Artificial Intelligence in Finance
at
Hong Kong University of Science and Technology
<table>
<thead>
<tr>
<th>Session</th>
<th>Date</th>
<th>Topic</th>
<th>Application &amp; Case Study</th>
<th>In-Class Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Feb 1</td>
<td>History and Overview of Artificial Intelligence</td>
<td>Google Experiments: Draw!</td>
<td>Kahoot</td>
</tr>
<tr>
<td>2</td>
<td>Feb 15</td>
<td>Supervised &amp; Unsupervised Learning Classification vs. Regression</td>
<td>Google Experiments: Vision Sensing</td>
<td>Class survey and group formation, Kahoot</td>
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<tr>
<td></td>
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<td>Case study: HireVue (Video Analytics for Recruitment)</td>
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<tr>
<td>3</td>
<td>Feb 22</td>
<td>Regression &amp; Classification Model Assessment and Selection</td>
<td>Speaker: Katrina Fong</td>
<td>Kahoot</td>
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<tr>
<td></td>
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<td>Case study: WorkFusion (Robotic Process Automation)</td>
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<tr>
<td>4</td>
<td>Mar 1</td>
<td>Neural Network Basics Perceptrons</td>
<td>Credit analysis</td>
<td>Kahoot</td>
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<td></td>
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<td>Case study: Clover (Temporal Unfolding)</td>
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<tr>
<td>5</td>
<td>Mar 8</td>
<td>Deep Learning Hyperparameter Optimization &amp; Tuning</td>
<td>TensorFlow Neural Network Playground</td>
<td>Kahoot</td>
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<tr>
<td>6</td>
<td>Mar 15</td>
<td>Practitioners’ Perspectives Independent Consultation for Projects</td>
<td>Slido Q&amp;A</td>
<td>Sharing from researchers and industry professionals</td>
</tr>
<tr>
<td>7</td>
<td>Mar 22</td>
<td>Recurrent Neural Network (RNN)</td>
<td>Natural language processing</td>
<td>Word2Vec</td>
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<td>Case study: Deep Instinct (Cybersecurity)</td>
<td>Kahoot</td>
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<td>Speaker: Mr. Jeffrey Hui</td>
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<tr>
<td>8</td>
<td>Mar 29</td>
<td>Convolutional Neural Network (CNN)</td>
<td>Google Image Recognition</td>
<td>3D Visualization of CNN</td>
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<td>Case study: SenseTime (Computer Vision)</td>
<td>Kahoot</td>
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<tr>
<td>9</td>
<td>Apr 12</td>
<td>Reinforcement Learning</td>
<td>Case study: Osaro (Robotics), Ascent (Autonomous Driving)</td>
<td>Kahoot</td>
</tr>
<tr>
<td>10</td>
<td>Apr 26</td>
<td>Midterm Exam Independent Consultation for Projects</td>
<td></td>
<td>TBA</td>
</tr>
<tr>
<td>11</td>
<td>May 3</td>
<td>Recent Advances &amp; Applications of AI Catalysts &amp; Enablers of AI</td>
<td>Recap of concepts</td>
<td>Kahoot</td>
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<tr>
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<td></td>
<td>Case studies: Airobotics (Drones), Cornami (AI Chip)</td>
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</tr>
<tr>
<td>12</td>
<td>May 10</td>
<td>Frontiers of AI Challenges in AI Commercialization</td>
<td>Recap of concepts</td>
<td>Review of Neural Ordinary Differential Equations (NIPS 2018)</td>
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<td>Case studies: Prophesee (Computer Vision), Prowler (AGI)</td>
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<td></td>
<td>Speaker: Mr. Christopher Lee</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>May 17</td>
<td>Synthesis &amp; Outlook</td>
<td></td>
<td>Final presentations (details TBD)</td>
</tr>
</tbody>
</table>

Note: Details may change depending on class progress, development of relevant technologies, as well as information and feedback from students’ surveys.
Please wait for the Game Pin
Use your full name for attendance
Beyond the Classroom

Topics of Interest
(n = 75)

- CV Writing & Interview Preparation (67%)
- Company Research: Bloomberg, McKinsey Insights, Zero2IPO (52%)
- LinkedIn & Networking (43%)
- Industry Primer: FinTech & VC/PE (43%)
- Industry Primer: Investment Banking (32%)
- Certifications (CFA, CPA, GMAT…) (23%)
- Industry Primer: Management Consulting (21%)
- PowerPoint Creation (13%)
# Beyond the Classroom

