

Business Intelligence Techniques and Applications

Session 1a. Introduction

Renyu (Philip) Zhang

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About Me



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About Me



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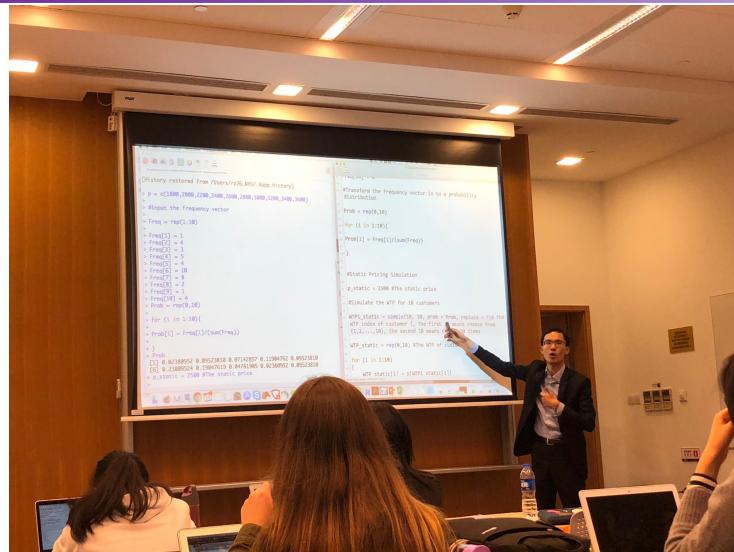
About Me



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About Me



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About Me



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Who Am I?

- I am a scholar, a teacher, and a practitioner in data science/AI and operations research.
- Research:**
 - How to use data analytics to improve business decision making, especially for digitalized online platforms.
- Teaching:**
 - Data science/AI for business to undergraduate, master, EMBA and PhD students.
- Data Science Practitioner:**
 - Economist and Tech Lead, Kuaishou (快手; <https://www.kwai.com/>).
Evaluating and optimizing the ecosystem of Kuaishou.



- CUHK Business School, Associate Professor (with tenure), since 2022
- NYU Shanghai, Assistant Professor, 2016-2022; Visiting Scholar, since 2022
- Washington University in St. Louis, PhD, 2011-2016
- Peking University, BS, 2007-2011

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Who Are You?



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What is Business Analytics?



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What is Business Analytics?

"Big data is like teenage sex; everyone talks about it, no one really knows how to do it, everyone thinks everyone else is doing it, so everyone claims they are doing it."
-Dan Ariely, Duke University



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What is Business Analytics (in this Course)?

- Exciting applications of analytics:
 - Large Language Models
 - Autonomous driving
 - AlphaGo
 - Image and sound recognition
 - Autonomous translation
 - Recommender system
 - Online advertising
 - And many more

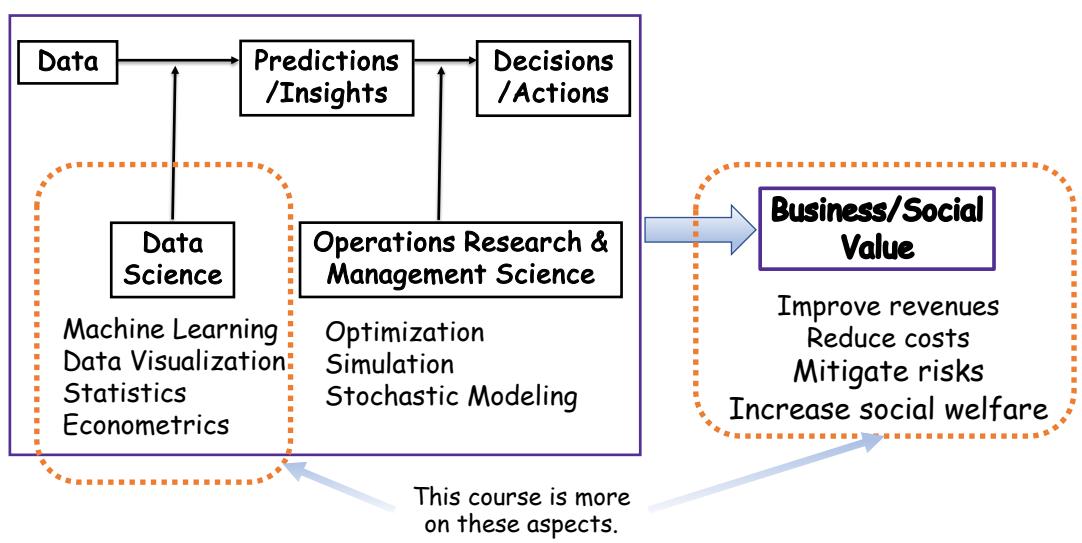
The **automated** scientific process of transforming **data** into **insights** for making better **decisions** and adding **values** to individuals, companies, and the society.

