

Artificial Intelligence for Business Research @Antai

Course Summary

Renyu (Philip) Zhang

1

Homework Assignments

All due at 11:59pm, June 2, 2024, Sunday

- If you have taken the 1st-Half, you should submit Problem Sets 1 & 2, and Replication Project 1.
- If you have taken the 2nd-Half, you should submit Problem Sets 3 & 4, and Replication Project 2.
- You also need to evaluate your teammate(s).
- Each Problem Set is worth 20% and each Replication Project is worth 60% of the final grade.

2

2

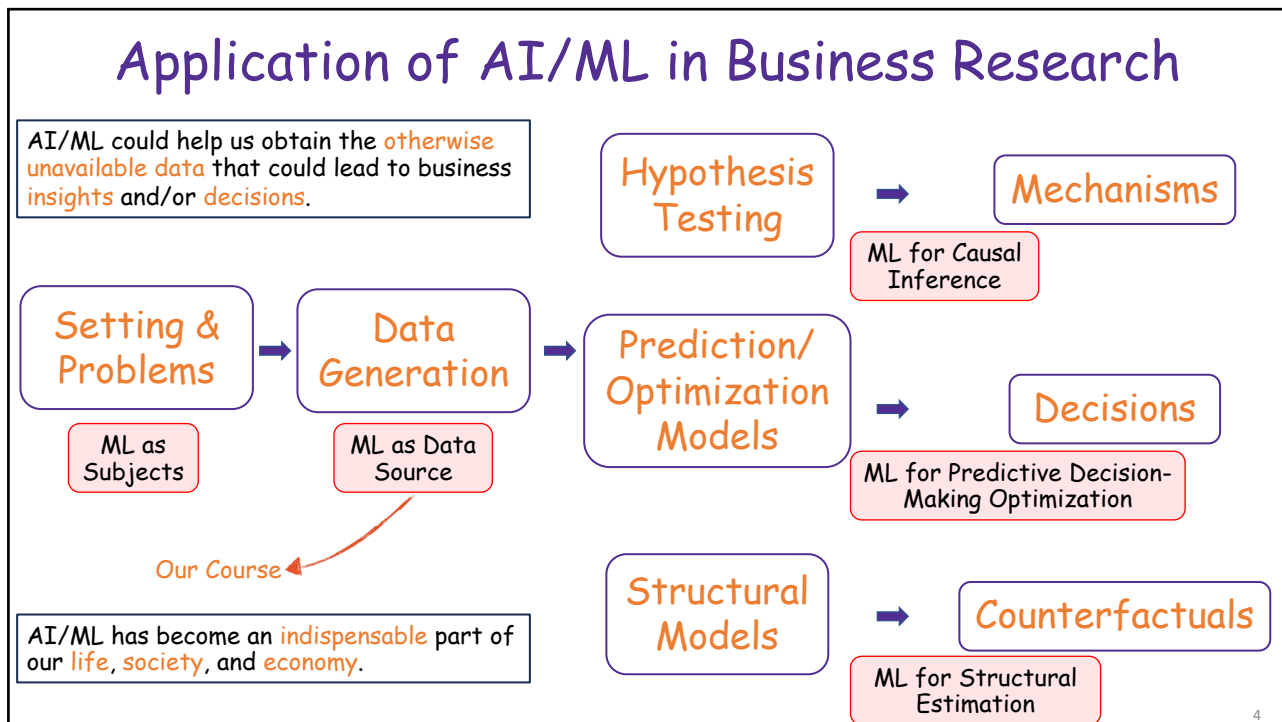
Session	Date & Time	Topic	Key Words
1	May 8, 2:00pm- 5:40pm	AI/ML in a Nutshell	Course Intro, ML Models, DL
2	May 10, 6:00pm- 9:05pm	Prediction and Traditional NLP	Prediction in Biz Research, Pre-processing, N-gram, Naïve Bayes
3	May 11, 6:00pm- 9:05pm	NLP (II): Deep Learning	Word2Vec, RNN, Seq2Seq, Attention, Transformer
4	May 12, 2:00pm- 5:40pm	NLP (III): LLM	BERT, GPT, Emergent Abilities, Chain-of-Thought, In-context Learning, GenAI in Business Research
5	May 15, 2:00pm- 5:40pm	CV (I): Image Classification	CNN, AlexNet, ResNet, ViT
6	May 16, 6:00pm- 9:05pm	CV (II): Image Segmentation and Video Analysis	R-CNN, YOLO, 3D-CNN
7	May 17, 6:00pm- 9:05pm	Unsupervised Learning (I): Clustering & Topic Modeling	GMM, EM Algorithm, LDA
8	May 18, 2:00pm- 5:40pm	Unsupervised Learning (II): Diffusion Models	VAE, DDPM, LDM, DiT

What Happened in the Past 2 Weeks?

