Praxis der Forschung: *Applying Causal Machine Learning in Conflict Research*

Recent quantitative and predictive research on interstate and intrastate conflict and war is based on fine-grained spatial and temporal data. Thus, we know where (geolocations or grid cells of varying sizes) and when (day-wise, week-wise) military conflict happens (binary), who is involved (e.g. rebel group x, government y), how many fatalities (counts), which actors (civilians, military personel) are harmed, or which buildings and infrastructures are destroyed. For preventive and post-conflict recovery policies it is necessary to predict and monitor these processes. There is an extensive forecasting literature based on machine learning (ML) (see the most recent prediction competition here: https://www.prio.org/news/3602, https://doi.org/10.1177/00223433241300862). Based on existing contributions (Racek et al., 2025, Racek et al., 2024, Fritz et al., 2022) we would like to enhance causal ML (Feuerriegel et al. 2024, Chernozhukov et al., 2025) in statistical conflict explanation and forecasting. Using high-dimensional data consisting of structural embedding covariates and remote sensing data, we intend to identify the causal impact of different, selected interventions as treatments: local foreign aid, terrorist attacks, economic shocks, climatic shocks etc.).

Research Focus for Students:

1. Understanding Causal Machine Learning:
    - Students will explore different causal ML frameworks.
    - They will study how traditional ML compares to causal ML.
2. Methods for identifying Causal Effects:
    - Students will investigate methods to quantify causal effects, including double machine learning and individual causal treatment effects.
    - They will identify the most suitable framework to answer the applied questions above.
3. Understanding Current Machine Learning Approaches in Conflict Research:
    - Students will explore the most recent forecasting competition (see Hegre et al. 2025) and the available replication packages
4. Identifying a New Design Based on Causal ML
    - Students will develop a methodical and empirical design with the team. Data will be provided but hmustbe processed by the students.
5. Conducting Data Analysis
    - Based on the findings students will conduct the data analysis and investigate the resul.

Contact:

For further information, please contact Prof. Dr. Nadja Klein (nadja.klein@kit.edu), Agostino Ruta (Agostino.ruta@kit.edu) and Jan Wenkel (jan.wenkel@kit.edu). The project will be co-supervised by Prof. Dr. Paul W. Thurner (LMU Munich) (paul.thurner@gsi.uni-muenchen.de).

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