https://www.youtube.com/watch?v=5adE_cxtSbY

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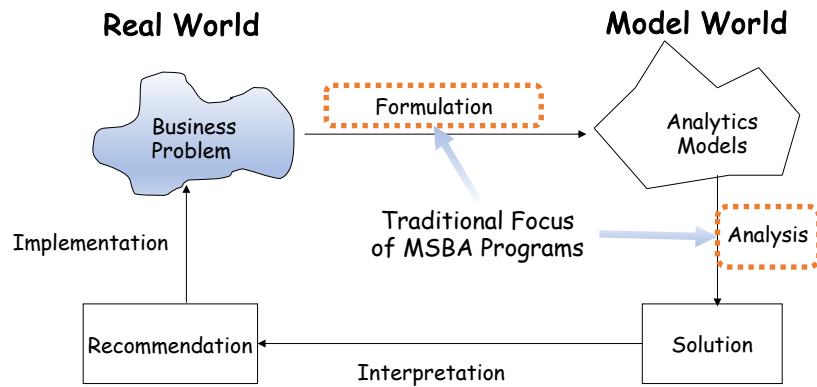
Data-Driven Decision Making



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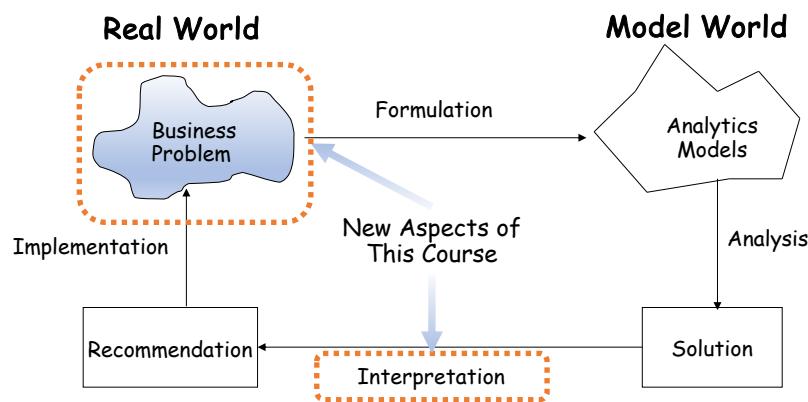
Business Analytics Procedure



