



**Artificial Intelligence in Finance**  
*at*  
**Hong Kong University of Science and Technology**

Course Schedule				
Session	Date	Topic	Application & Case Study	In-Class Activity
1	Feb 1	– History and Overview of Artificial Intelligence	– Google Experiments: Draw!	– Kahoot
2	Feb 15	– Supervised & Unsupervised Learning	– Google Experiments: Vision Sensing – <a href="#">Case study: HireVue (Video Analytics for Recruitment)</a>	– Class survey and group formation – Kahoot
3	Feb 22	– Classification vs. Regression – Model Assessment and Selection	– Chatbots – <a href="#">Case study: WorkFusion (Robotic Process Automation)</a>	– Kahoot
4	Mar 1	– Decision Trees and Random Forests – Support Vector Machines	– Credit analysis – Case study: Clover (Temporal Unfolding)	– Kahoot
5	Mar 8	– Neural Network – Deep Learning Introduction	– TensorFlow Neural Network Playground	– Kahoot
6	Mar 15	– Practitioners' Perspectives – Independent Consultation for Projects	– Slido Q&A	– Sharing from researchers and industry professionals
7	Mar 22	– Recurrent Neural Network (RNN)	– Natural language processing – Case study: Deep Instinct (Cybersecurity) – <a href="#">Speaker: Mr. Jeffrey Hui</a>	– Word2Vec – Kahoot
8	Mar 29	– Convolutional Neural Network (CNN)	– Google Image Recognition – Case study: SenseTime (Computer Vision)	– 3D Visualization of CNN – Kahoot
9	Apr 12	– Reinforcement Learning	– Case study: Osaro (Robotics), Ascent (Autonomous Driving)	– Kahoot
10	Apr 26	– Midterm Exam – Independent Consultation for Projects		– TBA
11	May 3	– Recent Advances & Applications of AI – Catalysts & Enablers of AI	– Recap of concepts – Case studies: Airobotics (Drones), Cornami (AI Chip)	– Kahoot
12	May 10	– Frontiers of AI – Challenges in AI Commercialization	– Recap of concepts – Case studies: Prophesee (Computer Vision), Prowler (AGI) – <a href="#">Speaker: Mr. Christopher Lee</a>	– Review of Neural Ordinary Differential Equations (NIPS 2018)
13	May 17	– Synthesis & Outlook		– Final presentations (details TBD)
Note: Details may change depending on class progress, development of relevant technologies, as well as information and feedback from students' surveys.				



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A collage featuring a portrait of Christopher Lee in the bottom left corner, surrounded by various mathematical and scientific illustrations. These include a 3D grid, a complex function plot, a vector field labeled  $\vec{u} = \text{grad}(A) = (F_x'(A), F_y'(A), F_z'(A))$ , a surface equation  $m_i = f(x_i) \Delta x_i \Delta y_i \Delta z_i$ , a differential equation  $Df(x)(\infty; 0) \cup (0; 1)$ , and a graph of a function  $\int_{-1}^2 \int_{x^2}^{x+2} \int_{x^2+y^2}^{z^2} dz dy dx$ .

## Christopher Lee • 1st

Private Investor & Corporate Board Director  
Hong Kong

[Message](#)[More...](#)

Farron, Augustine &  
Alexander Ltd



Harvard Business School

[See contact info](#)

500+ connections

Mr. Chris Lee is a partner at FAA Investments, a private investment group focusing on real estate, early stage companies and in-depth research on hedge funds and private equity managers. With home bases in San Francisco and Hong Kong, Chris and his partners allocate capital globally. He is fluent in English a...

[Show more ▾](#)

## Highlights



### 78 Mutual Connections

You and Christopher both know Shuonan Chen, Jenny Zhang 张婧, CPA, and 76 others



You both studied at University of California, Berkeley, Haas School of Business

Christopher started at University of California, Berkeley, Haas School of Business before you started

Ad ...



Anthony, explore jobs at Matthews Asia that match your skills

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Learn the skills Christopher has



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# Beyond the Classroom

Session	Date	Topic	Session	Date	Topic
3	Feb 22	– HireVue: Recruiting & AI	8	Mar 29	– LinkedIn & Networking
4	Mar 1	– Company Research: Bloomberg, McKinsey Insights, Zero2IPO	9	Apr 12	– Industry Primer: Investment Banking
5	Mar 8	– PowerPoint Creation	10	Apr 26	– Industry Primer: Management Consulting
6	Mar 15	– CV Writing & Interview Preparation	11	May 3	– Industry Primer: FinTech & VC/PE
7	Mar 22	– Certifications (CFA, CPA, GMAT...)	12	May 10	– Presentation Skills

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## Robotic Process Automation 机器人与工序自动化

Full-stack AI-enabled Robotic Process Automation (RPA) solution suite for business-critical tasks spanning multiple applications and data silos



## Real-Time Robotics Automation 实时机器人自动化

Deep reinforcement learning-based AI software platform that enables enhanced perception, reaction and control in real-time robotics environments



## Quantum Computing 量子计算

Solution provider and platform developer for quantum and classical computing for predictive analytics, forecasting, and optimization



## AI Chips 人工智能芯片

Deep reinforcement learning-based AI software platform that enables enhanced perception, reaction and control in real-time robotics environments



## Computer Vision 计算机视觉

Developer of deep learning technology-based computer vision solutions aimed at a broad range of consumer and enterprise applications



## Cybersecurity 网络安全

Advanced deep learning technology-based cybersecurity products and solutions for threat detection and prevention



## Knowledge Graph 知识图表

Dynamically evolving knowledge graphs that provides inference strength across concepts, events and themes derived from a wide variety of information services



## Music Augmentation 音乐强化

Developer of a music augmentation technology that transforms linear music to dynamically personalized music for consumers, ad-agencies, music labels, and producers

**WE'RE  
HIRING!**



**Alpha  
Intelligence  
Capital**

### **Key Responsibilities**

- Keen interest and experience in venture capital transactions and financial analysis
- Familiar with transaction legal documents and investment structure
- Understanding of the commercialization of technologies from an investor perspective
- Conduct due diligence for potential investments in the AI space
- Assist in the preparation of deal-related materials (e.g. data collection, industry research, comparable company and valuation analysis)

### **Position Requirements**

- Undergraduate or postgraduate students, preferably majoring in Finance, Investments, Legal Studies, and/or Business Analytics
- Experience in using Bloomberg, S&P Capital IQ, Pitchbook, and Wind preferred
- Exposure and understanding of the high-tech industry (especially AI/ML) a plus
- Strong sense of responsibility and attention to details

