

## Business Intelligence Techniques and Applications

### Session 1a. Introduction

Renyu (Philip) Zhang

1

#### About Me



2

2

## About Me



3

3

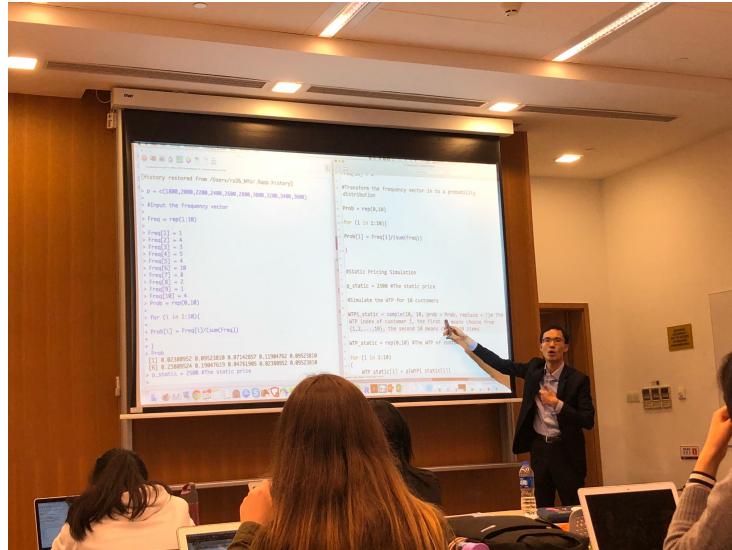
## About Me



4

4

## About Me



5

5

## About Me



6

6

## 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

7

## Who Are You?



8

# What is Business Analytics?



9

9

## 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



10

10

## 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

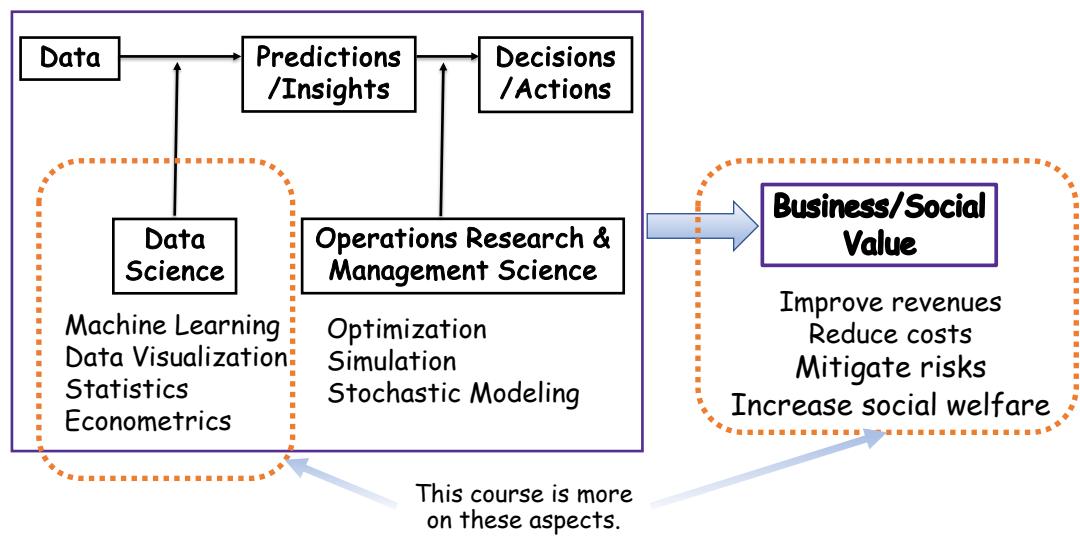
The automated scientific process of transforming **data** into **insights** for making better **decisions** and adding **values** to individuals, companies, and the society.