<table>
<thead>
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<tbody>
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<td>Feb 22</td>
<td>HireVue: Recruiting &amp; AI</td>
</tr>
<tr>
<td>4</td>
<td>Mar 1</td>
<td>Industry Primer: FinTech &amp; VC/PE</td>
</tr>
<tr>
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</tr>
<tr>
<td>12</td>
<td>May 10</td>
<td>PowerPoint &amp; Presentation Skills</td>
</tr>
</tbody>
</table>
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
## Final Project Options

<table>
<thead>
<tr>
<th></th>
<th>Option A</th>
<th>Option B</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Nature</strong></td>
<td>Unleash your imagination</td>
<td>Solve a real-life problem</td>
</tr>
<tr>
<td><strong>Organization</strong></td>
<td>HKUST</td>
<td>HKUST &amp; AIC</td>
</tr>
<tr>
<td><strong>Advantage</strong></td>
<td>More freedom&lt;sup&gt;1&lt;/sup&gt;</td>
<td>More guidance</td>
</tr>
<tr>
<td><strong>Requirements</strong></td>
<td>N/A</td>
<td>Interview</td>
</tr>
<tr>
<td><strong>Scope</strong></td>
<td>No limit</td>
<td>Specific</td>
</tr>
<tr>
<td><strong>Group Composition</strong></td>
<td>Free for all</td>
<td>Managed</td>
</tr>
<tr>
<td><strong>Deliverables</strong></td>
<td>Final presentation</td>
<td>Monthly progress reports</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Monthly update meetings</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Final presentation</td>
</tr>
<tr>
<td><strong>Recommendation Letter</strong></td>
<td>N/A</td>
<td>Provided&lt;sup&gt;2&lt;/sup&gt;</td>
</tr>
<tr>
<td><strong>Full-Time Positions</strong></td>
<td>Considered</td>
<td>Considered</td>
</tr>
</tbody>
</table>

Note 1: Equal amount of guidance provided for Option A but more self-initiative is called for.

Note 2: Recommendation letters provided based on satisfactory performance.
<table>
<thead>
<tr>
<th>WorkFusion</th>
<th>Q² Branch</th>
<th>senseTime</th>
<th>Yewno</th>
</tr>
</thead>
<tbody>
<tr>
<td>Robotic Process Automation&lt;br&gt;机器人与工序自动化&lt;br&gt;Full-stack AI-enabled Robotic Process Automation (RPA) solution suite for business-critical tasks spanning multiple applications and data silos.</td>
<td>Quantum Computing&lt;br&gt;量子计算&lt;br&gt;Solution provider and platform developer for quantum and classical computing for predictive analytics, forecasting, and optimization.</td>
<td>Computer Vision&lt;br&gt;计算机视觉&lt;br&gt;Developer of deep learning technology-based computer vision solutions aimed at a broad range of consumer and enterprise applications.</td>
<td>Knowledge Graph&lt;br&gt;知识图表&lt;br&gt;Dynamically evolving knowledge graphs that provides inference strength across concepts, events and themes derived from a wide variety of information services.</td>
</tr>
</tbody>
</table>

### Track & Monitor

<table>
<thead>
<tr>
<th>OSARO</th>
<th>anotherbrain</th>
<th>deep instinct</th>
<th>A.I.MUSIC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Real-Time Robotics Automation&lt;br&gt;实时机器人自动化&lt;br&gt;Deep reinforcement learning-based AI software platform that enables enhanced perception, reaction and control in real-time robotics environments.</td>
<td>AI Chips&lt;br&gt;人工智能芯片&lt;br&gt;Deep reinforcement learning-based AI software platform that enables enhanced perception, reaction and control in real-time robotics environments.</td>
<td>Cybersecurity&lt;br&gt;网络安全&lt;br&gt;Advanced deep learning technology-based cybersecurity products and solutions for threat detection and prevention.</td>
<td>Music Augmentation&lt;br&gt;音乐强化&lt;br&gt;Developer of a music augmentation technology that transforms linear music to dynamically personalized music for consumers, ad-agencies, music labels, and producers.</td>
</tr>
</tbody>
</table>