Availability: Spring and Summer 2019

Number of Openings: 1-2

Renumeration: Market competitive

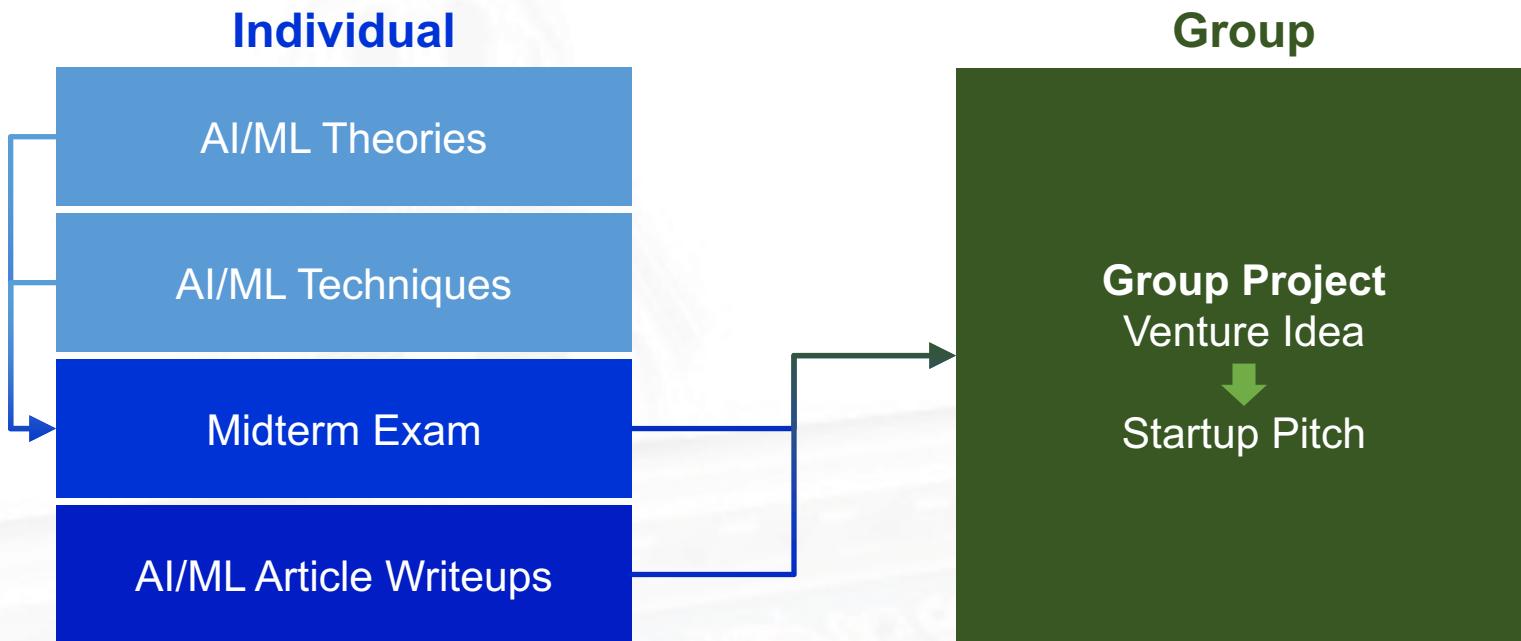
Office: Central • Hong Kong

If you have sent me your CV, let's talk during the break or after class



**Anthony Woo**  
CFA CAIA FRM  
Associate Director  
Alpha Intelligence Capital  
[aw@aicapital.ai](mailto:aw@aicapital.ai)

# Course Objectives



Jan 2019 –  
Present

**MOSAIC FINANCIAL TECHNOLOGY LTD.** (*AI/ML startup*)  
**Co-Founder and Chief Technology Officer**

**HONG KONG, CHINA**

- Compiled pitch deck and presented Mosaic's vision and underlying technology to potential investors and AI specialists at HKUST. Created a proof-of-concept (PoC) and demonstrated a prototype
- Devised strategy to drive adoption and compiled reports on the applications of AI/ML techniques. Elaborated on the plans for future product launches. Established Advisory Board with industry experts

Dear Professor Mathieson:

My name is Anthony Woo. I am currently a Master's student at the Faculty of Education here at HKU, and one of the Honorary Career Advisors at CEDARS. Hope all is well.

I have started a career development company at HKU leveraging the use of technology in education to help augment career development and vocational training for university students and young professionals. The company seeks to adopt the latest ICT developments, such as big data analytics and adaptive learning mechanisms, in helping job seekers build a solid foundation for their future success.

By way of background, I have over eight years of work experience in finance at J.P. Morgan and Morgan Stanley. I completed my MBA at Harvard Business School, and graduated from U.C. Berkeley *summa cum laude* with a B.S. degree in Business.

I understand that you must be very busy. But do you have 15 mins to spare so I can learn from your advice and insights on this initiative? Thank you very much.

Sincerely,  
Anthony Woo, CFA CAIA FRM  
LinkedIn: [www.linkedin.com/in/anthonywoo](https://www.linkedin.com/in/anthonywoo)

## Endorsements

This venture is very important and aligned with much of our thinking at HKU about encouraging entrepreneurship, a willingness to embrace failure and embracing

**Professor Peter Mathieson**  
President & Vice-Chancellor  
University of Hong Kong

At HKU we're delighted to be working with Anthony on such an innovative and impactful project, and we hope it will gain wide support.

**Professor Ian Holliday**  
Vice-President & Pro-Vice-Chancellor (Teaching and Learning)  
University of Hong Kong

This is an ingenious initiative which aims to help students acquire some of the essential skills for planning career development. It has the potential to have significant impact both for individual students and for organisations providing careers services.

