Course Title: Applied Methods in Digital Economy Research (6219)

Instructor: Michael Kummer

Course Description: This PhD-level course explores advanced topics at the intersection of causal analysis and digitization. We will delve into the theoretical foundations and practical applications of causal analysis in the context of analysing digitization and online platforms, covering topics such as causal inference methods, machine learning, and research methods in digitized environments.

A special focus will be on how to read and evaluate the scientific literature in this field and how to write effectively to produce more impactful research papers.

Week 1: Introduction to Causal Inference in Digitization

- Overview of causal analysis in digitization
- Theoretical foundations of causal inference
    - OLS
- Challenges and opportunities in digitized environments
- **Methods:**
    - Daily Goals and Time Log.
    - Reading Log – Bibtex etc.
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Week 2-3: Causal Inference Methods

- Counterfactual reasoning and potential outcomes
- Propensity score matching
- Instrumental variables and regression discontinuity design
- **Methods:** How to read scientific literature

Week 4-5: Experimental and Quasi-Experimental Designs

- Randomized controlled trials in digital contexts
- Quasi-experimental designs and their applications
- Evaluating causality in observational studies
- **Methods:** How to write effectively
- **Research Projects.**

Week 6: Machine Learning and Causal Inference

- Integration of machine learning in causal analysis
- Treatment effects estimation using machine learning

- Challenges and best practices
- **Methods:** Reproducability and
- **Final Allocation of Research Projects**

Break:

Week 7-9: Applications in Digitization and Ethical Considerations

- Causal analysis in social media and online platforms
- Digital healthcare and causal inference
- Privacy and ethical concerns in data collection
- Bias and fairness in causal analysis
- Policy implications and decision-making in the digital age

Week 10-11: Research Paper Presentations and Discussions

- Students present and discuss research papers in the field
- Students present and discuss their own writing.
- Critical analysis and synthesis of current literature

Week 12: Final Projects and Wrap-Up

- Group projects applying causal analysis to real-world digitization challenges
- Final presentations and reflections

Assessment:

- Class participation and discussions: 15%
- Research paper presentation: 20%
- Assignments and quizzes: 15%
- Group project: 30%
- Final exam: 20%

Textbooks:

1. "Causal Inference for Statistics, Social, and Biomedical Sciences" by Guido W. Imbens and Donald B. Rubin
2. Mostly Harmless Econometrics, by Josh Angrist & Stephen Pischke
3. "Ethics of Big Data: Balancing Risk and Innovation" by Kord Davis and Doug Patterson
4. Selected research papers and articles.

Prerequisites: Background in statistical methods, machine learning, and prior coursework in digital technologies or data science.