Contents are based on information from sources believed to be reliable, but accuracy and completeness cannot be guaranteed. Nothing herein should be construed as any past, current or future recommendation to buy or sell any security or an offer to sell, or a solicitation of an offer to buy any security. This material does not purport to contain all of the information that a prospective investor may wish to consider and is not to be relied upon as such or used in substitution for the exercise of independent judgment.
<table>
<thead>
<tr>
<th>Name</th>
<th>Idea</th>
<th>Description</th>
<th>What I need</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anthony Woo</td>
<td>AI for financial statement analysis</td>
<td>Proprietary tool for hedge funds to compare financial statements over time</td>
<td>Understanding of basic AI techniques including decision-making</td>
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<tr>
<td>Anthony Woo</td>
<td>Career analytics for university students</td>
<td>Time-series analysis of stock price augmented with NLP (natural language programming)</td>
<td>Data analysts who are interested in education</td>
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<tr>
<td>He Yuhang</td>
<td>AI in High Frequency Algo Trading</td>
<td>Use AI algorithm to develop trading strategies</td>
<td>AI algorithm, data for strategy development</td>
</tr>
<tr>
<td>XIE Hao</td>
<td>Artificial Intelligence for financial risk management</td>
<td>Traditional risk management techniques involve the scrutiny of customer’s credit records. The AI techniques can be used to track customer’s credit risk.</td>
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<tr>
<td>LIU Yucheng</td>
<td></td>
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<tr>
<td>HUANG Baohui</td>
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<td>CHEN Shuying</td>
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<td>ZHANG Qianying</td>
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<td>XU Liliyuan</td>
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<td>QIAN Jing</td>
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<td>Zhang Bannuo</td>
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<td>ZHAO Jingru</td>
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<td>HUANG Xingyi</td>
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<td>Hui</td>
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</tbody>
</table>
The Virtuous Cycle of Data Network Effects

Users contribute more data.

The product gets smarter.

More people use the service.
Katrina Fong
FinTech Recruiting Consultant at Hays
www.linkedin.com/in/katrinafong

• Katrina is a FinTech specialized recruitment consultant from Hays, and is completing Higher Education Teaching Certificate course from Harvard. She has a history of building successful working relationships with exceptional clients across the FinTech space in AI, Machine Learning, Crypto & Blockchain, Payment, Virtual Bank, Digital Transformation, Robo Advisory etc.

• She has played key roles in building the technology teams for HSBC (PayMe & Jasmine FinTech), Standard Chartered Bank (Virtual Banking), Hang Seng Bank (Digital Transformation via Chatbots and AI), DBS Innovation Hub, Bank of East Asia, Tencent, Alipay, Blue (first digital life insurer by Aviva and Tencent), Alipay, Accenture, KPMG, Deloitte Digital, PricewaterhouseCoopers, and leading FinTech start-ups such as WeLend, Privé Technologies, MioTech etc. Due to this wealth of knowledge, market intelligence, and extensive network, she has many repeated success in the FinTech field and retained on the region’s most high profile assignments.

• Prior to recruitment, Katrina used to be a serial entrepreneur in Education Consulting as well as EF Education as Course Leader in United States & United Kingdom.
Case Studies: HSBC & Hang Seng

- HSBC’s chatbot is called Amy, while Hang Seng Bank’s are called DORI and HARO
- As well as being there 24/7 to answer customer queries, the chatbots will also help to speed up services, which will save firms a great deal of money in the long run

- While DORI’s role involves searching for dining discounts and making personalized recommendations to its customers through the likes of Facebook, HARO focuses on its customers’ banking needs and is available both online and through the company’s mobile app
- The hardest part for most firms is not the integration of AI into their business, but finding the right people to deal with the actual maintenance once up-and-running

Source: https://algorithmxlab.com/blog/2018/01/16/hsbcs-amys-ai-chatbots-will-change-way-bank
Case Studies: Clare.AI & Asiabots

**Claire.AI**
- Chatbot start-up powered by machine learning and natural language processing, specifically in Cantonese
- Claire.AI helps financial institutions provide a more personalized experience for their customers

**Asiabots**
- Asiabots serves private clients to public clients and has developed a medical platform called Dr. Care (Clinicbot)
- Dr. Care utilizes latest natural language processing technology (Chinese, Cantonese, English) and AI to assist patients from understanding their potential health problems through symptom checking to finding a suitable doctors or medical solution
Chatbot Job Openings

Job Openings in Hong Kong

• Niche area with very limited number of vacancies, yet the demand is getting higher

• Not easy to find Chatbot Developers in Hong Kong, most of the time companies would buy from Vendor/Start-up and integrate

