluation metrics, i.e., precision, recall, and F1-score. The experiment results have shown that the proposed approach is superior to the current methods of TF-IDF, KNN, SVM, LSTM, etc. The proposed method can find wide applications in research management and technology transfers.

Funded by the National Science Foundation of China (NSFC), the project team have applied the proposed AI approach to solve the peer reviewer assignment problem, where both research proposals and reviewers are classified into detailed research discipline codes (over 1,000 discipline codes in NSFC) so as to maximise the research similarities under the same discipline area.

Funded by the Shenzhen Hong Kong Innovation and Technology Fund, the project team is also applying the proposed AI approach to classify patents and companies into detailed industry sectors so as to match their expertise for technology transfers.

Comings & Goings

We welcome our new faculty who joined CB between March 2021 and February 2022.

Department of Accountancy

Dr Jin Kyung Choi
Assistant Professor



Dr Oleg Kiriukhin
Assistant Professor



Dr Jing Wen
Assistant Professor



Dr Kelvin Yeung
Assistant Professor



Department of Economics & Finance

Dr Huiwen Lai
Associate Professor



Dr Ran Duan
Assistant Professor



Department of Information Systems

Dr Le Wang
Assistant Professor



Dr Cenying Yang
Assistant Professor



Dr Zhou Zhou
Assistant Professor



Department of Management

Dr Dong Hyun Shin
Assistant Professor



Dr Shi Tang
Assistant Professor



Dr Junhyok Yim
Assistant Professor



Department of Management Sciences

Dr Chi-wing Chu
Assistant Professor



Dr Menglong Li
Assistant Professor



Department of Marketing

Dr Jinjie Chen
Assistant Professor



Dr Jun Hyun Ryoo
Assistant Professor



Dr Minkyu Shin
Assistant Professor



Dr Camilla Eunyoung Song
Assistant Professor



Dr Zibin Xu
Assistant Professor



We extend our best wishes for future happiness, professional fulfilment and prosperity to faculty who left us between March 2021 and February 2022.

Department of Accountancy

Dr Yuyan Guan
Associate Professor

Dr Eunhee Kim
Assistant Professor

Dr Jingjing Xia
Assistant Professor

Department of Management

Professor Haibin Yang
Professor

Dr Paul Steven Hempel
Associate Professor

Dr Catherine Lam
Associate Professor

Dr Kyoung Yong Kim
Assistant Professor

Dr Shipeng Yan
Assistant Professor

Dr Melody Zhang
Assistant Professor

Department of Economics & Finance

Professor Yin-wong Cheung
Chair Professor

Dr Yongjin Kim
Assistant Professor

Dr Wei Ming Lee
Assistant Professor

Dr Jinyue Li
Assistant Professor

Dr Guannan Luo
Assistant Professor

Dr Ji Yan
Assistant Professor

Department of Management Sciences

Dr Siu-keung Tse
Associate Professor

Dr Cheuk-key Ng
Assistant Professor

Department of Marketing

Professor Wenyu Dou
Professor

Dr Maggie Dong
Associate Professor

Department of Information Systems

Professor Yulin Fang
Professor

Dr Alan Zhang
Assistant Professor

Dr Xi Li
Assistant Professor

Dr Jung Ju Yu
Assistant Professor

NEWS

Professor Stephen Shum wins Decision Sciences Journal Best Paper Award



Professor Stephen Shum and his co-authors Tao Zhang, Gang Li and T.C. Edwin Cheng, received the Best Paper Award at the Decision Sciences Institute 2021 Annual Conference. Their winning

paper, titled "Consumer Inter-Product Showrooming and Information Service Provision in an Omni-Channel Supply Chain," was published in the Decision Sciences Journal in October 2020.

In their research, Professor Shum and his co-authors, develop a theoretical model to investigate consumer inter-product showrooming (inter-SR) behavior and the information service provision in an omni-channel supply chain. This is the behavior of inspecting one product offline but buying a different or related product online, is critical to firms' decisions.