- A lot of **Natural Language Processing**.
- Some **Computer Vision**.
- Some **Unsupervised Learning**.
- Decent amount of their **applications in biz/econ research**.

3

3



4

4

Our Goal

1. Have a basic understanding of the **fundamental concepts/methods** in machine learning (ML) and artificial intelligence (AI) that are used (or potentially useful) in business research.
2. Understand how business researchers have utilized ML/AI and what **managerial questions have been addressed by ML/AI** in the recent decade.
3. Nurture a taste of what the **state-of-the-art AI/ML technologies** can do in the ML/AI community and, potentially, in your own research field.



5

5

Course Takeaways

- The **necessary knowledge** of AI/ML that could help you:
 - Keep up with the **literature development** in the relevant domains in both CS and business;
 - Develop the **necessary sense** to do **rigorous business research** using the relevant methods;
 - Identify **important and interesting questions** in your own field where AI technologies are useful;
 - **Invent new applied methods** (most likely without any theoretical guarantee) in your own research.

Impact of a **CS** Paper = Problem Importance * **Technical** Novelty * **Performance** Improvement

Impact of a **Business** Paper = Problem Importance * **Identification** Rigor * **Insight** Novelty

- Academic research is a kind of **craft**: You can only learn by **doing it on your own**.
 - So, take your Replication Projects seriously!

6

6

When Will Things Go Wrong?

- Most AI applications are only useful if actionable insights can be derived:

$$\frac{d\pi(X_0, Y)}{dX_0} = \frac{\partial \pi}{\partial X_0} \underbrace{(Y)}_{\text{prediction}} + \frac{\partial \pi}{\partial Y} \underbrace{\frac{\partial Y}{\partial X_0}}_{\text{causation}}.$$

Your prediction of Y is not accurate.

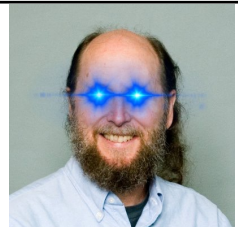
Your causal identification is not clean.

- You should be able to judge whether you should seek for **accurate prediction** and/or **clean identification**.
- Empirical model: $Y = a + b \cdot D + g(X) + \epsilon$
 - Key parameter of interest: b
 - If D is predicted by a ML model, the prediction error is likely to be correlated with ϵ , giving rise to the bias to estimate b .

7

7

The Bitter Lesson



- Reference: <http://www.incompleteideas.net/IncIdeas/BitterLesson.html>
- The biggest lesson that can be read from 70 years of AI research is that **general methods that leverage computation** are ultimately the most effective, and by a large margin.
- Leveraging domain knowledge (short-term & specific) vs. Leveraging computation (long-term & general).
- Bitter lesson: Leveraging domain knowledge is **self-satisfying** and **intellectually inspiring**, but plateaus in the long-run or even inhibits further progress.
- Are you ready to control the machine intelligence to create great knowledge?**

8

8

Want to Learn More?

- This course will be offered again in the next AY at CUHK Business School (and maybe at Antai as well).
 - Feel free to join it (online).
- What to expect:
 - Deep Dive into **Generative AI**
 - Use AI to (a) **generate strategies/content** valuable to business; and (b) **simulate human behaviors** in response to business strategies.
 - AI/ML-based **Causal Inference** (<https://causalml-book.org/>)
 - **Reinforcement Learning**
 - **AI Ethics/Safety/Society** (Ilya left OpenAI on May 15; not sure whether AI will become a new species then.....; <https://www.aisafetybook.com/>)
- Stay tuned and hope to see you all again!

9

9

Keep in Touch

- Stay in contact and keep me posted of your **academic and career successes**.
- Feel free to send me an email/WeChat message. I am always happy to **discuss topics related to AI research and business**. We may work on something interesting together ☺
- Let me know if you need a **job referral** from me to comment on your academic/career potential.

10

10

Finally

Thank You & All the Best!

谢谢!
祝前程似锦!

Renyu (Philip) Zhang
张任宇

philipzhang@cuhk.edu.hk
<https://rphilipzhang.github.io/rphilipzhang/index.html>

WeChat: rphilip_zhang
WhatsApp: 85246828057

Hope to see you all again!

11