DOTE 6635: Artificial Intelligence for Business Research

What's Next in DOTE 6635

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📅 Brief Schedule

Subject to modifications. All classes start at 12:30pm and end at 3:15pm.

Session	Date	Topic	Key Words
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
10	3.25	Causal (II)	ML-Powered Causal Inference, Causal Trees and Forests
11	4.01	Causal (III)	Double Machine Learning, Neyman Orthogonality
12	4.08	Causal (IV)	RL, Off-Policy Evaluation
13	4.15	Causal (V)	LLM x Causal Inference and Course Wrap-up

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Note Scribing Schedule

Session	Date	Content	Group	Group Name	Group Member 1	Group Member 2
1	Jan/14	Course Introduction	5	42	Wang Tao	LIU Zhe
2	Jan/21	Deep Learning Introduction	1	Li-Wang	LI, Guohao	Wang, Jin
3	Feb/04	LLM (I)	2	group 2	Li, Keming	Huang, Qilin
4	Feb/11	LLM (II)	4	CD	WU Di	SUN Chuchu
5	Feb/18	LLM (III)	6	Group 6	Chao Yiquan	SHENG An
6	Feb/25	LLM (IV)	8	Group 8	QIN Xiqing	CHEN Yuxin
7	Mar/4	LLM (V)			Shu Zhang	Xinyu Xu
8	Mar/11	LLM (VI)	3	Group3	Lin, Mengyang	Zhang, Bingqi
9	Mar/18	Causal (I)	10	Group10	LAI Ningfan	JIANG Yu
10	Mar/25	Causal (II)	7	Group 7	Zizhou Zhang	Lin Ma
11	Apr/1	Causal (III)	9	Group 9	Yi Jiaci	Wang Yachong
12	Apr/8	Causal (IV)				
13	Apr/15	Causal (V)				

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Final Project

- You should schedule a meeting (online or offline) with me to discuss about your final project.
  - I suggest you do so before submitting your mid-term report.

- You need to submit a 1-page proposal by 12:30pm on March 11 (soft deadline), articulating your research problem, the data you plan to collect (or have collected), and the AI method you plan to use.

- You need to complete a (short, no more than 10 pages excluding references and appendices) research paper (with research question, data, implementation and, at least partial, results).

- You will also need to record a video (no more than 15 minutes) of your final project.

- Both the paper and the video will be due in early May.

- You will be judged by:
  - (20%) Research questions and methodologies;
  - (40%) Execution and results;
  - (20%) Presentation;
  - (20%) Writing of final paper.

- The paper should be either empirical or ML-methodological (unless with justifiable reasons).

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Final Project

- Answer the following questions before working on your chosen project:

  - Why do I think this is an interesting research question to business/econ audience? Will I make methodological or empirical contributions?

  - Why do I think this data set is good enough for me to answer this question? How will my results depend on the outcomes of the data?

  - Am I using the cutting-edge AI/ML technologies to solve this problem? Why or why not?

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Data Sets

- CS Datasets:
  - Kaggle
  - Packages
  - Papers that publish datasets

- Econ Datasets:
  - FOMC, 10-K, government contracting, census data, and other government datasets
  - Papers that publish datasets

- Business Datasets:
  - Published datasets from companies, such as Tmall, JD.COM, Tweet (X), Yelp and Reddit (most of them are on Kaggle)
  - A lot of UTD journals require publicizing data for replication (JF, RFS, IJoC, JM, MktSci, ManSci, OR, and ASQ).
  - Proprietary datasets

- Other Datasets:
  - Scraped data
  - Crypto

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Final Project

At your earliest convenience, please submit to me by email a one-page proposal of your final project, articulating your research problem, the data you plan to collect (or have collected), and the AI method you plan to use.

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Tentative Schedule for the Rest

9	3.18	Causal (I)	Causal Inference Intro, RCT, IPW, AIPW
10	3.25	Causal (II)	Double Machine Learning, Neyman Orthogonality
11	4.01	Causal (III)	ML-Powered Causal Inference, Causal Trees and Forests
12	4.08	Causal (IV)	(Off-)Policy Evaluation, Policy Learning
13	4.15	Causal (V)	LLM x Causal Inference and Course Wrap-up

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Tentative Schedule for the Rest

Mar 18, 2025

Please remember to implement causal forest for HTE.
- Durably reducing conspiracy beliefs through dialogues with AI [Link]

Mar 25, 2025

Please replicate Figure 7 with synthetic data.
- Deep Learning Based Causal Inference for Large-Scale Combinatorial Experiments: Theory and Empirical Evidence [Paper Link] [GitHub Link]

Apr 1, 2025

Can you think of other methods to de-bias the causal estimates under interference?
- A Bias Correction Approach for Interference in Ranking Experiments [Link]

Apr 8, 2025

It will be great if you can replicate both papers. Replicating one will suffice for full credit.
- Artificial Intelligence, Algorithmic Pricing, and Collusion [Link]
- Algorithmic Collusion by LLM [Link]

Apr 15, 2025

Please introduce the detailed implementation/parameter tuning procedures (in the Appendix of this paper) in your presentation.
- Smart Green Nudging: Reducing Product Returns Through Digital Footprints and Causal Machine Learning [Link]

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What's Next?

Date	Session	Topics	Replication
March 25	10	IPW, AIPW, DML	DML
April 1	11	DML, Neyman Orthogonality, Interference	Interference
April 8	12	Causal Trees, Causal Forests	Algorithmic Collusion
April 15	13	Causal Forests, Synthetic Control, Matrix Completion, LLM x Causal, Course Wrap-up	Green Nudge and Causal Machine Learning
April 29, 11:59pm	N.A.	Scribed Lecture Notes Due	
May 10, 11:59pm	N.A.	Project Paper, Slides, Video, and Code Due	
May 12	N.A.	I need to submit the grades to DOT Department…	

- We will NOT schedule project presentations in class, but feel free to schedule individual meetings with me to discuss about your projects.

- With your permission, the scribed lecture notes, project papers, slides, videos, and code will be shared with the students who take this course for credit.

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