

# Marko Veljanovski

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## EDUCATION

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### University of Michigan

*PhD in Computer Science and Engineering*

Ann Arbor, MI

*Aug. 2025 – May 2030*

- Coursework: Machine Learning, Human Computer Interaction

### Northwestern University – McCormick School of Engineering

*BS in Computer Science, Mathematics*

Evanston, IL

*Sept. 2021 – June 2025*

- GPA: 3.97/4.00
- Graduate Coursework: Advanced Topics on Deep Learning, Probabilistic Graphical Models, Statistical Language Modeling, Deep Learning, Measure Theory
- Member of Tau Beta Pi Engineering Honor Society

## RESEARCH PROJECTS

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### Invariant Risk Minimization for Large Language Models

June 2024 – May 2025

- Work from my undergraduate honors thesis advised by Prof. Zach Wood-Doughty, presented at ACIC 2025.
- Wrote and was awarded a Northwestern CS Undergraduate Innovation Fellowship to pursue the project.
- Investigate the effectiveness of applying IRM to LLM fine-tuning and explore potential optimization adjustments to improve their OOD generalization.
- Adapt a synthetic data-generating process to create text with controlled correlation ( $\tau$ ) and preference strength ( $\delta$ ) using a modified Zipfian distribution, enabling a comparison of IRM and ERM as we vary  $\tau$  and  $\delta$ .

### Causally Sufficient Dimension Reduction for Text Data

Feb. 2024 – Present

- Third author paper (ongoing) advised by Prof. Zach Wood-Doughty and Kayla Schroeder (PhD student).
- Helped develop and test a causally sufficient dimension reduction estimator for text, focusing on validating predictive accuracy on Latent Dirichlet Allocation-based synthetic datasets.
- Achieved substantial accuracy gains, demonstrating reduction in prediction error compared to baseline methods.

### FAST: Feed-Forward Assisted Transformers for Time Efficient Fine-Tuning

Sept. 2023 – Feb. 2024

- First co-author research project ([pre-print](#)) in efficient AI with other Northwestern undergraduates.
- Won third overall and first among US university submissions at the 2023 ProjectX competition hosted by University of Toronto.
- Developed a novel approach to fine-tuning transformers that achieves an 80-170x speedup compared to full and common parameter-efficient fine-tuning methods while obtaining higher accuracy than similarly efficient models.

### European integration and economic growth in emerging Europe

Mar. 2023 – Feb. 2024

- Second author paper advised by Profs. Aleksandar Stojkov and Thierry Warin.
- Published in [Post-Communist Economies](#) and presented at [IT&FA2023](#).
- Utilized Double Machine Learning (DML) with causal forest residual regression to enable the analysis of heterogeneous treatment effects of governance on economic growth.

### DoubleLingo: Causal Estimation with Large Language Models

June 2023 – Oct. 2023

- First author paper advised by Prof. Zach Wood-Doughty.
- Wrote and was awarded a McCormick Summer Research Award and Fellowship to pursue the project.
- Published at [NAACL 2024](#) Main Conference and presented at ACIC 2024.
- Designed first causal estimator to utilize Double Machine Learning (DML) with LLM-based nuisance parameters.
- Achieved best results on a novel text-based RCT dataset – over 10% decrease in causal effect error compared to current best models in the literature.

### Cross-domain Abstractive Summarization through Incremental Fine-tuning

Mar. 2023 – June 2023

- Research project advised by Prof. David Demeter.
- Designed CRAFT, a custom abstractive summarization model with a new incremental fine-tuning method that further trains the model on semantically similar sentences.
- Achieved higher ROUGE scores (R1/R2/RL) than a baseline PEGASUSLARGE on CNN.

## TEACHING & LEADERSHIP EXPERIENCE

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### Undergraduate TA (Peer Mentor)

Mar. 2023 – June 2024

*Northwestern University Department of Computer Science*

*Evanston, IL*

- Undergraduate TA for Causal Inference (Spring 2024), Machine Learning (Fall 2023, Summer 2023), Data Structures and Algorithms (Spring 2023).
- Held weekly office hours and graded students' assignments, midterms, and final exams.

### Northwestern Robotics Drone Team Lead

Jan. 2022 – Sep. 2023

*Northwestern University Robotics Club*

*Evanston, IL*

- Directed and managed the Northwestern Robotics Drone Team, attending weekly meetings in the executive board.
- Designed and developed a fully autonomous drone for box pick-up/transport, integrating real-time object detection and PID control loops.
- Trained and fine-tuned SSD-MobileNet real-time object detection models on an NVIDIA Jetson Nano.

## AWARDS

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2025 CRA Outstanding Undergraduate Researcher Award: Honorable Mention

2024 CRA Outstanding Undergraduate Researcher Award: Honorable Mention

Northwestern CS Undergraduate Innovation Fellowship

Peter and Adrienne Barris Outstanding Peer Mentor Award

McCormick Summer Research Award and Fellowship

Northwestern IEEE Impact Award

Northwestern McCormick School of Engineering Dean's List (9/9 quarters)

## PUBLICATIONS

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**Marko Veljanovski**, and Zach Wood-Doughty. *DoubleLingo: Causal Estimation with Large Language Models*. 1 Jan. 2024, pp. 799–807, <https://aclanthology.org/2024.naacl-short.71/>.

Aleksandar Stojkov, et al. "European Integration and Economic Growth in Emerging Europe: The Role of Institutions and Policy Factors." *Post-Communist Economies*, vol. 36, no. 7, 1 Sept. 2024, pp. 778–800, <https://doi.org/10.1080/14631377.2024.2376974>.

## PRESENTATIONS

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Presented *Invariant Risk Minimization for Large Language Models* at Northwestern's 2024 Fall Research Showcase.

Presented *DoubleLingo: Causal Estimation with Large Language Models* at the 2024 Annual Conference of the North American Chapter of the Association for Computational Linguistics.

Presented *DoubleLingo: Causal Estimation with Large Language Models* at the 2024 American Causal Inference Conference Organized by the Society for Causal Inference.

Presented *DoubleLingo: Causal Estimation with Large Language Models* at Northwestern's 2023 Fall Research Showcase.