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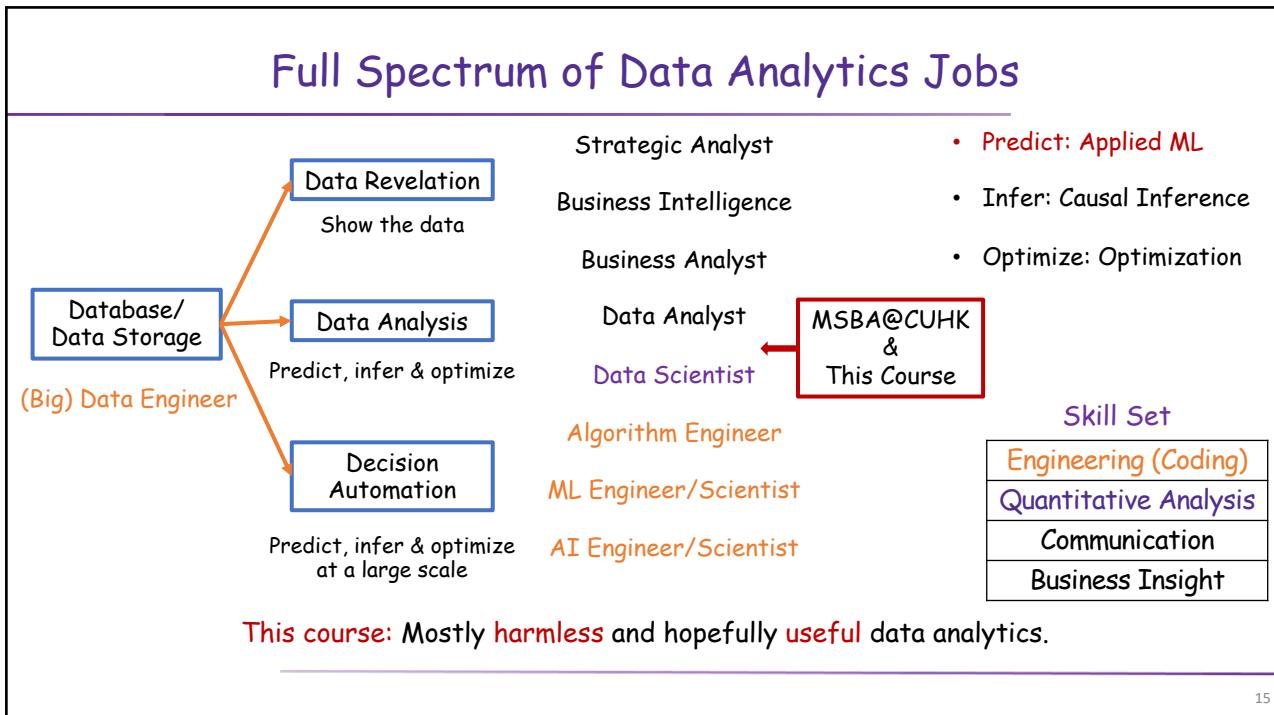
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Business Analytics Procedure



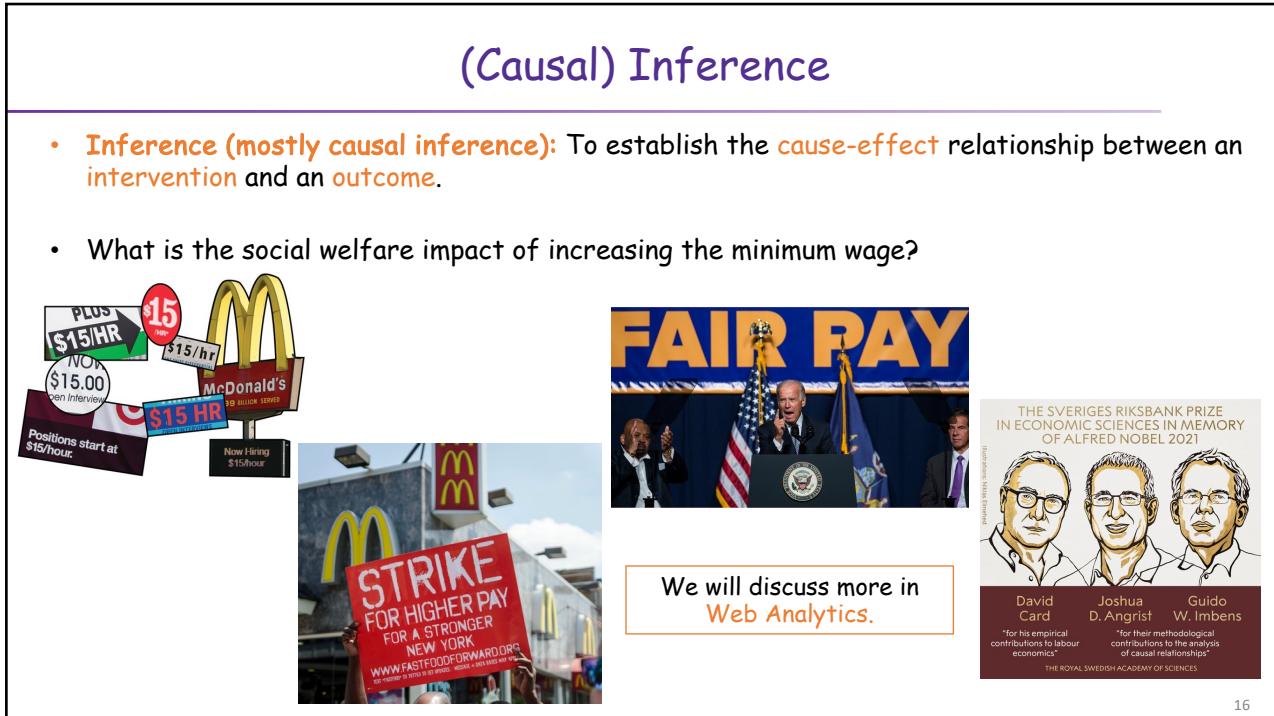
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Prediction

- **Prediction (mostly machine learning):** To predict an important unobserved outcome using features.
- What is the probability for you to click/like/follow/share a video if it is shown to you?