**Professor Stephen Andrews**  
Dean of the Faculty of Education  
University of Hong Kong

## Advisory Board



**Prof. Peter Mathieson**  
President & Vice-Chancellor  
University of Hong Kong



**Prof. Ian Holliday**  
Vice-President & Pro-Vice-Chancellor  
(Teaching and Learning)  
University of Hong Kong

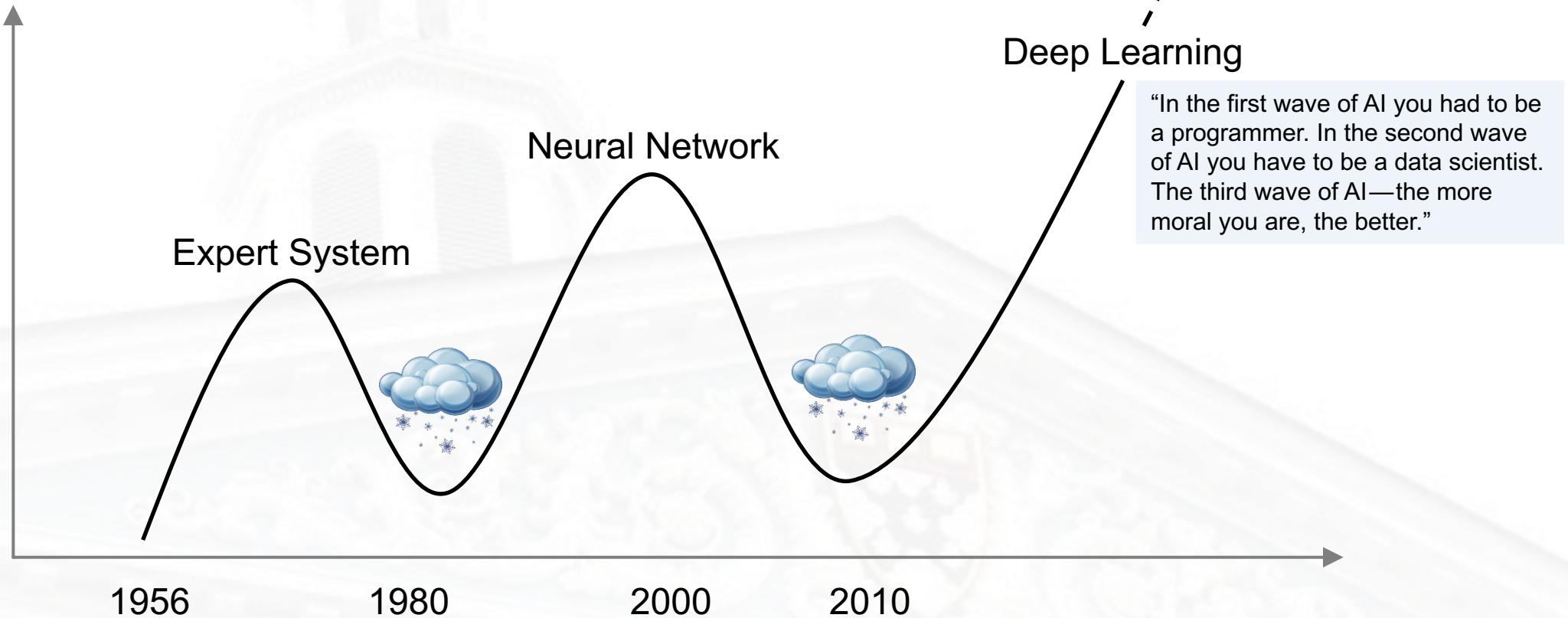


**Prof. Stephen Andrews**  
Dean of the Faculty of Education  
University of Hong Kong

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# History of A.I.

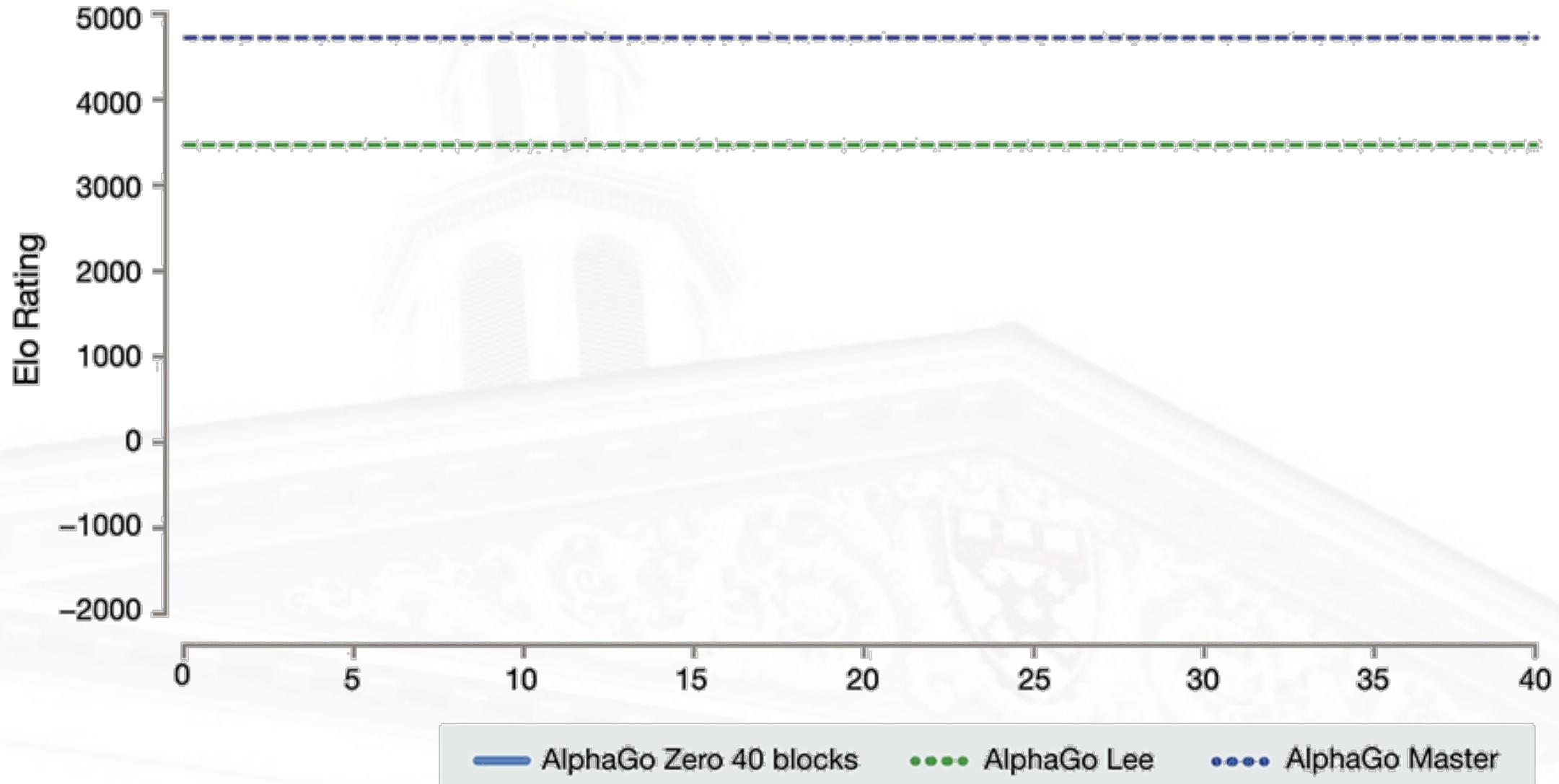
Neural Ordinary  
Differential Equations





