Artificial Intelligence in Finance

at

Hong Kong University of Science and Technology

Assignment I: Team Project Options

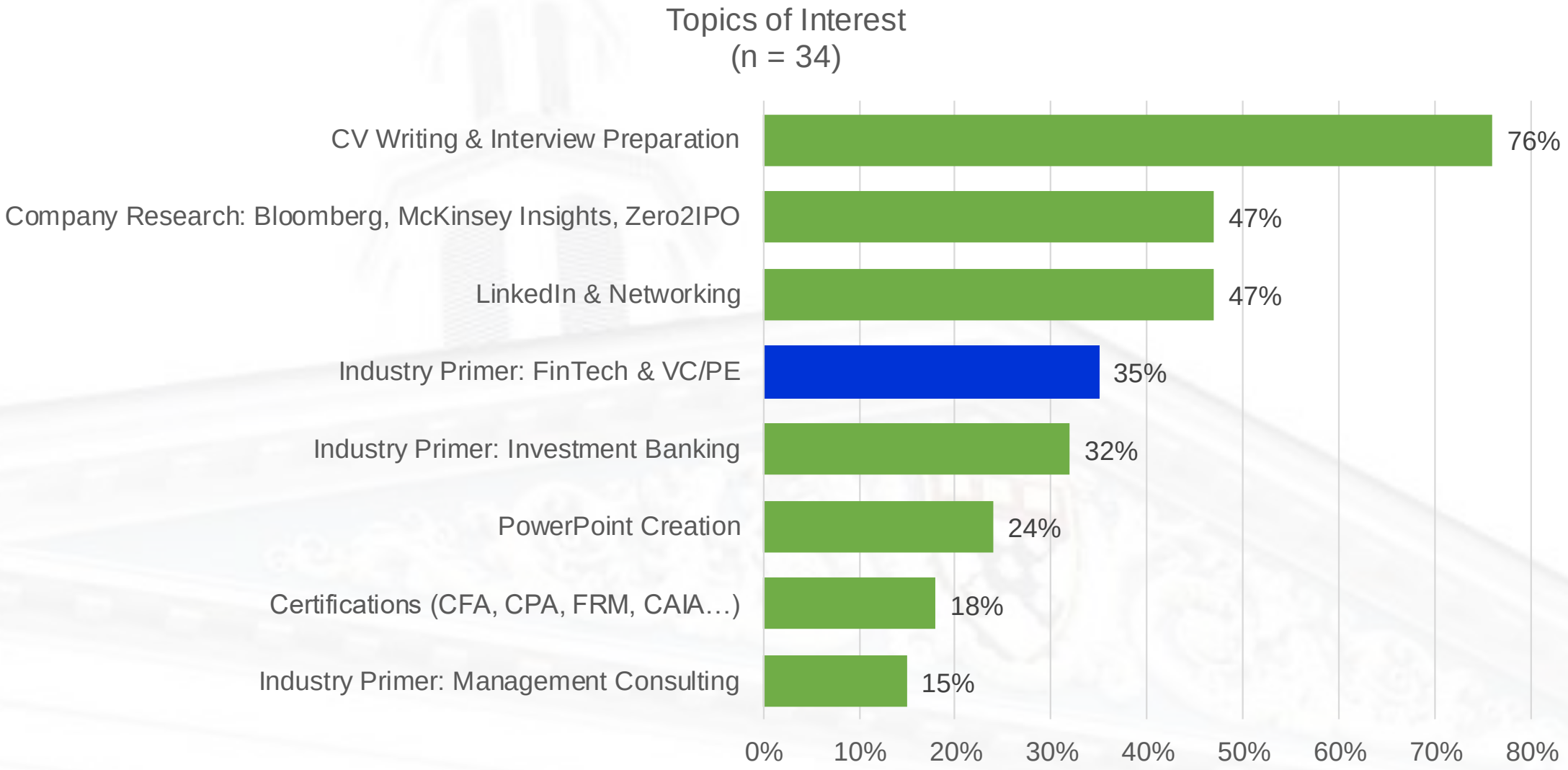
	Kaggle Competition	Entrepreneurship Competition	CogX-AIC Conference	Other
Overview	2-Sigma Kaggle contest in financial modeling	Application details to be can be found here	Also known as “CognitionX”, Europe’s largest AI conferece	Other project(s) initiated by student(s) to be approved by instructors
Scope	Public	Public	Private	Public or private
Team Size	Any	Any	5 members	Any
Internship	No	No	Yes[1]	No
Interviews	N/A	N/A	Required	N/A
Nature	Trading	Various	NLP	Any
Deadline	May 31	April 15	May 31	May 31