- Revenue of Byte Dance in 2023 H1: 54 Billion USD

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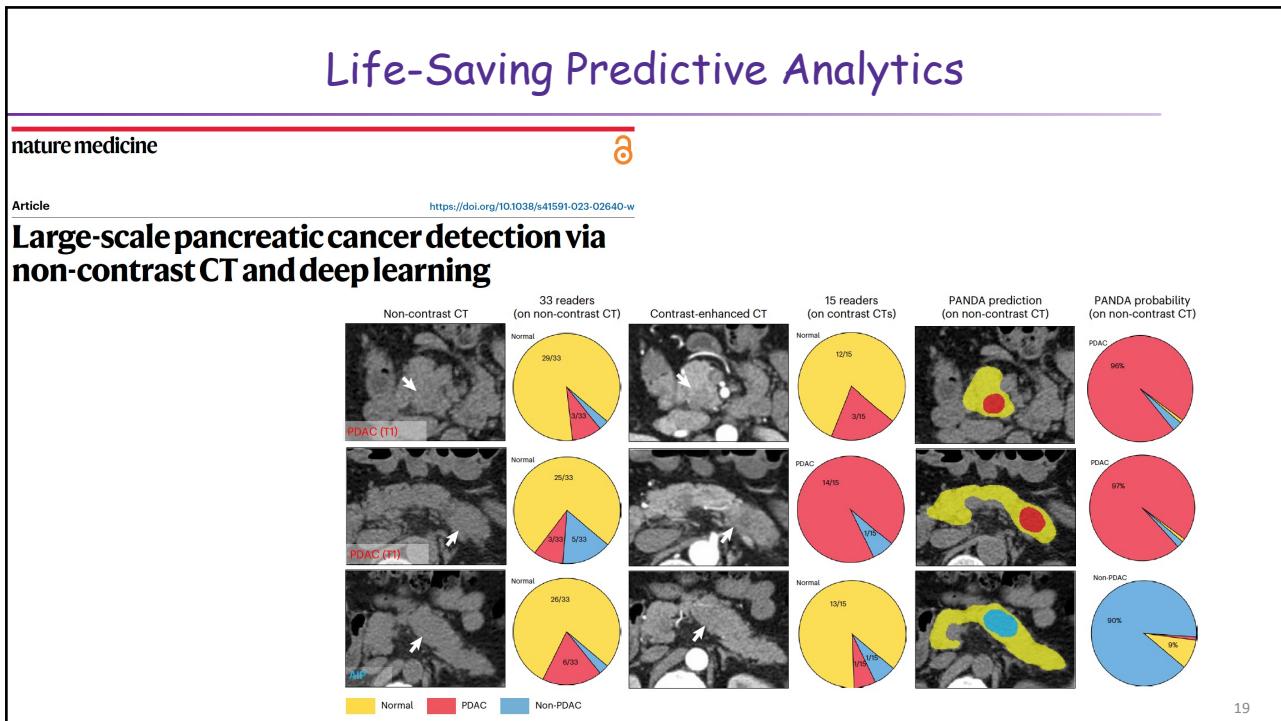
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A Multiple-Billion Tale about Predictive Analytics