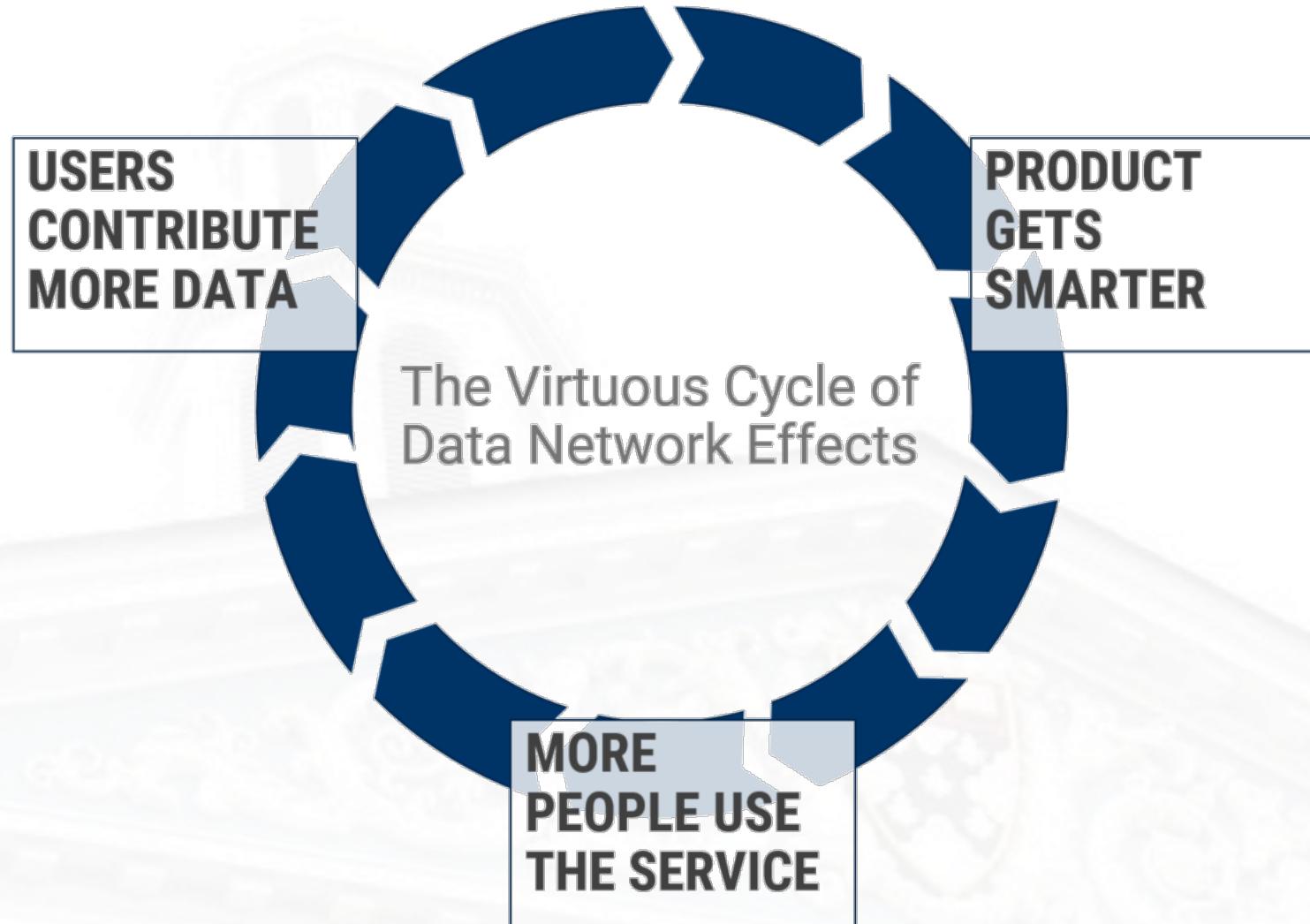
# A Tale of Two AI Camps

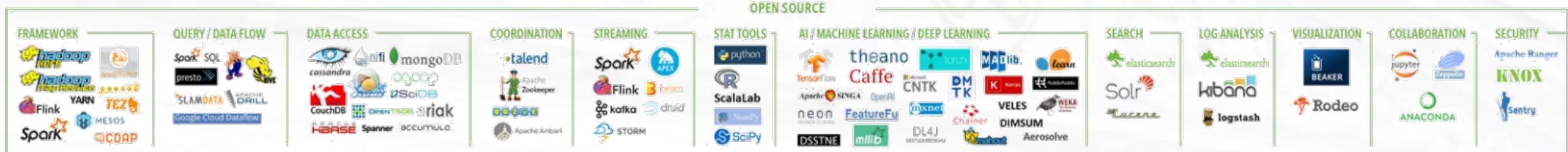
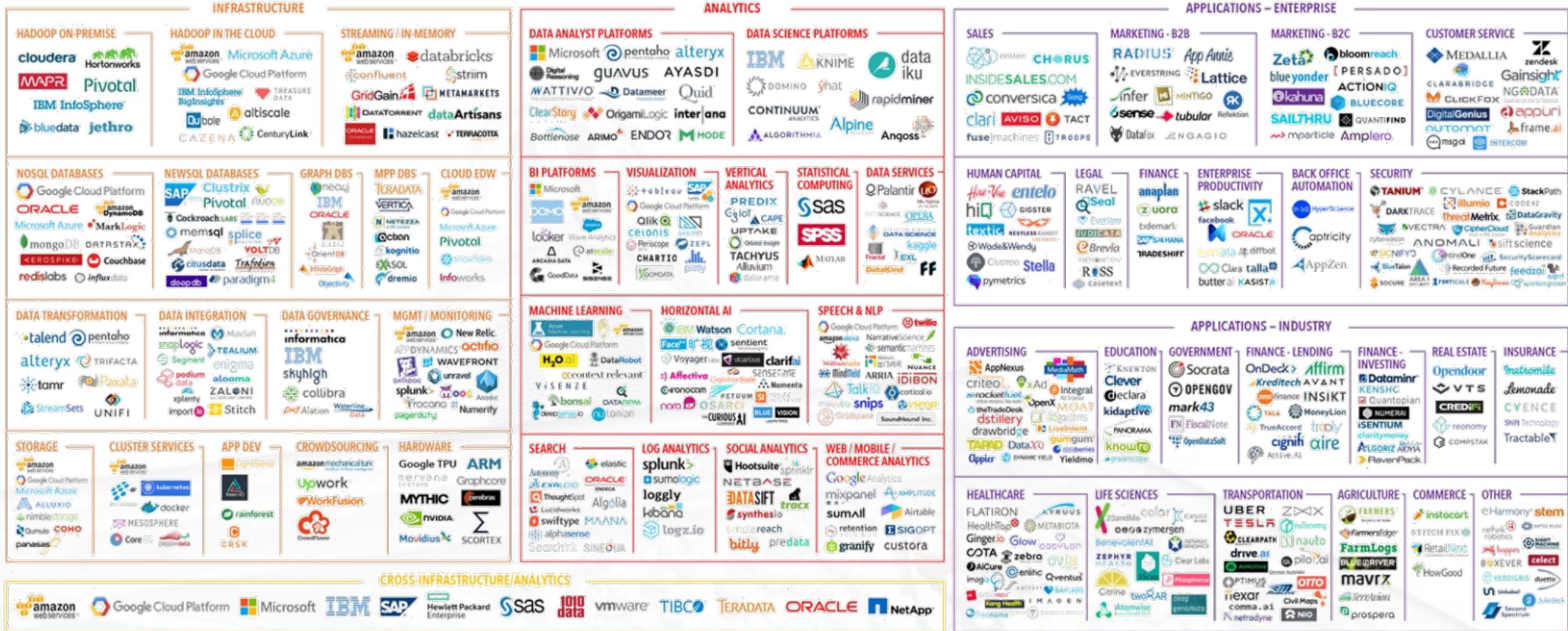
Property	Symbolic AI	Connectionist AI
Knowledge Acquisition	✓ Theoretical knowledge insertion can be made in a simple and direct manner. It is sufficient to clarify, convert, and formalize the knowledge.	✗ Theoretical knowledge may not be useful in constructing neural networks, while examples are always required for knowledge acquisition.
Processing Mode	✗ Processing is sequential. Answer and consultation times are long.	✓ Neural networks consist of a set of units with information processing completed in a parallel fashion.
New Knowledge Insertion	✓ Insertion of knowledge (rules) can be made very quickly once experts have already processed them.	✗ Training process is often time-consuming as weights and biases are trained gradually.
Training	✗ Training is not a basic process. Knowledge acquisition is done by explicitation, with potential bottleneck issues.	✓ Training and generalization from examples are fundamental and integrate processes.
Results Explanation	✓ Reasoning process allows for explanability. Knowledge is coded in a language close to natural language, and therefore easily interpretable.	✗ Neural networks are “black” boxes, where knowledge is coded in weights and interconnections, with a lack of access to a form that is interpretable by humans.