Note: 1. High performers will be invited to interviews for full-time positions at Alpha Intelligence Capital

Assignment II: Monthly Article Review

- Optional and due on March 31, April 30, and May 31
- 1-2 articles every month from top journals (e.g. NIPS, ICCV) in the past 5 years
  - Maximum of 6 articles in total for the whole semester
- 1 page review with the following components:
  - Abstract in simple language (in words that your grandmother will understand)
  - What is good about the article or research approach?
  - What may not work regarding the research?
  - What are the potential applications of the research findings?
- More details to be announced soon

Beyond the Classroom



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 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.

Source: Souici-Meslati, Labiba & Sellami, Mokhtar. (2004). A hybrid approach for Arabic literal amounts recognition. The Arabian Journal for Science and Engineering. 29.

A Tale of Two AI Camps

Property	Symbolic AI	Connectionist AI
Information Processing	✗ Theoretical knowledge must be complete beforehand, and the approach is not conducive to approximate or incomplete information processing.	✓ Neural networks are conducive to approximate and incomplete information processing (i.e. fuzzy logic).
Knowledge Coding	✓ Knowledge is represented by rules and data structures.	✓ Knowledge is coded in networks representing the relationships among input variables.
Development	✗ Long development cycles with domain experts are typical.	✗ Architecture and (hyper)parameters derivation and tuning can be time-consuming and difficult.
Maintenance	✗ Managing and maintaining large databases of rules are challenging. Adding new rules and updating existing ones may be difficult.	✓ Maintenance and management are often easy, and networks can be retrained based on changes in situational factors.

Source: Souici-Meslati, Labiba & Sellami, Mokhtar. (2004). A hybrid approach for Arabic literal amounts recognition. The Arabian Journal for Science and Engineering. 29.