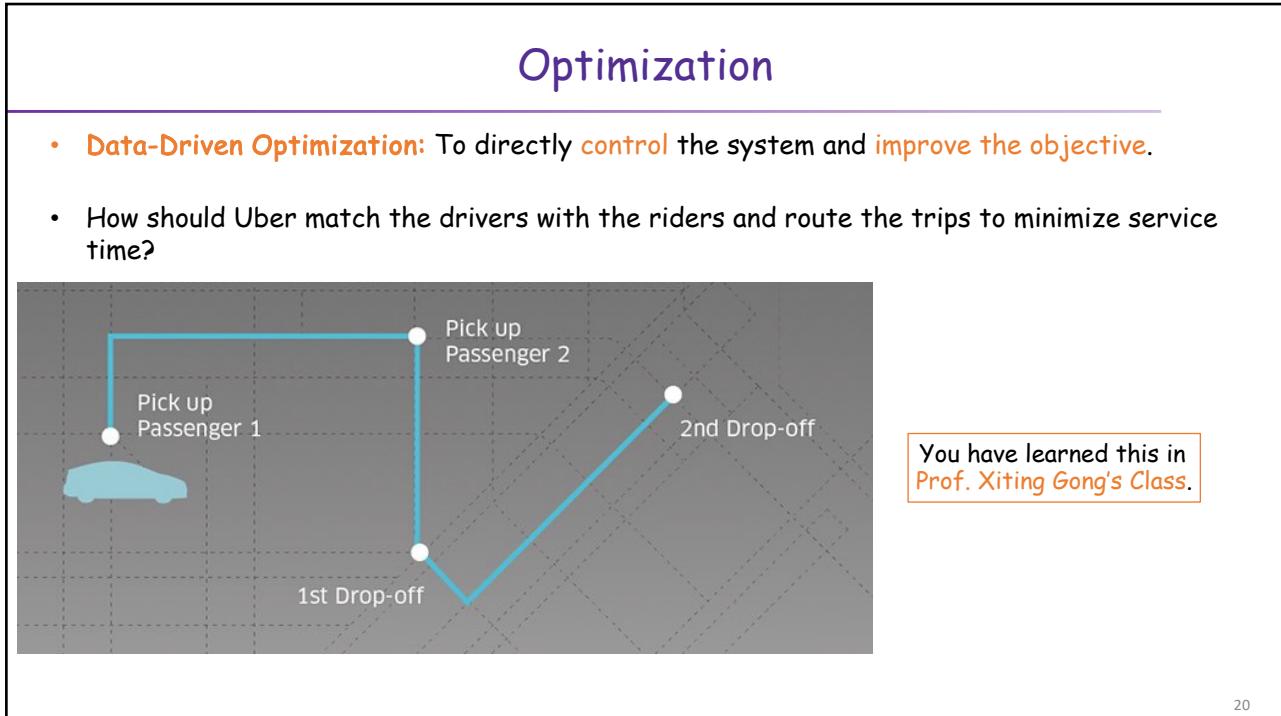
The diagram shows a flow from a desktop application interface on the left to a mobile phone screen in the center, and finally to a mobile app interface on the right. The desktop application displays a complex dashboard with multiple windows, including a file explorer, a search bar, and several data tables and charts. An arrow points from this desktop interface to the mobile phone screen, which shows a simplified version of the same user interface. Another arrow points from the mobile phone screen to the mobile app interface on the right. The mobile app interface is a standard social media feed with a header labeled "Home" and a "Feeds" tab. Below the feed, there is a post by "Jordan Jones" with a timestamp "Just Now". The bottom navigation bar of the app includes "Home", "Watch", "Feeds", "Groups", "Notifications", and "More".

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Mechanism Design

- **Data-Driven Mechanism Design:** To design the mechanisms of a marketplace so that the participants would automatically play the desired strategies.
- How should Google design the auction mechanisms to sell its ad spaces?



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Data Analytics Classified by Expertise

- **Inference (mostly causal inference):**
 - What is the value of the ML-based ranking over the inverse chronological ranking for Facebook feeds?
- **Prediction (mostly machine learning):**
 - Given a consumer query at Amazon, what is the most suitable search result?
- **Data-Driven Optimization:**
 - Given a car and 10 restaurants to deliver food, what is the optimal route for Food Panda?
- **Data-Driven Mechanism Design:**
 - How should YouTube pay its content creators?

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Analytics Covered in this Course

- **Prediction**

- Predicts *future* probabilities and trends
- Finds relationships in data that may not be readily apparent with descriptive analysis
- Tools: Machine learning, statistics, etc.

- **Other interesting (and important) stuffs**

- Coding (copiloted by AI) basics
- Data (pre-)processing
- Generative Artificial Intelligence

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This Course

Business Sense

Foundations of Finance;
Introduction to Marketing;
Principles of Financial Accounting;
etc.

Business Intelligence Techniques and Applications

Machine Learning;
Econometrics;
Probability and statistics;
etc.