# A.I. Landscape: China vs. U.S.

	<b>China</b>	<b>United States</b>
<b>Institutional Norm</b>	Large volume of <u>data</u> via proprietary systems, yet to focus on building innovation capacity. China tends to be averse to adopting the standard metrics structures used by most multinationals. Chinese A.I. initiatives are good at developing facial recognition as well as tools for surveillance and tracking.	A.I. ecosystem with <u>unified standards and cross-platform sharing</u> . More conducive to developing international standards for what is acceptable for law enforcement use of big data and A.I., and how they will be held accountable for abuse. Developing A.I. tools for surveillance and tracking remains a sensitive topic in U.S.
<b>Regulatory Environment</b>	Tends to set regulations <i>after</i> product commercialization. Pursues a strategy of " <u>military-civil fusion</u> " in A.I., as China devises a range of policy mechanisms to incentivize industry cooperation. A looser approach to digital regulations means that companies have more freedom to experiment.	Tends to set regulations <i>before</i> product goes to market. The White House has so far been characterized as " <u>missing-in-action</u> " in terms of policymaking for A.I.
<b>Industry Structure</b>	<u>592 A.I. companies</u> (23% of global). Came second in the total number of A.I. enterprises in the world in 2017, and contributed 48% of the world's total A.I. startup funding. A.I. Potential Index = 17.	Ranked first with <u>1,078 A.I. firms</u> (42% of global). Provided 38% of the funding for A.I. startups globally in 2017. A.I. Potential Index = 33.





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ix | Question Number

## Short CV of Yuan YAO

ACADEMIC QUALIFICATIONS	<b>University of California at Berkeley</b> , USA Ph.D. Mathematics, December 2006 <ul style="list-style-type: none"><li>Dissertation: A dynamic theory of learning: online learning and stochastic algorithms in Reproducing Kernel Hilbert Spaces</li><li>Committee: Stephen Smale (chair), Peter Bartlett, and Steve Evans.</li></ul>	
	<b>City University of Hong Kong</b> , Hong Kong SAR, China M.Phil. Mathematics, June 2002	
	<b>Harbin Institute of Technology</b> , Harbin, China M.S. Control Engineering, July 1998 B.S. Control Engineering, July 1996	
ACADEMIC POSITIONS	<b>Hong Kong University of Science and Technology</b> , China <i>Department of Mathematics</i> <i>Department of Chemical and Biological Engineering</i> <i>(by courtesy) Department of Computer Science and Engineering</i> <i>Associate Professor</i>	Aug 2016 - present
	<b>Peking (Beijing) University</b> , China <i>School of Mathematical Sciences</i> <i>Department of Probability and Statistics</i> <i>Associate Professor with Tenure</i> <i>Professor of Statistics in the Hundred Talents Program</i> <sup>1</sup>	July 2015 - present July 2009 - present
	<b>Stanford University</b> , USA <i>Department of Mathematics and Computer Science</i> <i>Postdoctoral Fellow</i>	August 2006 – August 2009
AWARDS AND GRANTS	<b>Hong Kong RGC General Research Fund</b> , award 16303817 <i>Principal investigator</i> Social Choice, Crowdsourced Ranking, and Hodge Theory	Aug 2017 - Jul 2020
	<b>Microsoft Research Asia</b> , collaborative research award <i>Principal investigator</i> Active Sampling Strategy (Optimal Budget Plan) for Crowdsourced Pairwise Ranking Aggregation	2015 - 2017
	<b>Baidu</b> , collaborative research award <i>Principal investigator</i> (with Tong Zhang) Statistical Machine Learning Algorithms and Applications for Internet Technology	2015 - 2017

Interact

Encourage

Reward

# Kahoot!

# **https://kahoot.it/**

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<https://goo.gl/KRoiJt>



## MAFS6010U: Artificial Intelligence in Finance

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Team leaders should collect the completed forms from the whole team and e-mail them to course TA  
Mr. Yifei Huang at [aifin.hkust@gmail.com](mailto:aifin.hkust@gmail.com) on or before February 22, 2019 (Fri).



### Basic Information

English Name	Chinese Name	Photo
Name you prefer to be called:		
Program at HKUST:		
E-mail:		
Student ID:		

### Academic & Professional Background

What is your undergraduate university and major?

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Brief description of recent work experience (including internships):

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Share with us something unique about yourself that is important to you (e.g.  
hobbies, family background, etc.)

