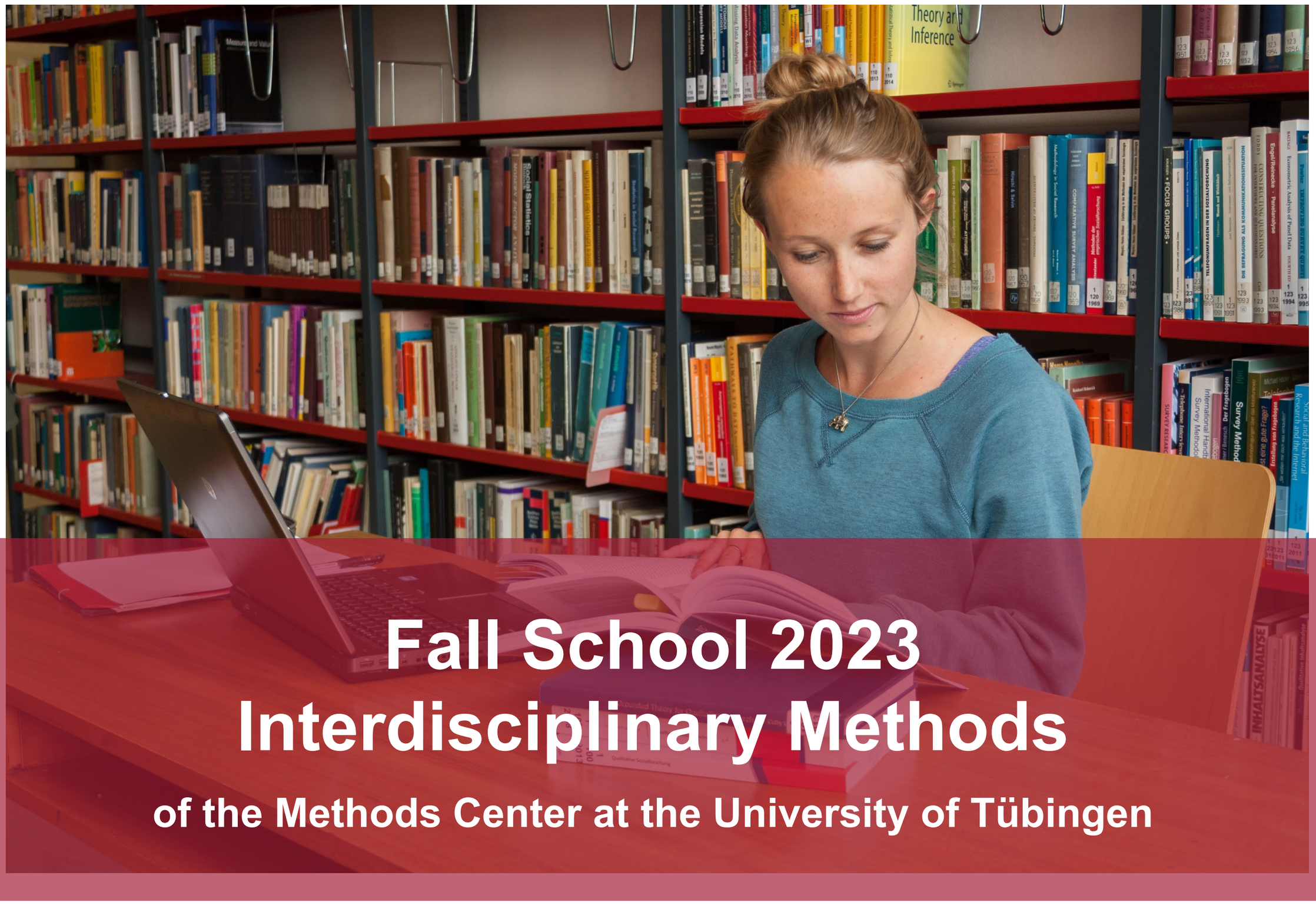
EBERHARD KARLS
UNIVERSITÄT
TÜBINGEN

Wirtschafts- und Sozialwissenschaftliche Fakultät
Methodenzentrum



Fall School 2023
Interdisciplinary Methods

of the Methods Center at the University of Tübingen

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October 12 and 13, 2023

WS 1: Introduction to causal inference: a machine learning perspective – *Uri Shalit*
WS 2: Qualitative Comparative Analysis – *Judith Glässer*

The Methods Center at the University of Tübingen cordially invites **PhD candidates, postdoctoral researchers, and professors** to join our Spring School.

If you are interested joining, please write an **email to office@mz.uni-tuebingen.de** attaching the filled out **registration form** (see the QR code).

The **application deadline** is **September 30, 2023**. Please be aware that we fill the spots in the workshops in the order of the registration.

Please find further information on our website:
https://uni-tuebingen.de/de/235412

Introduction to causal inference: a machine learning perspective
Uri Shalit (Technion – Israel Institute of Technology)

Causal inference is a scientific paradigm which teaches us when and how can we use data to learn the effects of actions. It has wide applications in diverse fields, including medicine, economics, and social science. More recently, ideas from causal inference have been influential in machine learning, for example when addressing problems such as out-of-distribution generalization and offline reinforcement learning.

In the tutorial we will aim to cover the following subjects:

1. Identifying problems and use cases which require causal inference
2. The mathematical languages of causality: potential outcomes and causal graphs
3. Practical methods for estimating population-level and individual-level treatment effects, including a discussion of machine learning methods for these tasks
4. A real-world use case in the field of healthcare
5. Causal ideas in modern machine learning: domain generalization and reinforcement learning

Prerequisites:

- Basic knowledge of probability theory: probability distributions, expectations, conditioning, etc.
- Basic knowledge of statistics and/or machine learning: Linear and logistic regression, training and test set, mean squared error, generalization, etc.
- Familiarity with handling data using Python and the scikit-learn library (or R)

Qualitative Comparative Analysis (QCA)
Judith Glaesser (University of Tübingen)

Based on formal logic, set theory and Boolean algebra, Qualitative Comparative Analysis (QCA) is a research method used to analyse combinations of conditions which are sufficient and/or necessary for the outcome under study. Developed by the political scientist and sociologist Charles Ragin, QCA focuses holistically on cases as combinations of factors rather than on the relationship between variables (as correlation-based methods such as regression analysis do). While it was developed in a case study tradition where just a small number of cases form the focus of an analysis, it is well suited to analysing large n datasets. Thus, while combining elements from qualitative as well as quantitative research approaches, it is genuinely innovative in transcending the qualitative-quantitative divide.

This workshop provides an introduction to QCA in its crisp, fuzzy and multi-value variants as well as practice sessions on the application of QCA using fsQCA and R software (package QCApro). Researchers are welcome to bring their own data if they wish to analyse them using QCA, but this is no requirement; practice datasets will be provided. No prior knowledge of QCA or any particular software is assumed.