Probabilistic Forecasting:

What Makes a Good Forecast?

This version: (First official draft)

Course instructors

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Location

Campus Heilbronn

Application and registration procedure

Goal and target audience
In this course, we will develop a principled framework for forecast evaluation, guiding good practices in forecasting. A particular focus will be put on embracing forecast uncertainty through the use of probabilistic forecasts. The course is aimed at doctoral candidates with a basic understanding of (and some interest in) statistics and probability.

Application/Registration process
There is a limit of 15 participants maximum for this course. Please use the official application procedure for the TUM MGT Doctoral Summer School.

The application starts on June 3, 2024, 12:00 noon. The deadline for application is June 30, 2024, end of day. Registration works on a first come, first served basis. Registration is only possible for doctoral candidates of TUM School of Management.

Please find the link for registration here: https://www.mgt.tum.de/faculty-research/doctoral-program/course-program

Course aims

What this course is
The course serves as an introduction to forecast evaluation and principled probabilistic forecasting. The course introduces theory and concepts underpinning forecast evaluation, as well as tools to assess forecast quality in practice.

What this course is not
The course does not provide a comprehensive introduction to predictive modeling. Instead, the theory and tools will be illustrated on simulated as well as real data examples (case studies).
Course objectives

Knowledge, Skills and Learning Objectives

We will discuss

- concepts such as forecast calibration (reliability) and sharpness (discrimination);
- various types of forecasts:
  - probabilistic (density) forecasts for uncertainty quantification,
  - point predictions and how to make sense of them despite forecast uncertainties,
  - other types of forecasts such as prediction intervals conveying uncertainty;
- tools to assess calibration such as PIT histograms and reliability diagrams;
- summary measures of forecast performance provided by
  - proper scoring rules,
  - consistent scoring or loss functions,
  - score decompositions;
- regression, as well as model diagnostics, from a predictive perspective;
- combination of predictive distributions.

The course enables doctoral candidates to apply these tools in their own research to identify good forecasts, as well as potential shortcomings in poor forecasts. The practical relevance of the course materials will be illustrated throughout using multiple case studies.

Preliminary schedule

The course takes place in the second week of the TUM MGT Doctoral Summer School from September 16 to September 20, 2024. Please refer to the schedule for the Summer School for further details on the course schedule. The schedule for the Summer School can be found in the digital flyer on the Summer School: https://www.mgt.tum.de/faculty-research/doctoral-program/course-program

Core readings


Further references will be shared during the course.

Course procedures

The course will feature a mix of lectures and lab sessions. The lectures will be accompanied by class discussions. For the lab sessions doctoral candidates will be provided with a variety of exercises both on theoretical aspects and practical applications of the course materials. Doctoral Candidates are free to choose what exercises to work on. The statistical programming language R will be used for code examples and programming exercises.

Assessment
A written report (3-4 pages, details to be announced in the first session) and active participation in all sessions are expected to pass this course.

**Workload**

3 ECTS (21 hours lectures, 90 hours total workload)