# Codename

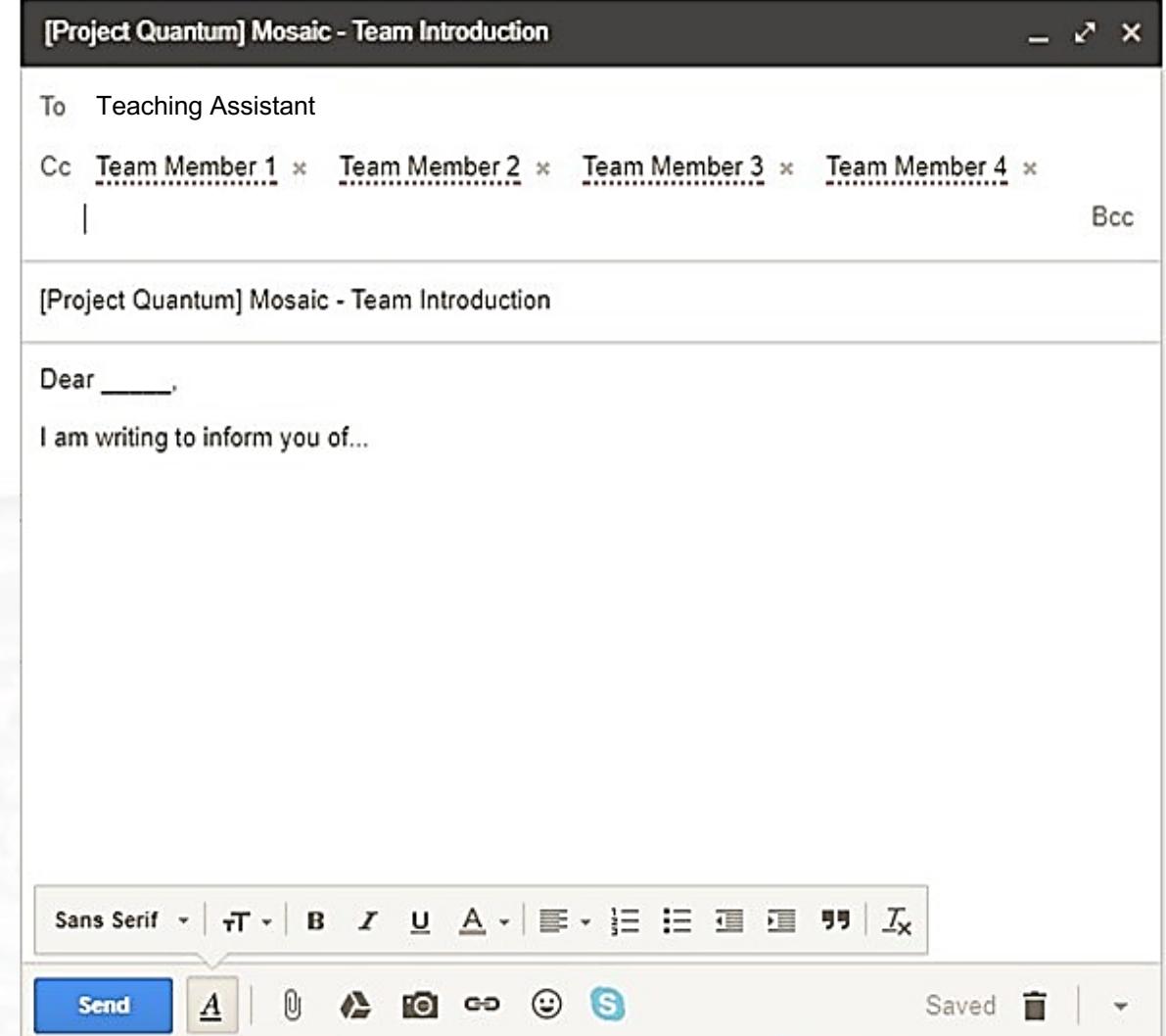
Project Quantum

Project Redbook

Project Dragon

Project Oasis

Project Fire



# Teachable Machine

October 2017 | By Google Creative Lab

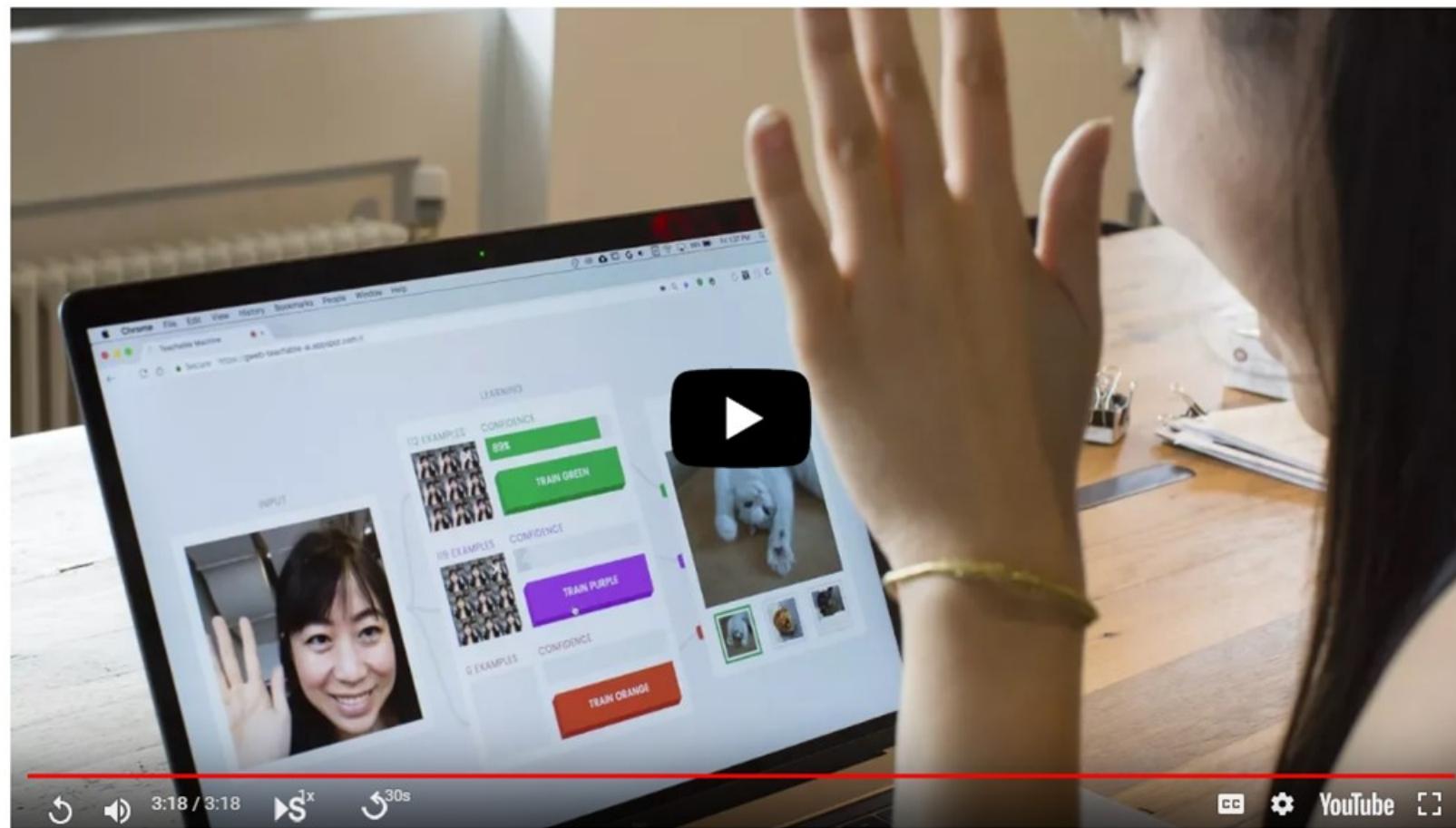
Teach a machine using your camera, live in the browser - no coding required.