Codename

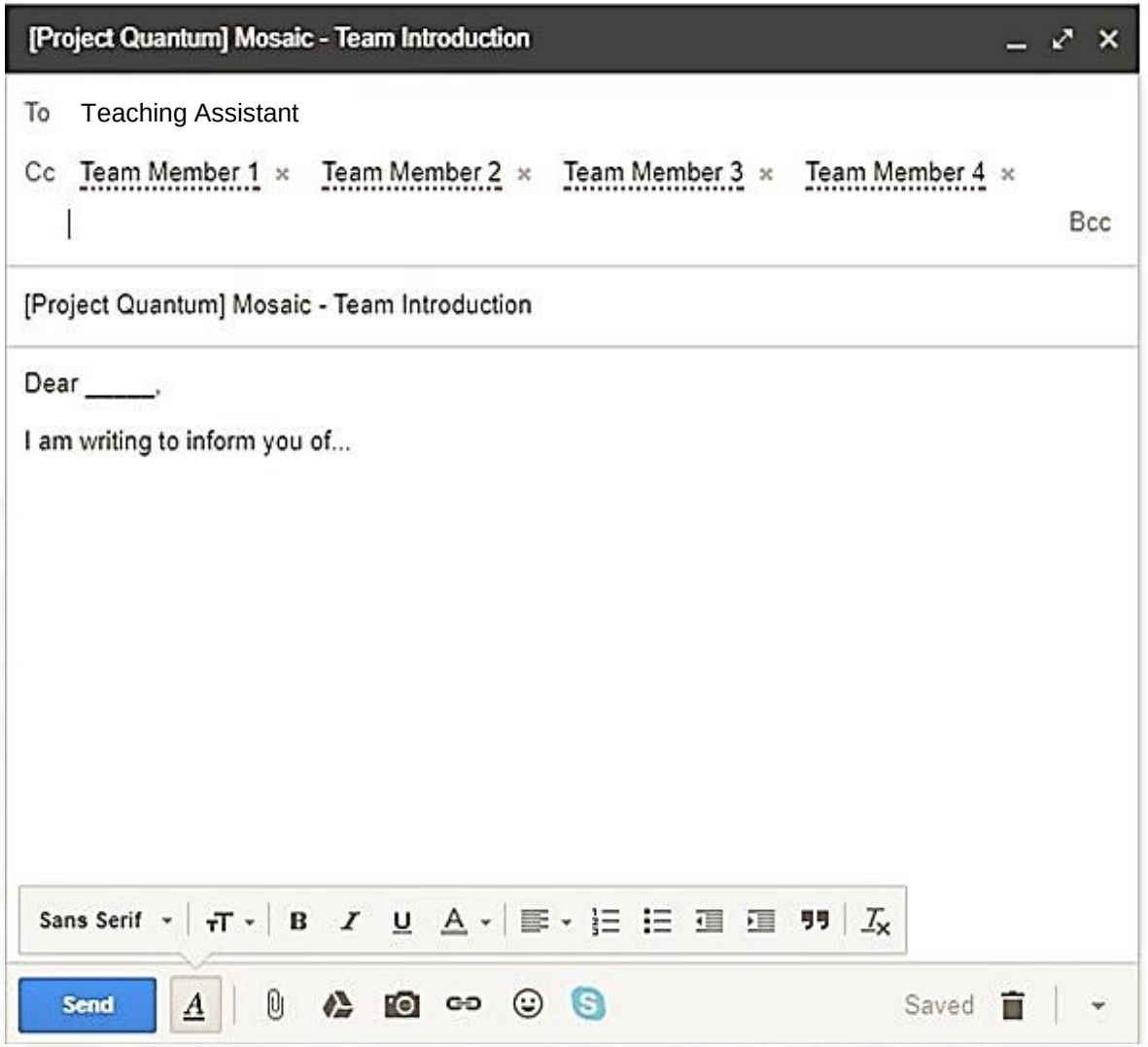
Project **Quantum**

Project **Redbook**

Project **Dragon**

Project **Oasis**

Project **Fire**



WorkFusion

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

QXBranch

Quantum Computing
量子计算
Solution provider and platform developer for quantum and classical computing for predictive analytics, forecasting, and optimization

商汤 sensetime

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

Yewno

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

OSARO

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

AB another brain

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