• Chatbot Product Owner, Project Manager, and Consultant are of high demand

Job Openings in Hong Kong (Cont’d)

• Candidates normally only have 2-3 years of professional working experiences within the area
FinTech Trends in Hong Kong

- Payment (PayMe, Tap & Go, Alipay, WeChat Pay)
- Crypto and Blockchain
- Wealth Management and Robo-Advisory
- Regulatory Tech (RegTech)
- Insurance Tech (InsurTech)
- Corporate-Startup Collaborations
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 overdrawning 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?
MORGAN STANLEY ASIA  
HONG KONG, CHINA  
Associate, Investment Banking Division – Hong Kong Corporate Finance Coverage Team  
- Shangri-La Asia inaugural issuance of US$600MM under US$3Bn Medium Term Note Program  
- 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)

Summer 2010  
Summer Associate, Investment Banking Division – Technology, Media & Telecommunications Group  
- US$272MM IPO of Dangdang Inc., China’s largest B2C e-commerce company (equivalent of Amazon)

2006 – 2008  
J.P. MORGAN CHASE & CO.  
Investment Strategy Analyst, J.P. Morgan Private Wealth Management  
NEW YORK, NY  
- Sole analyst directly supporting the global Chief Investment Officer (CIO) and Chief Economist of PWM

2006 – 2008  
Financial Analyst, J.P. Morgan Private Bank  
SAN FRANCISCO, CA

Summer 2007  
Financial Analyst, J.P. Morgan Private Bank, EMEA Equity Derivatives Group  
LONDON, UK

UNIVERSITY OF HONG KONG  
HONG KONG, CHINA  
Master of Science in Information Technology in Education (Specialist Strand: e-Leadership), Distinction.

2009 – 2011  
HARVARD BUSINESS SCHOOL  
BOSTON, MA  
MBA. Co-producer, Asian Cultural Show. Advisor, Harvard Innovation Lab (iLab)

2002 – 2006  
UNIVERSITY OF CALIFORNIA, BERKELEY – HAAS SCHOOL OF BUSINESS  
BERKELEY, CA  
Bachelor of Science in Business Administration, summa cum laude (cumulative GPA: 3.9, top 3% of class). Dean’s Honor List (02-06). President, California Investment Association (Haas-sponsored investment fund)

Technology-related Certifications  
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SAN FRANCISCO, CA

Education
2015 – 2016
UNIVERSITY OF HONG KONG
HONG KONG, CHINA
Master of Science in Information Technology in Education (Specialist Strand: e-Leadership), Distinction.

2009 – 2011
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Technology-related Certifications
MAFS6010U: Artificial Intelligence in Finance

Complete and e-mail this form to course TA Mr. Yiwei Huang at ai5fin.hkust@gmail.com on or before March 1, 2019 (Fri).

### Basic Information

<table>
<thead>
<tr>
<th>English Name</th>
<th>Chinese Name</th>
<th>Photo</th>
</tr>
</thead>
</table>

| Name you prefer to be called: |
| Program at HKUST: |
| E-mail: |
| Student ID: |

### Academic & Professional Background

What is your undergraduate university and major?

---

Brief description of recent work experience (including internships):

---

Share with us something unique about yourself that is important to you (e.g. interests, hobbies, talents, awards, overseas experience):

---
### Overview

- Provider of an **intelligent automation platform** designed to digitize enterprise operations
- Intelligent automation platform offers AI-based tools needed to automate business processes, enabling enterprises to digitize their operation, increase productivity and improve service delivery

### Financing

- Raised US$50 million of **Series E** venture funding in a deal led by Hawk Equity and Declaration Partners in May 2018 at a valuation of US$350 million
- Investors include NewYork-Presbyterian Ventures, NGP Capital, Georgian Partners, Alpha Intelligence Capital, iNovia Capital, Guardian Life Insurance Company of America, and PNC Bank National Association
Leading enterprise operations choose a single platform with all critical capabilities to avoid integration complexity and achieve highest automation rates at the lowest cost.