"I am honoured to receive the award. I am thankful to the College and the Department of Management Sciences which provide a resourceful and supportive environment for knowledge exchange and research excellence," said Professor Shum.

Professor Shum was born in Hong Kong, and had primary and secondary education in the city. He received his PhD in Operations Research from MIT. He conducts research in supply chain management, revenue management and the operations-marketing interface, and he teaches courses in operations management and revenue management. He has received RGC GRF grant for numerous research projects. He was awarded the Dean's Research Excellence Award in 2019 and the College of Business Teaching Excellence Award in 2020. He is also the Associate Dean (Research and Faculty) of the College.

CityU team triumphs in PMI Hong Kong Chapter Project Management Case Competition

"Smart People Consulting", a team of six CityU Business students, won the Best Project Award in the PMI Hong Kong Chapter Project Management Case Competition 2021-2022.

The competition was organised by the Project Management Institute (PMI) Hong Kong, with 300 students from nine local universities entering the competition and attending training sessions in December 2021 and January 2022. Then, 178 students formed 36 teams and submitted project proposals and project plans, as well as reflections on how they applied project management skills to manage the competition project. Eventually, eight teams, including three from the CityU College of Business, were shortlisted to present their projects to a panel of six judges in April 2022.

Smart People Consulting from CityU impressed the judges with the effective use of project management skills and

knowledge. Members of the winning team include:

Marco Chan, BBA Information Management
Tony Chong, BBA Accountancy
Chloe Choy, BBA Finance
Natalie Ling, BBA Business Economics
Christy Ma, BBA Accountancy
Kammy Wong, BBA Marketing

Team leader Natalie said, "This was a really valuable experience. It gave me the chance to lead a team using project management tools that I learnt in earlier workshops. I'd like to say a big Thank You to all team members who overcame challenges with effective communication and teamwork."

The team will be presented the award at the PMI Hong Kong Chapter Annual Congress 2022.

College of Business Distinguished Alumni Award 2022

The College is pleased to announce the results of the College of Business Distinguished Alumni Award 2022, which recognises the outstanding achievements and contributions of our distinguished alumni to their professions, the University, and wider society.

The three award winners for 2022 are:

- **Mr Sunny KOK Ping-kam**
BA Information Systems, 1995
- **Dr Rajeev CHIB**
Doctor of Business Administration, 2020
- **Dr Stan HO Ho-ming**
Doctor of Business Administration, 2016



Mr Sunny Kok is the Chief Executive Officer of Green Tomato Limited, which has created award-winning applications, including Hong Kong Movie, Hong Kong's largest movie community, and Talkbox, the world's first voice messenger. Since its establishment in 2003, GreenTomato has delivered over 800 mobile apps and web services, and has achieved over 50 local and global awards including Computerworld's Tech Company of the Year in Hong Kong, Red Herring's Global 100 and Red Herring's Asia 100 company awards, Asia Pacific ICT Alliance's grand award, the Gold Award at the Hong Kong ICT Awards, amongst others. With over twenty years of experience in internet, mobile internet and mobile application development in Hong Kong, the PRC and the Asia-Pacific region, Mr Kok continues to champion innovative approaches to business processes. Mr Kok holds a BA in Information Systems from CityU. He is the Vice Chairman of Hong Kong Wireless Technology Industry Association and was an awardee in the Capital Leaders of Excellence Awards 2013.



Dr Rajeev Chib is a leading capital markets professional with 27 years international experience with preeminent banks based in Hong Kong, New York and Toronto. He is the Asia COO - Financial Institutions Sales & Solutions at Citi based in Hong Kong. Dr Chib is a passionate advocate for responsible finance, ESG, and diversity & talent. He is the Co-Chair of the COO Markets committee at Asia Securities Industry & Financial Markets Association, and is engaged with several industry associations including the FinTech Association of Hong Kong, Canadian Chamber of Commerce and various ESG and Citi Talent related task forces. He is also involved with several mentorship programmes. Dr Chib holds a BSc in Quantitative Economics and an Executive MBA from the University of Toronto, and received a DBA from CityU in Organizational Behaviour and Leadership in October 2020.