deepinstinct™ BEFORE YOU KNOW IT

Cybersecurity
网络安全
Advanced deep learning technology-based cybersecurity products and solutions for threat detection and prevention

A.I.MUSIC

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

WorkFusion

Overview	Financing
• 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	• 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

WorkFusion

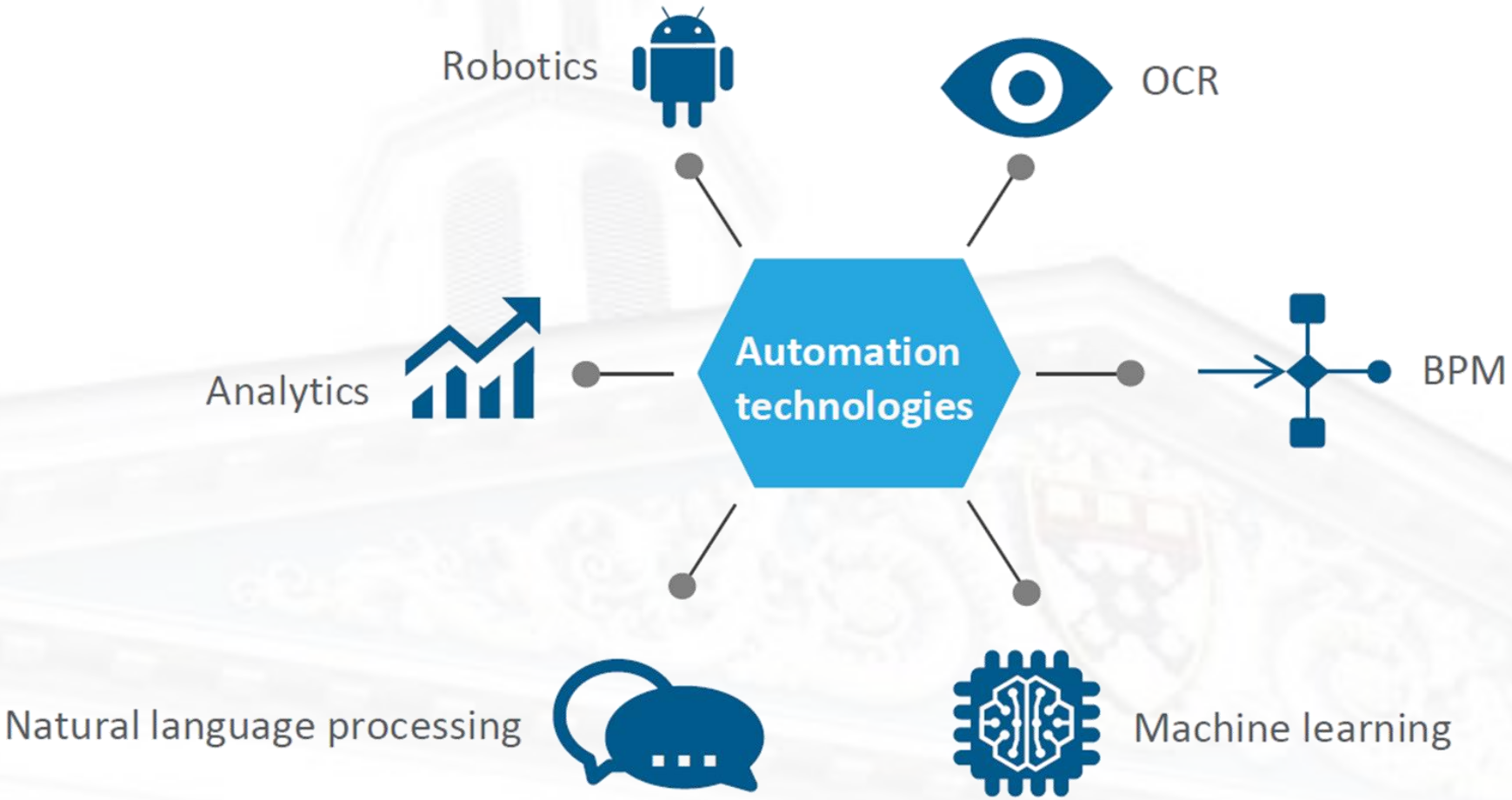
Leading enterprise operations choose a single platform with all critical capabilities to avoid integration complexity and achieve highest automation rates at the lowest cost

