Monthly Research Progress

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1. Modeling Problems as Graphs

2. Recommendation Systems

3. Counterfactual Learning

4. Counterfactual Learning on Graphs

Modeling as Graph Theoretic Problems

- Graphs for representing objects, complex interactions
- Domains where the problems are modeled as graphs
    1. Social Networks
    2. Chemical Compounds
    3. Knowledge Graphs
    4. Recommendation Systems

Recommendation Systems

- Recommendation is viewed as a system involving **Users and Items**
- Basic models of Recommendation systems work with 2 kinds of data
    1. User Item Ratings
    2. Associated attributes of the user and items

Blocks of Highlighted Text

In this slide, some important text will be highlighted because it's important. Please, don't abuse it.

> **Block**
>
> Sample text

> **Alertblock**
>
> Sample text in red box

> **Examples**
>
> Sample text in green box. The title of the block is "Examples".

Multiple Columns

Heading

1. Statement
2. Explanation
3. Example

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Integer lectus nisl, ultricies in feugiat rutrum, porttitor sit amet augue. Aliquam ut tortor mauris. Sed volutpat ante purus, quis accumsan dolor.

Counterfactual Learning

- Counterfactual learning gives a chance to alleviate the intrinsic bias making models interpretable and exploiting the information stored in data well
- Counterfactual comes from the research community of causal inference.
- 2 main concepts
  1. Counterfactual Fairness: prediction for an individual is fair if it remains the same in a counterfactual world where the individual belongs to a different demographic group
  2. Counterfactual Explanation
- Besides the aid on fairness and interpretability, the research community also utilizes counterfactual learning to provide additional information from the counterfactual world [Guo et al., 2025]

- Compared with traditional statistical models, causal models have better generalization ability in modeling real-world systems

Treatments	Response 1	Response 2
Treatment 1	0.0003262	0.562
Treatment 2	0.0015681	0.910
Treatment 3	0.0009271	0.296

Table: Table caption

Theorem

> **Theorem (Mass–energy equivalence)**
>
> $E = mc^2$

Figure

Uncomment the code on this slide to include your own image from the same directory as the template .TeX file.

Counterfactual Learning on Graphs

- Recent works on graph counterfactual learning have shown great potential to overcome the aforementioned challenges on fairness, explanation, etc.

Citation

An example of the \cite command to cite within the presentation:

This statement requires citation [Guo et al., 2025].

References

Guo, Z., Wu, Z., Xiao, T., Aggarwal, C., Liu, H., and Wang, S. (2025).
Counterfactual learning on graphs: A survey.
Machine Intelligence Research, 22(1):17–59.

The End