Source: WorkFusion
<table>
<thead>
<tr>
<th>Case Study I</th>
<th>Case Study II</th>
<th>Case Study III</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Business Problem</strong></td>
<td>The bank was looking at opportunities to improve their customer experience as part of their efforts to digitize bank operations</td>
<td>A global performance management company that provides information about what consumers watch and buy faced challenges in product categorization and SKU management</td>
</tr>
<tr>
<td><strong>Business Outcome</strong></td>
<td>The bank reduced the average time for customer onboarding from <strong>16 days to 9 minutes</strong></td>
<td><strong>Achieved 98.5% accuracy in product categorization with up to 70% of the process automated and reduced manual effort by up to 80%</strong></td>
</tr>
</tbody>
</table>

WorkFusion

Automation technologies

Robotics
OCR
Analytics
BPM
Natural language processing
Machine learning
## Key Characteristics

**RPA**
- Deterministic
- Rules-based automation
- Workflows and code are embedded manually
- Deployed to automate transactional and repetitive tasks of business processes
- Handles structured and semi-structured data

**Cognitive Automation**
- Automates knowledge-based processes
- Learns by itself and builds knowledge bases over time
- Deployed to automate conversational and complex business processes
- Handles all types of data including unstructured

## Differentiating Technologies & Capabilities

**RPA**
- Screen scraping
- Rules engine
- Basic analytics
- Library of pre-built automations
- Bot performance analytics

**Cognitive Automation**
- Machine learning
- Natural language processing
- Advanced analytics
- Data capture
- Workplace analytics
- Automated training and self-learning
- Library of machine learning algorithms
- Performance management
- Resource management

*Source: Everest Group Report on WorkFusion (2017)*
<table>
<thead>
<tr>
<th>Bot</th>
<th>Key Characteristics</th>
</tr>
</thead>
</table>
| Agent-Assist Bot    | • Assist customer service agents in handling queries by automating various applications  
                        • Monitor the screen of agents and guide them with the next best action                                                           |
| Copy-Paste Bot      | • Execute rules-based processes to move structured data from one application to another                                                                 |
| Reconciliation Bot  | • Match transactions across disparate systems and detect errors (e.g. subjective mapping and hence such bots also require AI capabilities)              |
| Dispatch Bot        | • Classify documents from multiple sources into different categories  
                        • Classification often involves screening documents in multiple formats (text, images, etc.) and hence requires automation technologies such as OCR, along with RPA and AI |
| Data-Entry Bot      | • Gather relevant information from unstructured documents for relevant systems or applications  
                        • Collecting and processing unstructured data with OCR and AI capabilities to read and interpret data in multiple formats |
| Chatbot             | • Directly interact with customers in natural language to solve low-complexity queries  
                        • Determine customer intent and sentiments with NLP and ML and respond accordingly to customer queries or escalate to concerned departments to be handled by human agents |

<table>
<thead>
<tr>
<th>Type of Business Process</th>
<th>Sample Use Case</th>
<th>Smart Digital Workforce</th>
<th>Business Outcomes</th>
</tr>
</thead>
</table>
| Transactional            | Validating customer information in Know-Your-Customer (KYC) process | RPA bots, humans for exceptions | • Cost reduction  
• Increased workforce productivity  
• Increased process efficiency  
• Regulatory compliance |
| Transactional            | Self-service: Answering FAQs in interactive chat | Chatbots, RPA bots, and human agents for exceptions | • Enhanced customer experience  
• Increased process efficiency  
• Improved agility |
| Transactional            | Consumer onboarding | RPA bots with OCR for forms screening, and human agents and cognitive bots for exceptions | • Cost reduction  
• Improved quality and process efficiency  
• Enhanced customer experience |
| Knowledge-Based          | Customer servicing: Answering complex customer queries | Chat-assist bots and human agents | • Increased workforce productivity  
• Increased process efficiency  
• Enhanced customer experience |
| Knowledge-Based          | Sentiment analysis: Predicting customer emotions | Cognitive bots and human agents for actions | • Increased customer satisfaction  
• Increased workforce productivity |
| Knowledge-Based          | Fraud detection in banking and financial services | Cognitive bots and human agents | • Better management and control  
• Increased process efficiency  
• Regulatory compliance |

**Objective:** Automation of deterministic and knowledge-based tasks

**Key capabilities:** Robotics, control tower, machine learning, NLP, BPM, advanced analytics, and deep learning

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**Market prevalence**
- High
- Low

**Smart automation:** Long-term value

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**Objective:** Automation of deterministic tasks

**Key capabilities:** Robotics, control tower, BPM, and basic analytics

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**RPA:** Quick-wins

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Teachable Machine

October 2017 | By Google Creative Lab

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

LAUNCH EXPERIMENT  GET THE CODE
A.I. Experiments:
Teachable Machine