Source: WorkFusion

	Case Study I	Case Study II	Case Study III
Business Problem	The bank was looking at opportunities to improve their customer experience as part of their efforts to digitize bank operations	A global performance management company that provides information about what consumers watch and buy faced challenges in product categorization and SKU management	A leading multinational software corporation was looking to transform the way they process their customer invoices
Business Outcome	The bank reduced the average time for customer onboarding from **16 days to 9 minutes**	**Achieved 98.5% accuracy** in product categorization with up to 70% of the process automated and **reduced manual effort by up to 80%**	**67% reduction in the number of FTEs** needed in the process and improved accuracy with **20% reduction in help desk inquiries**

Source: Everest Group Report on WorkFusion (2017)

WorkFusion


Robotics
OCR
Analytics
Automation technologies
BPM
Natural language processing
Machine learning

	RPA	Cognitive Automation
Key Characteristics	• 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	• 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	• Screen scraping • Rules engine • Basic analytics • Library of pre-built automations • Bot performance analytics	• 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)

A.I. Implementation Matrix

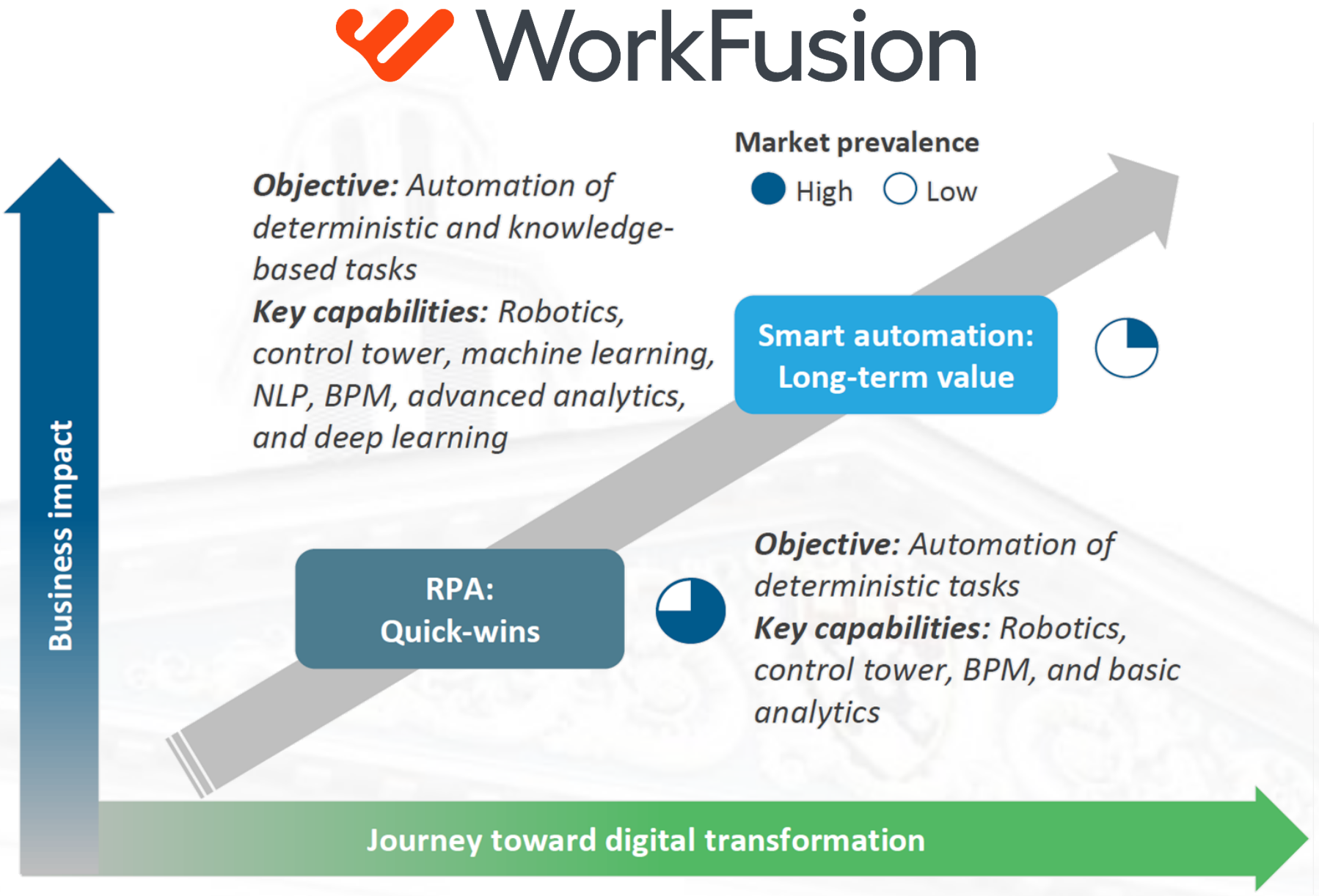
	Process A	Process B	Process C	Process D	Process E
Function & Nature	Strategic direction exploration	Sales lead management	Quality control	Risk management	Customer service (non-chatbot)
Data Availability					
AI Function & Role	Classification and Sentiment analysis	Facial recognition	Fault identification	Fraud detection and forecasting	Text to image processing
AI Data Type	Unstructured	Structured and clean	Structured and clean	Structured but sparse	Unstructured
AI Model	• Support Vector Machines (SVM) • Clustering • Recurrent Neural Networks (RNN)	• Convolutional Neural Networks (CNN)	• Support Vector Machines (SVM) • Clustering	• K-Nearest Neighbors (kNN) • Recurrent Neural Networks (RNN)	• Generative Adversarial Network (GAN)
AI Readiness					
Schedule	TBD	Q3 2019	Q1 2019	TBD	Q1 2020

Bot	Key Characteristics
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

Source: Everest Group Report on WorkFusion (2017)