[https://www.youtube.com/watch?v=5adE\\_cxtSbY](https://www.youtube.com/watch?v=5adE_cxtSbY)

11

11

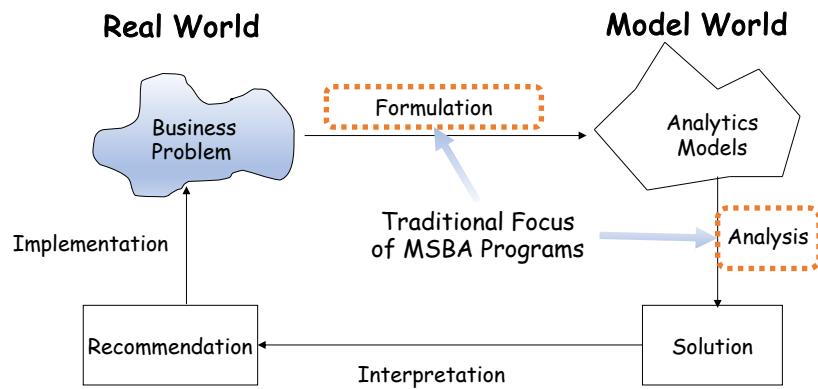
## Data-Driven Decision Making



12

12

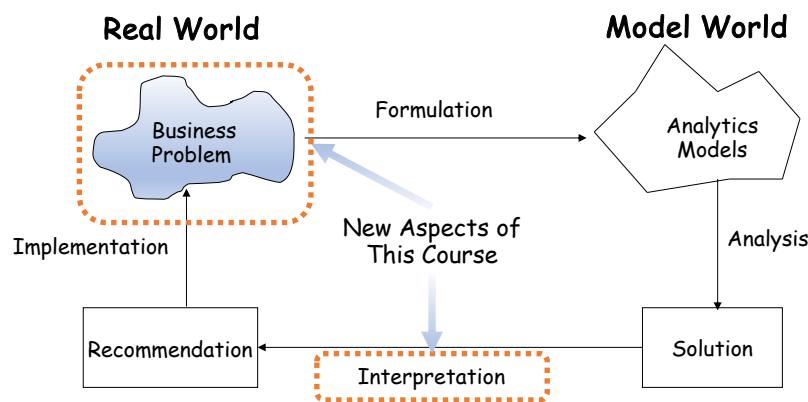
## Business Analytics Procedure



13

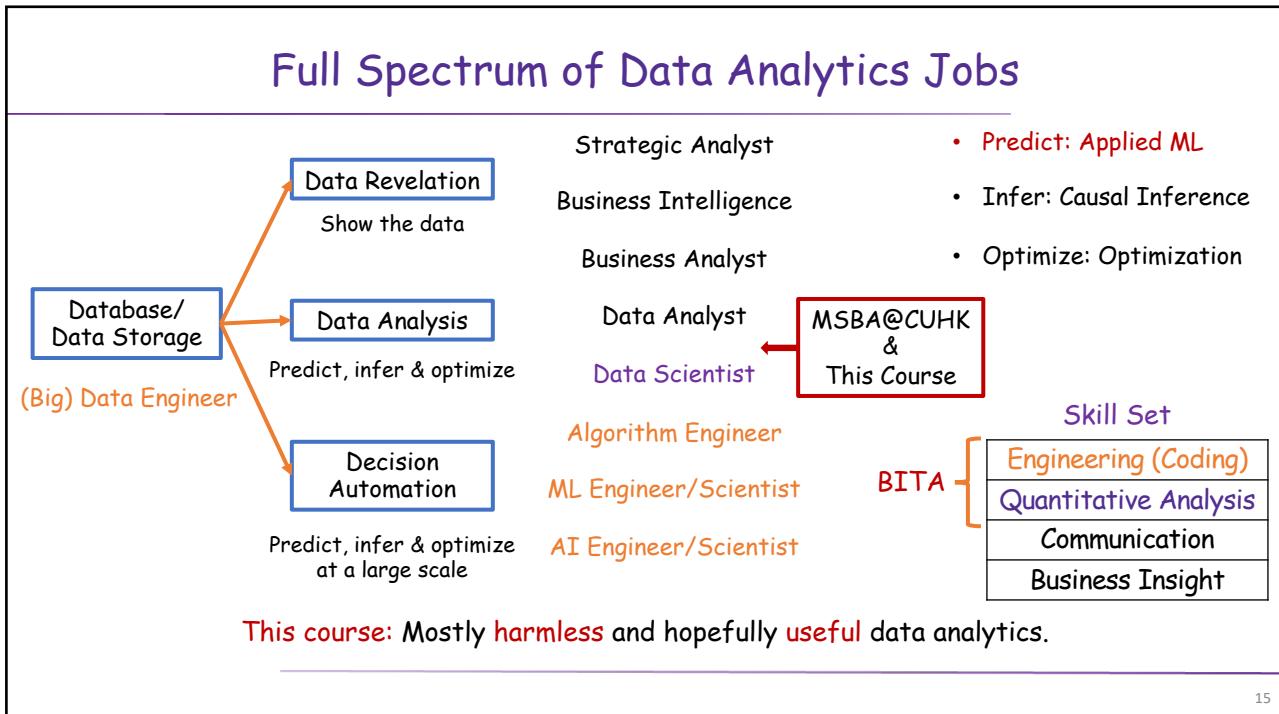
13

## Business Analytics Procedure



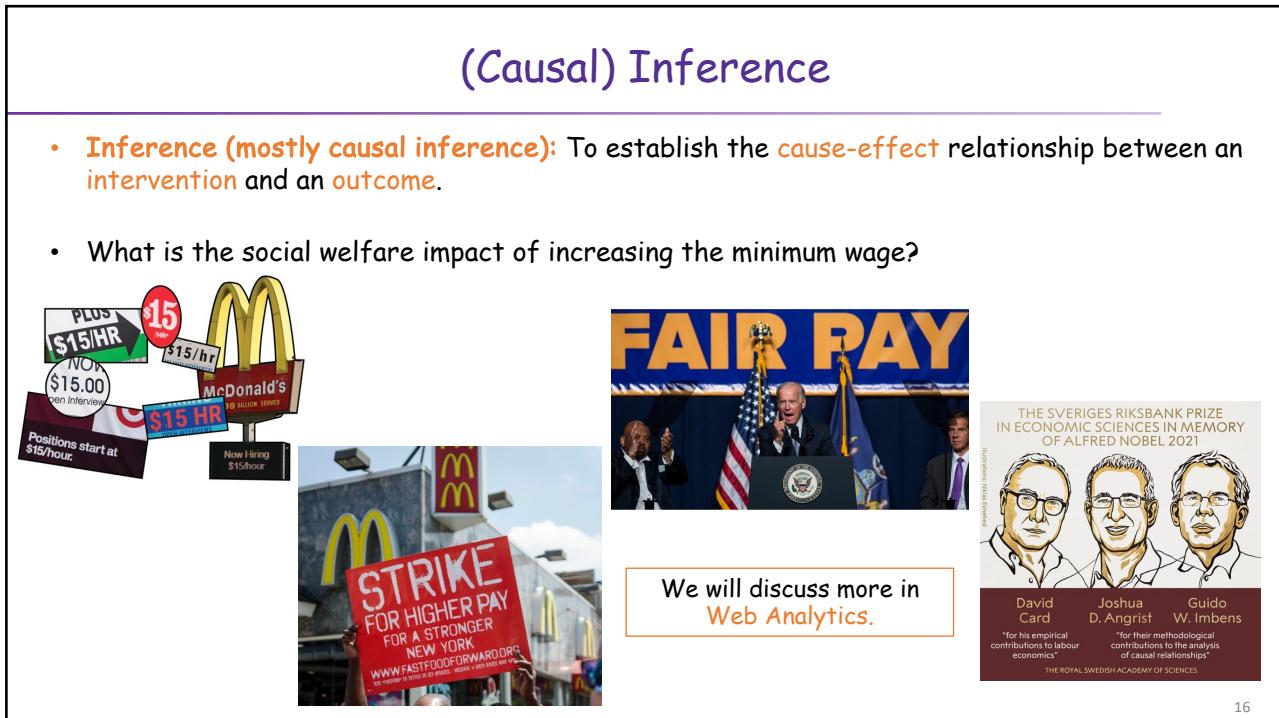
14

14



15

15



16

16

## 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?

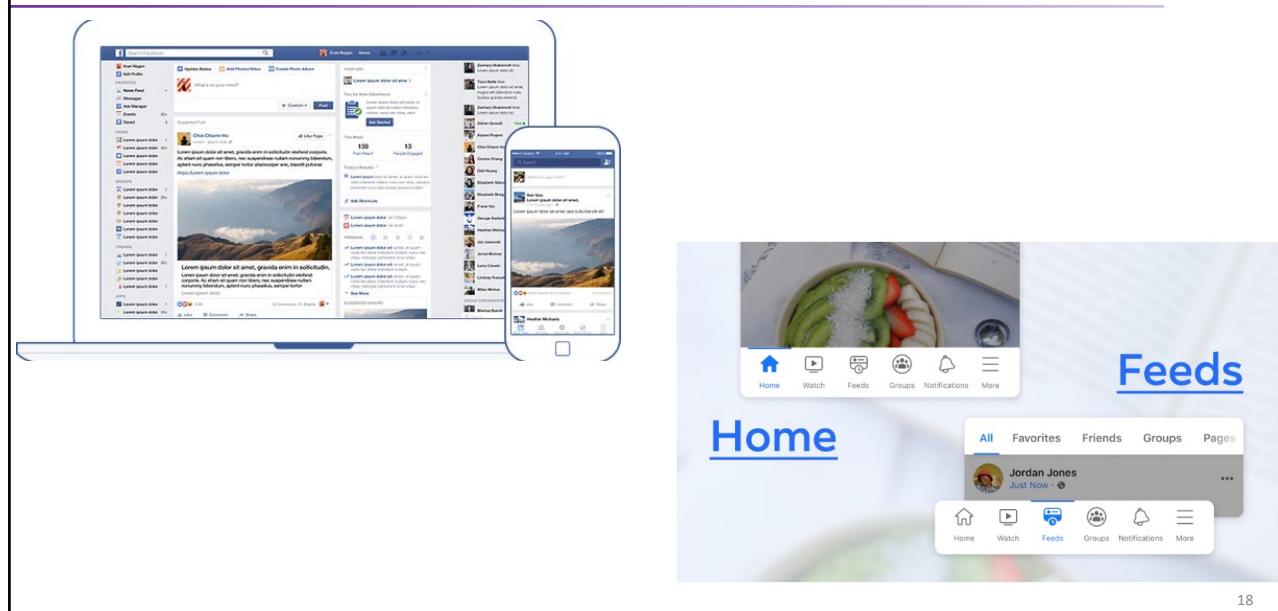