COLLECTION:

AI Experiments

LAUNCH EXPERIMENT

GET THE CODE



A dark, blurred background image of a person sitting at a desk, facing a laptop screen. The person's hands are visible on the keyboard. The overall atmosphere is dim and focused on the text in the foreground.

# A.I. Experiments: Teachable Machine



# HireVue Overview

This will be a new experience for many applicants because top banks like Goldman Sachs and JP Morgan have recently begun to use HireVue. It apparently adds 13% more top performers above the client's industry.

**The first interview is provided by HireVue;** however, it will not completely replace the more traditional, intensive recruiting process. If the first interview is successful, then **a representative from the bank will contact the candidate for a second interview.** From then on, any upcoming interviews will be part of the regular interview rounds, involving live interactions with analysts, associates and even VPs and MDs.

You will be given about **20-30 seconds for each question to think of a response.** After that, you'll have about **3 minutes to record your answer.** The amount of time given really depends on the questions. For instance, a question about why you would be the best candidate for the role will require a much longer and thoughtful response than answering a question about what your overall GPA is.

## Practice First!

Take as many practice questions as you like before you start the interview.

Don't worry, your practice questions are not recorded or seen by anyone.

Practice

Start Interview



# HireVue Iris™ Deep Learning Analytics Engine

**15,000  
PREDICTIVE  
ATTRIBUTES**



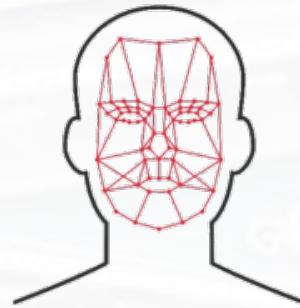
**100,000X  
MORE DATA THAN A RESUME**



# Predictive Power of a Traditional Assessment



friend tonight you data service application availability years resume real technology  
now me years resume real technology  
experience apply resume real technology  
apply references words degree  
systems listen work communication design  
time people personal student



150 words/minute \* 20 minutes

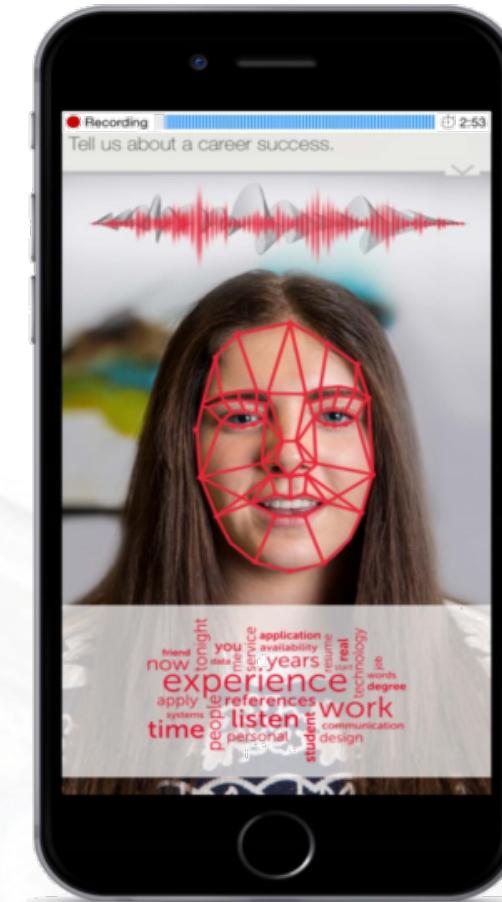
+

50 features/sample \* 10 samples/sec \* 60 seconds \* 20 minutes

+

30 features/frame \* 24 frames/sec \* 60 seconds \* 20 minutes

= 1.4 M Features



>4000x More Features Available than a 300 Question Assessment

# Underlying Mechanics

HireVue Iris, a patented deep learning analytics engine that powers HireVue Insights, analyzes a unique data set of interactions, feedback and outcomes that never before existed. Developed by HireVue's data science team, Iris was built based on over **3 million interview responses**. Each candidate interview contains 100,000 times more bytes of data than the resume or profile traditionally used for identifying job candidates. The platform examines attributes in three major categories: **interview attributes, behavioral attributes, and performance attributes**. Iris's proprietary algorithms discover patterns and learn which attributes predict performance, then **scores each candidate on how they compare to existing top performers**.

Video interview, the recruiter can see the personality, drive, and work ethic of a candidate. Furthermore, this **attracts and captures more candidates from more schools**, because the talent isn't just found from target schools such as those belonging to Ivy League group.

HireVue Assessments evaluates tens of thousands of data points, studying both **verbal and nonverbal content**, including:

- **Word choice and vocabulary**
- **Intonation**
- **Inflection**
- **Facial expressions**



Hello Awesome Candidate, welcome to your Best Job Ever interview with Your Future Career.



Your interview will consist of:



About 10 Minutes



4 Questions



171.67 MB Upload



By continuing you agree to HireVue's Terms and Conditions



Hello Awesome Candidate, welcome to your Best Job Ever interview with Your Future Career.

Your interview will consist of:



4 Questions



About 10 Minutes



171.67 MB Upload



By continuing you agree to  
HireVue's Terms and Conditions



# Deep Learning on Bespoke Video Assessments



## Question 1 of 6

### Scenario

Imagine you are responding to a call from a customer in which the person is noticeably upset because they are locked out of their account. She informs you that she needs to transfer funds immediately from her investment account to a bank account to avoid overdrawing on the account. You try to address the customer's concerns, but she demands to speak to your supervisor.

How would you attempt to de-escalate the situation first without involving your supervisor?