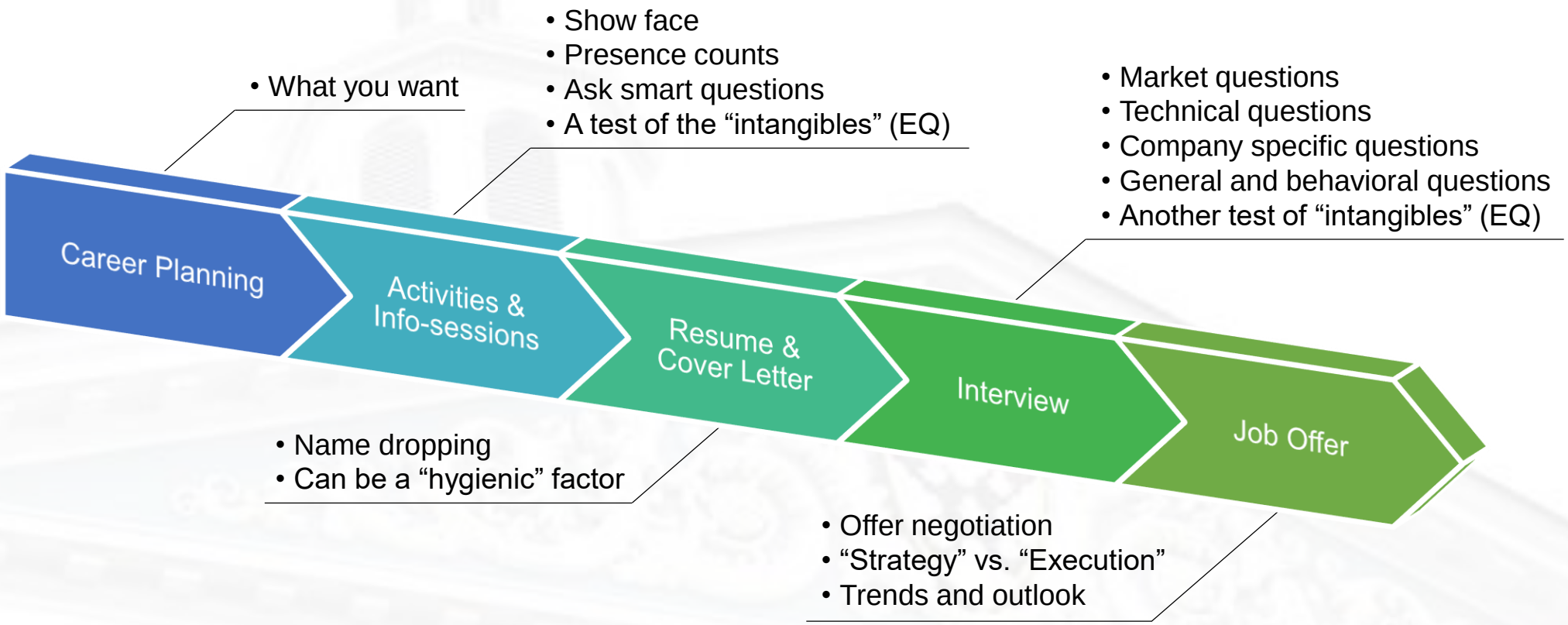
Type of Business Process	Sample Use Case	Smart Digital Workforce	Business Outcomes
Transactional	Validating customer information in Know-Your-Customer (KYC) process	RPA bots, humans for exceptions	• Cost reduction • Increased workforce productivity • Increased process efficiency • Regulatory compliance
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

Source: Everest Group Report on WorkFusion (2017)



Source: Everest Group Report on WorkFusion (2017)