- Revenue of Byte Dance in 2023 H1: 54 Billion USD

17

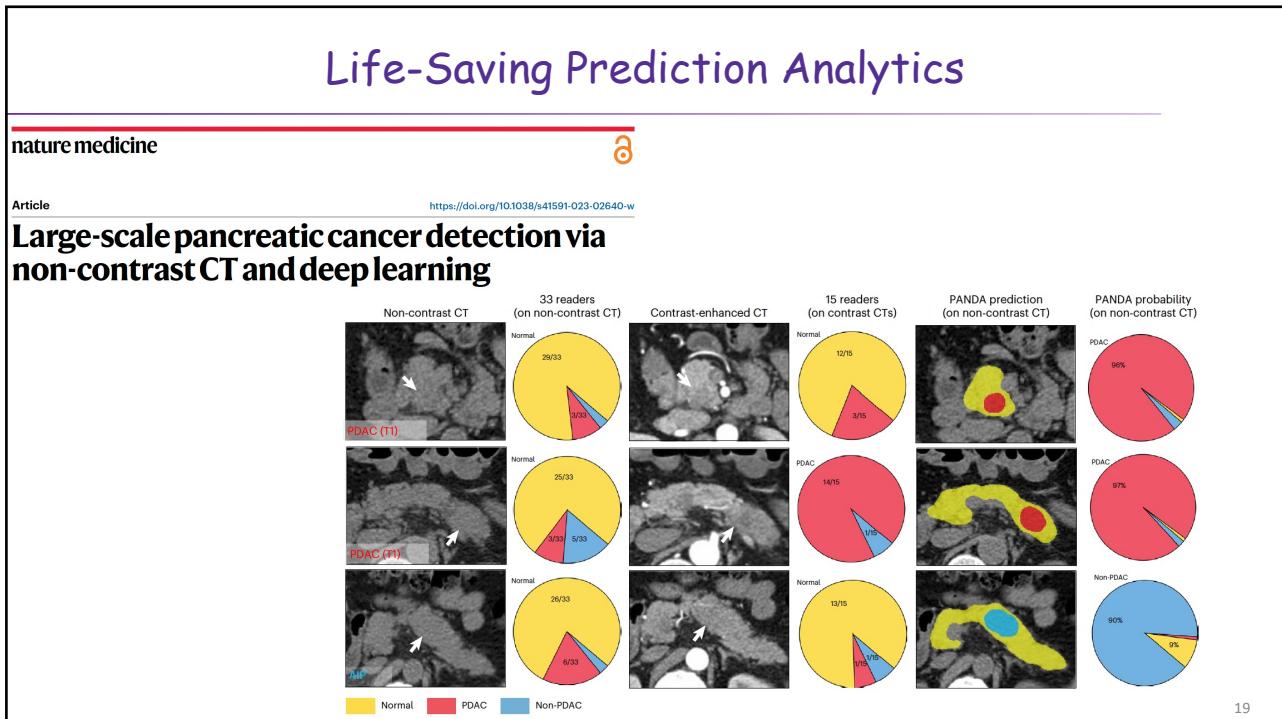
17

## A Multiple-Billion Tale about Prediction Analytics

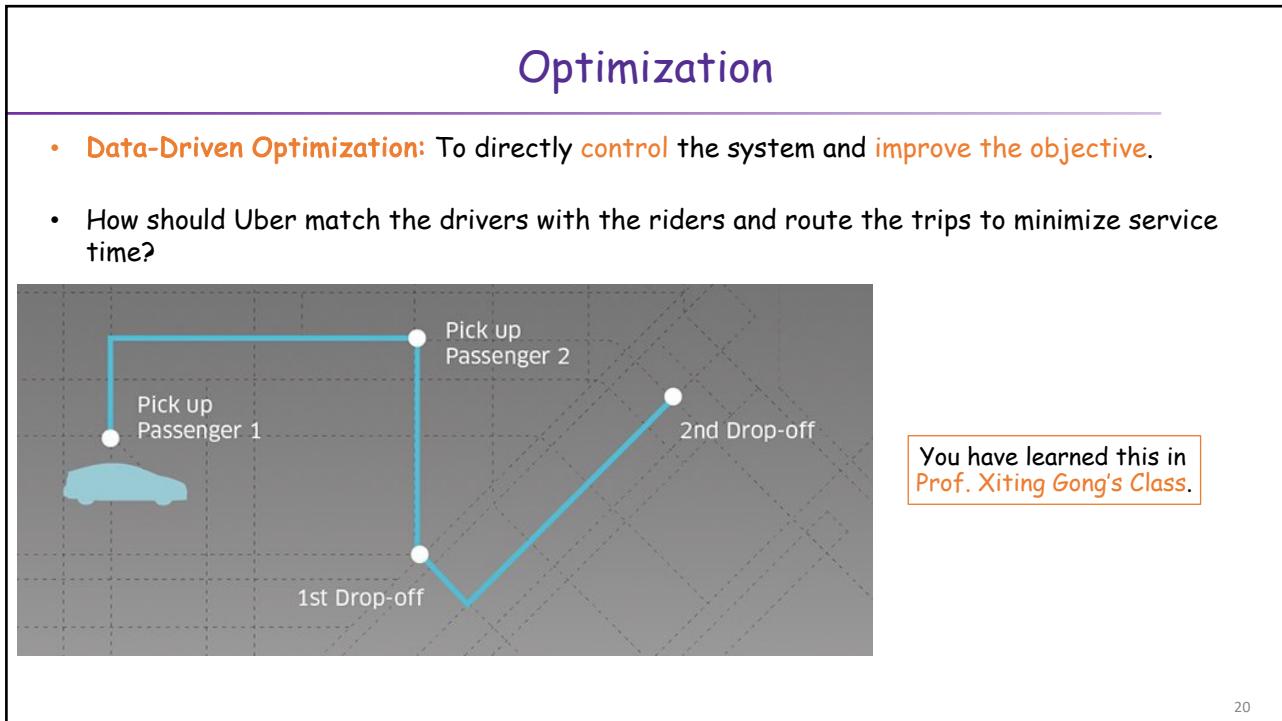


18

18



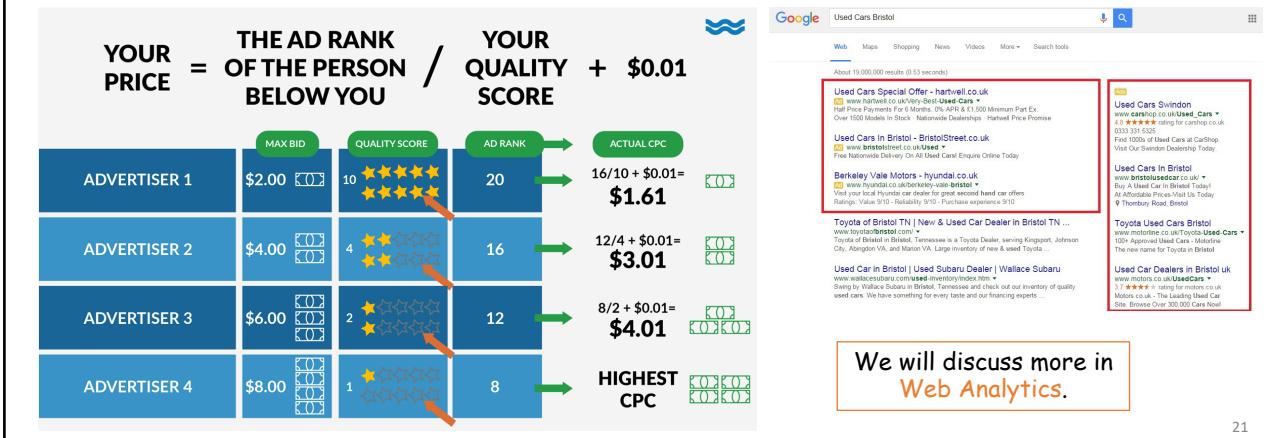
19



20

## 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?



21

21

## Data Analytics Classified by Expertise

- Inference (mostly causal inference):**
  - What is the value of reducing the quarantine time from 4+3 to 0+3?
- 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 on different ads?

22

22

## 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

23

23

## 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

24

24

## 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.

25

25

## 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

26

26

## 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.

27

27

## 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.

28

28

## Course Materials

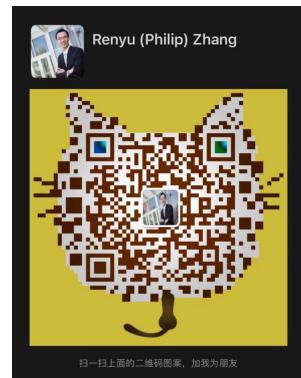
- **Blackboard**
  - Homework Submission
- **GitHub:**
  - <https://github.com/DSME6756-2023/BA-W2023>
- **Anonymous Survey:**
  - [Link to the survey.](#)
  - You are more than welcome to submit any feedback throughout this course.
- **No required text books**
  - Reference books given in the syllabus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

29

29

## 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](mailto: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](mailto:qinlu.hu@link.cuhk.edu.hk)



扫一扫上面的二维码图案，加我为朋友

30

30

## 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

31

31

## 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.

32

32

## 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!**

33

33

## Data Scientist vs. Alchemist



34

34