

DOTE 6635: Artificial Intelligence for Business Research

Final Words

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Session	Date	Topic	Key Words	What Happened in the Past 3 Months?
1	1.14	AI/ML in a Nutshell	Course Intro, Prediction in Biz Research	
2	1.21	Intro to DL	ML Model Evaluations, DL Intro, Neural Nets	
3	2.04	LLM (I)	DL Computations, Attention Mechanism	
4	2.11	LLM (II)	Transformer, ViT, DiT	
5	2.18	LLM (III)	BERT, GPT	
6	2.25	LLM (IV)	LLM Pre-training, DL Computations	
7	3.04	LLM (V)	Post-training, Fine-tuning, RLHF, Test-Time Scaling, Inference, Quantization	
8	3.11	LLM (VI)	Agentic AI, AI as Human Simulators, Applications in Business Research	
9	3.18	Causal (I)	Causal Inference Intro, RCT	
10	3.25	Causal (II)	IPW, AIPW	
11	4.01	Causal (III)	Partial Linear Models, Double Machine Learning	
12	4.08	Causal (IV)	Double Machine Learning, Neyman Orthogonality	
13	4.15	Causal (V)	Heterogeneous Treatment Effect, Causal Tree, Causal Forest, Course Wrap-up	
13+	Summer	Course Remake	Synthetic Control, Matrix Completion, LLM x Causal Inference, Interference, etc.	

What Happened in the Past 3 Months?

A lot of Large Language Models.

Decent amount of AI-Powered Causal Inference.

Decent amount of their applications in biz/econ research.

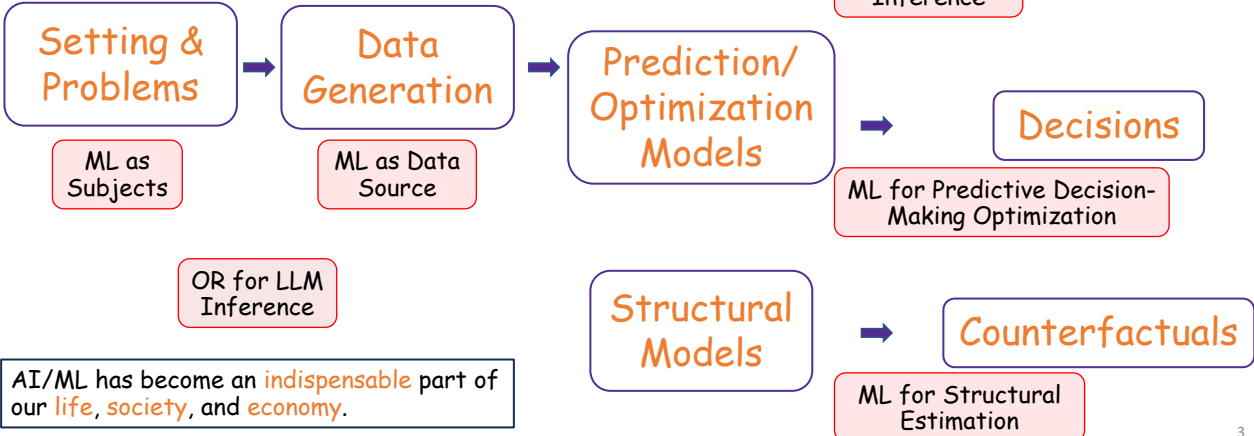
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Application of AI/ML in Business Research

LLM could help us obtain the **otherwise unavailable data** that could lead to business **insights** and/or **decisions**.

AI could power causal inference, **if done right**.



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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.



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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 **final projects** seriously!

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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.

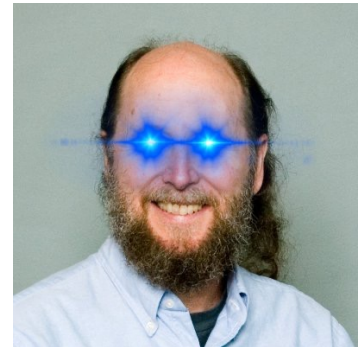
- You should be able to judge whether you should seek for **accurate prediction** and/or **clean identification**.
- Empirical model: $Y = a + b \cdot D + g(X) + \epsilon$
 - Key parameter of interest: b
 - If D is predicted by a ML model, the prediction error is likely to be correlated with ϵ , giving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

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The Bitter Lesson

- References: <http://www.incompleteideas.net/IncIdeas/BitterLesson.html>
<https://www.youtube.com/watch?v=vbVfAqPI8ng>
- 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?**



Prof. Richard Sutton

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What to Expect Next Year?

- This course will be offered again in the next AY.
- What to expect in Spring 2026:
 - Reinforcement Learning
 - Agentic AI
- Reading group in Fall 2025:
 - AI Economics, Ethics, Safety, etc.
- Stay tuned and hope to see you all again!

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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 technology, business 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.

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Finally

Thank You & All the Best!

谢谢!
祝前程似锦!

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Hope to see you all again!

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