### Video Response

no retries

minutes: 3

Prep time :30

Begin Answering

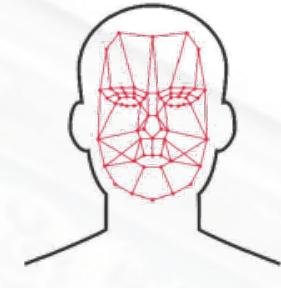


friend now application  
you data years resume  
experience apply start  
real references words  
work systems technology  
time people communication  
listen personal design  
student job degree

TEXT



AUDIO



VIDEO

# Sample Questions

- Why are you applying for this position?
- How did you deal with a difficult co-worker in your previous work experiences?
- How did you handle a drastic change in role to achieve a goal?
- Why do you think you are the right candidate for this position?
- What current events are you following at the moment? Why are they interesting?
- Do you have an expertise or unique experience that can benefit our team?
- What is the most important leadership experience you have? And why?
- What efforts do you make to keep abreast of financial markets and business news?
- Why do you want to work for our company?
- What relevant skills have you gained from your past work or internship that are easily transferable and directly beneficial to the new role you're applying for?
- Why are you looking for a new role in our company?
- What were your top responsibilities at your current/previous position?
- What are your three main weaknesses?
- How will you use your background and skills to succeed in his role

# Best Practices

## Logistics

- 30 secs to prepare; 3 mins to answer; do not have to use all 3 mins; a minimum of 10 secs
- Speak slowly with clear pronunciation and polished diction
- Clean camera lens and keep camera at eye level
- Notepad to minimize rambling
- Resume and job description in front of you
- Try not to prop up your phone
- Phone fully charged and strong Wifi (350 Kbps per second)
- Good background, clean desk and computer, bookshelf
- Quiet locale (e.g. carpet and “things” to minimize echo)

## Interview Preparation

- Prepare questions in advance
- Fully utilize sample interview before the real one
- On-demand video interviews are always structured interviews, i.e. same questions, in the same order as everyone else for the position

## Light

- Near window for natural light
- No light source from behind or below

## Dress Code

- Dress up (i.e. professional business attire)

## Demeanor

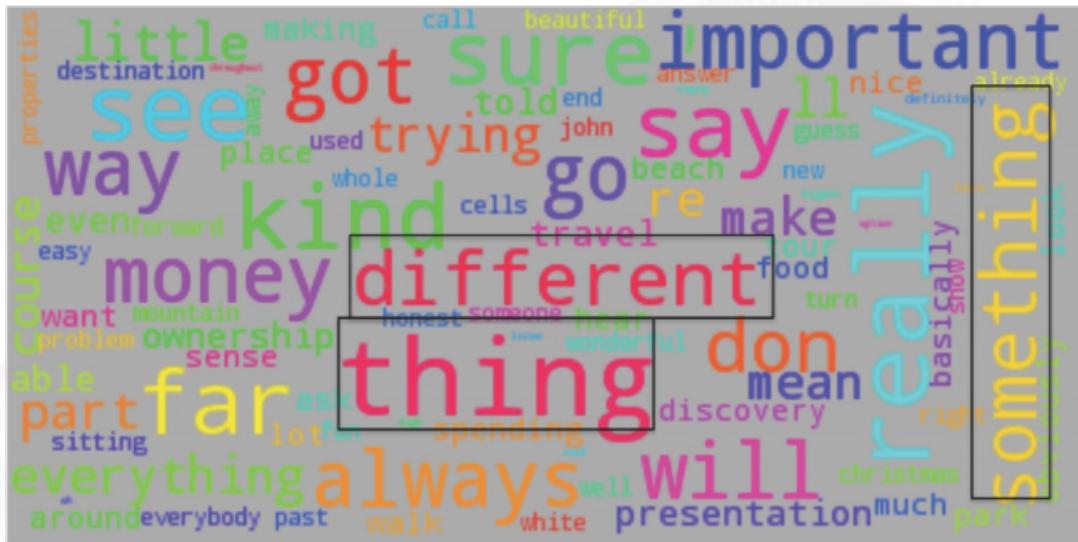
- Practice to avoid awkwardness and self-consciousness
- Show enthusiasm and maintain eye contact, enthusiasm (i.e. no downcast)
- Keep video feed near camera
- Stand up and “present” if you can
- Not evaluated based on stage presence

## Examples

- Toastmasters International, Enactus, TED

# Understanding Features of Candidate Scores

## Low Scoring Tier Candidates



## Top Scoring Tier Candidates



W	<p>Aug 2011  <b>MORGAN STANLEY ASIA</b> May 2013 <b>Associate, Investment Banking Division – Hong Kong Corporate Finance Coverage Team</b></p> <ul style="list-style-type: none"> <li>• Shangri-La Asia inaugural issuance of US\$600MM under US\$3Bn Medium Term Note Program</li> <li>• Multiple senior unsecured bond offerings for Hong Kong corporates, such as Kerry Properties (US\$600MM), Hang Lung Properties (US\$500MM), Nan Fung (US\$300MM), and PCCW (US\$500MM)</li> </ul> <p>Summer 2010 <b>Summer Associate, Investment Banking Division – Technology, Media &amp; Telecommunications Group</b></p> <ul style="list-style-type: none"> <li>• US\$272MM IPO of Dangdang Inc., China's largest B2C e-commerce company (equivalent of Amazon)</li> </ul> <p>2006 – 2009  <b>J.P. MORGAN CHASE &amp; CO.</b> <b>Investment Strategy Analyst, J.P. Morgan Private Wealth Management</b> <b>NEW YORK, NY</b></p> <ul style="list-style-type: none"> <li>• Sole analyst directly supporting the global Chief Investment Officer (CIO) and Chief Economist of PWM</li> </ul> <p>2006 – 2008 <b>Financial Analyst, J.P. Morgan Private Bank</b> <b>SAN FRANCISCO, CA</b></p> <p>Summer 2007 <b>Financial Analyst, J.P. Morgan Private Bank, EMEA Equity Derivatives Group</b> <b>LONDON, UK</b></p>
E	<p><b>Education</b></p> <p>2015 – 2019  <b>UNIVERSITY OF HONG KONG</b> <b>HONG KONG, CHINA</b> Master of Science in Information Technology in Education (Specialist Strand: e-Leadership), <i>Distinction</i>.</p> <p>2009 – 2013  <b>HARVARD BUSINESS SCHOOL</b> <b>BOSTON, MA</b> MBA. Co-producer, Asian Cultural Show. Advisor, Harvard Innovation Lab (iLab)</p> <p>2002 – 2006  <b>UNIVERSITY OF CALIFORNIA, BERKELEY – HAAS SCHOOL OF BUSINESS</b> <b>BERKELEY, CA</b> Bachelor of Science in Business Administration, <i>summa cum laude</i> (cumulative GPA: 3.9, top 3% of class). Dean's Honor List (02-06). President, California Investment Association (as-sponsored investment fund)</p>
T	<p><b>Technology-related Certifications</b></p> <p>Certificate on Machine Learning for Data &amp; Text Processing at MIT Computer Science and Artificial Intelligence Laboratory (CSAIL). Certificate on Deep Learning and Machine Learning with TensorFlow. Certified Bitcoin Professional (CBP). Conducted research into Probabilistic Topic Modeling using R</p>   