Dr Stan Ho is the Chief Executive Officer, Executive Director and Responsible Officer for Lianhe Ratings Global Limited, the international subsidiary of one of the two major Chinese credit rating agencies. Dr Ho is an experienced investment banking and credit rating expert, with equity capital market and corporate finance experience in Credit Suisse, Merrill Lynch and Bear Stearns. Dr Ho has extensive green finance and certification experience. He is involved in the rating of green and sustainable bonds issued by various Chinese issuers in the international capital market. He is also the Green Finance Certification Scheme Technical Committee Member of the Hong Kong Quality Assurance Agency, and the Green Finance and Sustainability Subject Advisory Panel Member at the Hong Kong Institute of Bankers. Dr Ho is an EMBA Adjunct Professor at CityU. Dr Ho graduated with a BBA in Information Systems at The Hong Kong University of Science and Technology, an MBA from the University of Cambridge, and DBA from CityU.

Alumni class notes

Share your news with classmates and CB alumni! Tell us about the highlights of your year – family, career, accomplishments, and interests. We will publish your updates in the “Alumni class notes” section of City Business Magazine and on the CB website.



Hilda Lau

BBA Accountancy 2010

Hi all CB Alumni! I'm currently pursuing master's studies in Toronto after 10 years of extensive financial planning & analysis in various multi-national companies (Adidas, Ralph Lauren etc). I would say you're never too old for things that you want to achieve. Nice meeting you all and hope all of you stay safe and peaceful.



Tommy Leung

BBA Information Systems 2012

After spending a few years in London and completing my MBA, I have decided to move back to Hong Kong to accelerate my career, shifting from the traditional capital markets to work on fintech strategy as a Vice President at J.P. Morgan. Although the time in the UK, not only working in London but also studying in Cambridge, was incredibly amazing, life eventually came to a point of wanting to take a step forward albeit without a solid life plan. My take on the move is never to fix yourself into the plan but to be agile to live with the plan that is best for you at the moment. Be prepared and be agile to live in a fast-growing world.



Katrina Li

BBA Accountancy 2018

皆さん、こんにちは！私は晴美です。I graduated from the Department of Accountancy with a minor in Japanese studies. I used to be an auditor working in a Big Four firm and have now switched my field to taxation in another Big Four. Since the peak tax season has not yet arrived, recently I have been catching up on my Japanese studies during Covid-19 time by watching Japanese dramas and writing short articles in Japanese. (I really missed the days studying Japanese at CityU with Kobe Chan Sensei, Keiko Sensei and Heidi Law Sensei!) In my spare time, I also do product trials and post product reviews on my Instagram. Please feel free to check out my public ig account: katrina_kt0218 and show some support! If you are also obsessed with Japanese Culture, welcome to chat and share the happiness with me.



Ben Lam

EMBA 2021

Recently I have been taking on new challenges at work. I became the first COO of Hyakunousha International Limited (華御結). Also, this summer, I was appointed as a part-time lecturer in the MSc Marketing programme at CityU, responsible for Strategic Retail Management.

Since last year, I have been fortunate enough to be involved in music creation as a lyricist for TV shows and pop songs. I wrote the lyrics for the Hong Kong Open TV show Where Does She Go? (姐姐去哪兒) under the pseudonym Heyben. In the future, everyone will hear my works in major media.

Joyce Yeung

EMBA 2022

After graduating in Canada, I came back to Hong Kong to start my career in the banking industry. I served several institutions including banks, insurance institutions as fund accountant, management accountant and FP&A analyst etc., and covered businesses such as trustee, retail lending, retail banking and corporate banking. I selected CityU EMBA programme, because of its compact classes which allowed me to meet leaders in different industries and become a member of a close-knit group of learning partners.

I would like to give my deepest thanks to Dr John Leung and Dr Michael Wong for offering me the opportunity to be a member of the CityU EMBA family; and my family for their constant support and backup.