Career Roadmap & CV Clinic

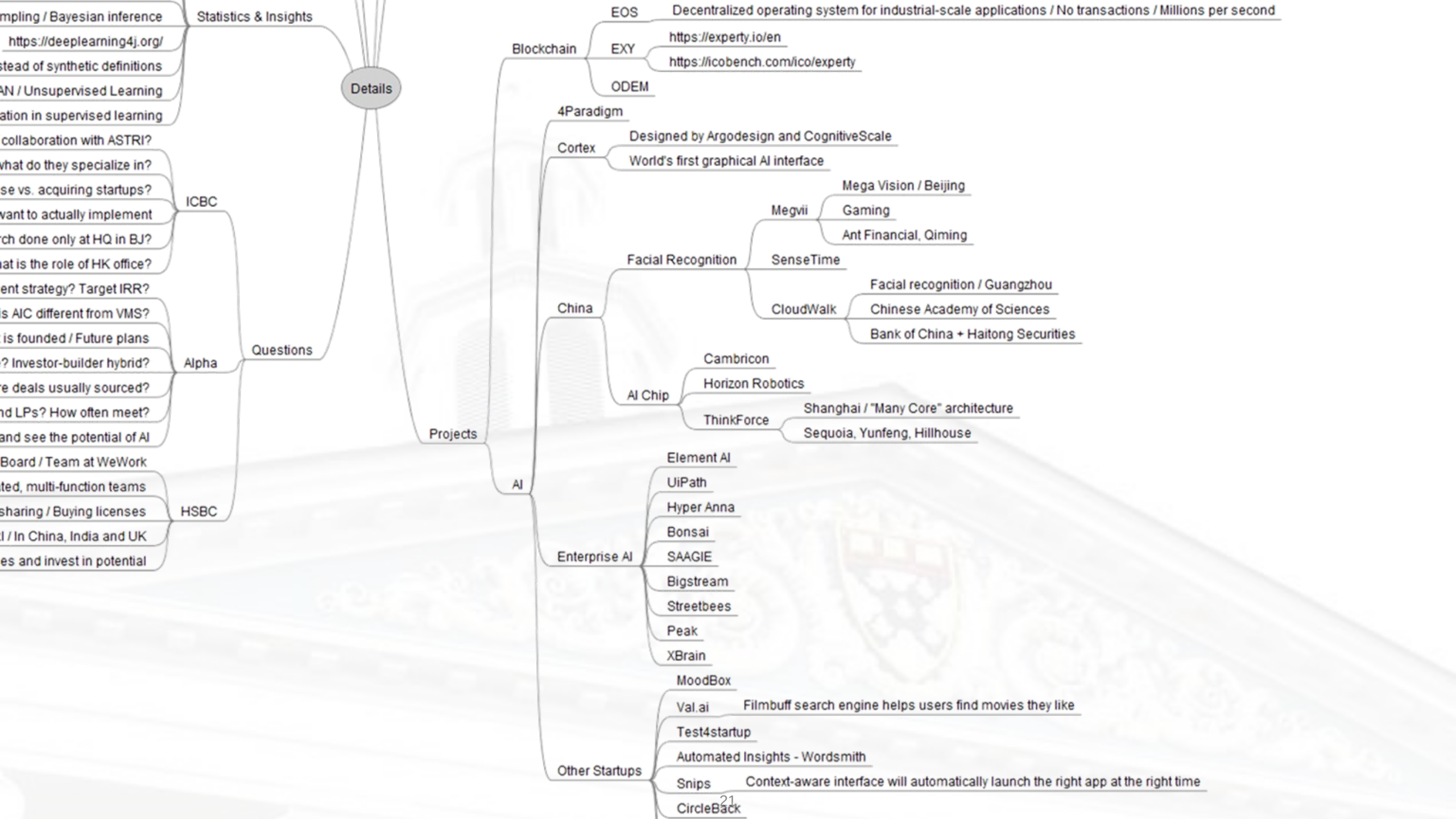


Info-session & Activities

- Types: coffee chats, presentations, campus visits, company visits, speaker events, dinners, drinks
- Face-time important
- “Paper-time” (i.e. signing in) equally important
- **Learn the jargon**
- Key is to show up, show face, and **not screw up**
- Problem of competing with peers

Best Practices

- F12 often
- Upload everything to the cloud
- Make a generic (master) document and highlight text that has be tailored
- An independent folder for each company
- Dedicate (separate) time for sanity check and name match
- Proper naming of files and documents
- Be extra careful if you are name-dropping
- Be mindful of delivery


Details
Questions
Statistics & Insights
mpling / Bayesian inference
https://deeplearning4j.org/
stead of synthetic definitions
AN / Unsupervised Learning
ation in supervised learning
ICBC
collaboration with ASTRI?
what do they specialize in?
se vs. acquiring startups?
want to actually implement
rch done only at HQ in BJ?
at is the role of HK office?
Alpha
ent strategy? Target IRR?
is AIC different from VMS?
is founded / Future plans
? Investor-builder hybrid?
e deals usually sourced?
nd LPs? How often meet?
and see the potential of AI
HSBC
Board / Team at WeWork
ted, multi-function teams
sharing / Buying licenses
I / In China, India and UK
es and invest in potential
Projects
Blockchain
EOS
Decentralized operating system for industrial-scale applications / No transactions / Millions per second
EXY
https://experty.io/en
https://icobench.com/ico/experty
ODEM
AI
4Paradigm
Cortex
Designed by Argodesign and CognitiveScale
World's first graphical AI interface
China
Facial Recognition
Megvii
Mega Vision / Beijing
Gaming
Ant Financial, Qiming
SenseTime
CloudWalk
Facial recognition / Guangzhou
Chinese Academy of Sciences
Bank of China + Haitong Securities
AI Chip
Cambricon
Horizon Robotics
ThinkForce
Shanghai / "Many Core" architecture
Sequoia, Yunfeng, Hillhouse
Enterprise AI
Element AI
UiPath
Hyper Anna
Bonsai
SAAGIE
Bigstream
Streetbees
Peak
XBrain
Other Startups
MoodBox
Val.ai
Filmbuff search engine helps users find movies they like
Test4startup
Automated Insights - Wordsmith
Snips
Context-aware interface will automatically launch the right app at the right time
CircleBack