Quantitative Skills

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Course Objective

- Our goal: Convince you of the tremendous business (and social) value of analytics and further inspire you to use it in your career and life.
- At the end of this course, hopefully, you will
 - Have an open mind about data;
 - Be ready to be convinced by data and quantitative analysis;
 - Be ready to solve a real problem using data and analytics tools (including the AI-powered copilots for coding);
 - Be well-prepared to study more advanced analytics courses.
- This is not a math course, not a data science course, not a computer science course, and not even a business course, but an **inter-disciplinary** course that bridges **business applications** and **analytics methodologies/toolboxes**.
- Connection to real business and **job referral** opportunities.

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Course Content

- **Module 0:** Python and data analysis basics
 - Python coding, descriptive analysis, data visualization
- **Module 1:** Prediction with Machine Learning
 - Supervised learning, unsupervised learning, reinforcement learning, generative AI

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Course Prerequisites

- No prerequisites, but some knowledge of statistics and coding will be useful.
- Highschool math is also assumed.
- Not adverse to programming (everything implemented in Python).
- Not adverse to analytical thinking and quantitative analysis in general.

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Learning by Doing

- Lectures and demonstrations (recordings available on GitHub)
- Extensive cases and data: End-to-end analysis and **problem-solving**
- In-class discussions
- Weekly problem sets and 2 projects
- Laptop
 - Bring a laptop to every class. **Close your laptop until you are asked to use it.**
 - Install the required applications (Python and Anaconda).
 - Download Jupyter Notebooks (from GitHub) to your laptop before each class.
- Attendance is required.

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Course Materials

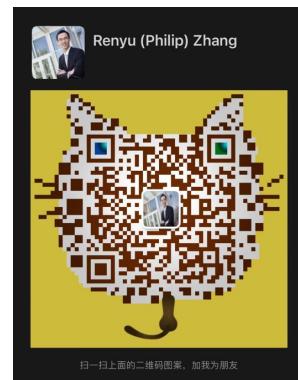
- **Blackboard**
 - Homework Submission
- **GitHub:**
 - <https://github.com/DSME6756-2023/BA-W2023>
- **Anonymous Survey:**
 - [Link to the survey.](#)
 - You are more than welcome to submit any feedback throughout this course.
- **No required text books**
 - Reference books given in the syllabus and provided at GitHub.
- **GPT-Powered Online Tutor:** <https://chat.openai.com/g/g-8WfURSDv9-cuhk-ba-tutor>

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Course Communications

- **Class Meeting:** Monday, 9:30AM-12:15PM (@WMY_508) or 2:30PM-5:15PM (@YIA_LT6)
 - You can choose to go to either Section.
- **Office hour:** Monday, 1:00PM-2:00PM, @CYT_911, or by appointment
- **WeChat group:** Online discussion forum.
- **Instructor contact**
 - Office: CYT_911
 - Email: philipzhang@cuhk.edu.hk
 - Tel: 852-3943-7763
 - WeChat: rphilip_zhang
- **Teaching Assistant:** Qinlu Hu
 - Office hour: By appointment.
 - Email: qinlu.hu@link.cuhk.edu.hk



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Grading

- Class participation, 10%
 - Baseline 6%; lose 2% for each class missed; failing grades for missing 4 or more classes
- Problem sets, $30\% = 6\% \times 5$
 - Due every Monday at 9:30AM before class
 - 5 problem sets with the highest scores will count
- Projects, $20\% = 10\% \times 2$
 - Project 1: A Kaggle competition, due on Monday, February 26
 - Project 2: TBD, due on Sunday, March 3
- Final Exam, 40%
 - 2:00PM-5:00PM, Saturday, March 2
 - Close-book, close-notes, electronic devices NOT allowed

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Grading

- Problem sets and projects submitted via Blackboard:
 - Everyone should **individually** finish and submit his/her **own solutions**, though discussions with others are allowed.
- Regrading:
 - Submit your requests within **7 calendar days** after receiving your grade.
- "Zero-tolerance" policy
 - Any violation of academic integrity is strictly prohibited and will be treated seriously.

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Who Will Find This Course a Nightmare?

- You want an easy A.
- You hate the quantitative/analytical way of thinking and solving problems.
- You hate coding/programming.
- You hate me.

Otherwise, you are very much welcome joining me to enjoy the excitements and challenges of **Business Analytics!**

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Data Scientist vs. Alchemist



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