DAY 1

INTRODUCTION TO TIME SERIES ANALYSIS, PREDICTION AND FORECASTING

The analysis of time-series is of crucial importance for forecasting and the analysis of dynamic effects. This workshop provides an introduction to the world of time-series analysis, helps practitioners avoid common pitfalls, and gives practical insights into forecasting and dynamic policy research.

WHO IS IT FOR

Anyone with an interest in time-series data, dynamic policy analysis, prediction and forecasting. This workshop will appeal to professionals seeking to gain knowledge of time-series data analysis, as well as data scientists and analysts interested seeking to strengthen their research/studies with dynamic datasets.

This workshop presumes that participants are familiar with introductory quantitative methods, and basic probability and statistics. Some prior understanding of linear regression analysis and statistical inference is relevant.

LEARNING OBJECTIVES

By the end of day 1, participants will:

- Be familiar with a number of time-series models, prediction and forecasting techniques;
- Understand how to implement optimal dynamic modelling strategies;
- Know which pitfalls to avoid in the analysis of time-series data;
- Understand how to analyze and extract relevant information from dynamic time-series models;
- Have been exposed to practical real-world time-series problems faced by companies, governments, central banks and research institutes devoted to data analysis.

COURSE CONTENT

This workshop covers the following aspects of time-series analysis and econometrics:

- Basic properties of time series
- Estimation and specification of ARMA-type and dynamic ML models
- Prediction and impulse response functions
- Distributed lags and error correction
- Unit roots, integration and co-integration

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Prof. dr. Francisco Blasques

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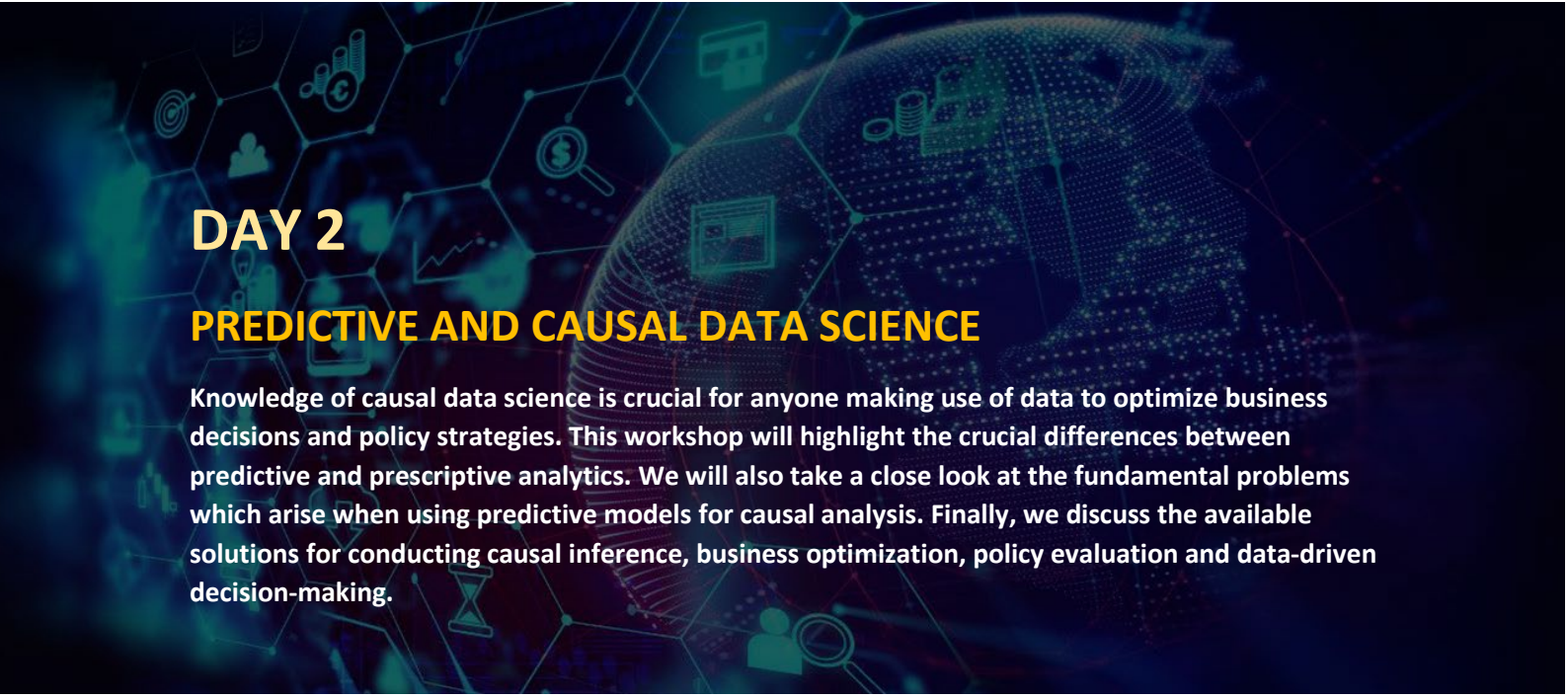

DAY 2

PREDICTIVE AND CAUSAL DATA SCIENCE

Knowledge of causal data science is crucial for anyone making use of data to optimize business decisions and policy strategies. This workshop will highlight the crucial differences between predictive and prescriptive analytics. We will also take a close look at the fundamental problems which arise when using predictive models for causal analysis. Finally, we discuss the available solutions for conducting causal inference, business optimization, policy evaluation and data-driven decision-making.

WHO IS IT FOR

Anyone with an interest in business strategy, policy evaluation, data-driven decision-making, and in turning analytics results into optimal actionable strategies. This workshop will appeal to professionals seeking to gain knowledge of casual data analysis, as well as data scientists interested in strengthening their analytics skills with structural modelling, causal inference, and prescriptive analytics tools.

This course presumes that participants are familiar with predictive methods, and basic probability and statistics. Some prior understanding of data science and machine learning is relevant.

LEARNING OBJECTIVES

By the end of day 2, participants will:

- Be familiar with the fundamental difference between predictive and prescriptive analytics.
- Know which pitfalls to avoid in the analysis of predictive analytics results.
- Understand how to implement structural models and perform causal inference.
- Know how to use prescriptive analytics for policy evaluation and decision making;
- Have been exposed to practical real-world problems faced by private companies, governmental agencies, and research institutes devoted to data analysis.

COURSE CONTENT

This workshop covers the following aspects of causal data science:

- Predictive versus prescriptive analytics.
- Pitfalls of predictive analytics.
- Methods of causal inference.
- Data-driven policy evaluation and decision-making.

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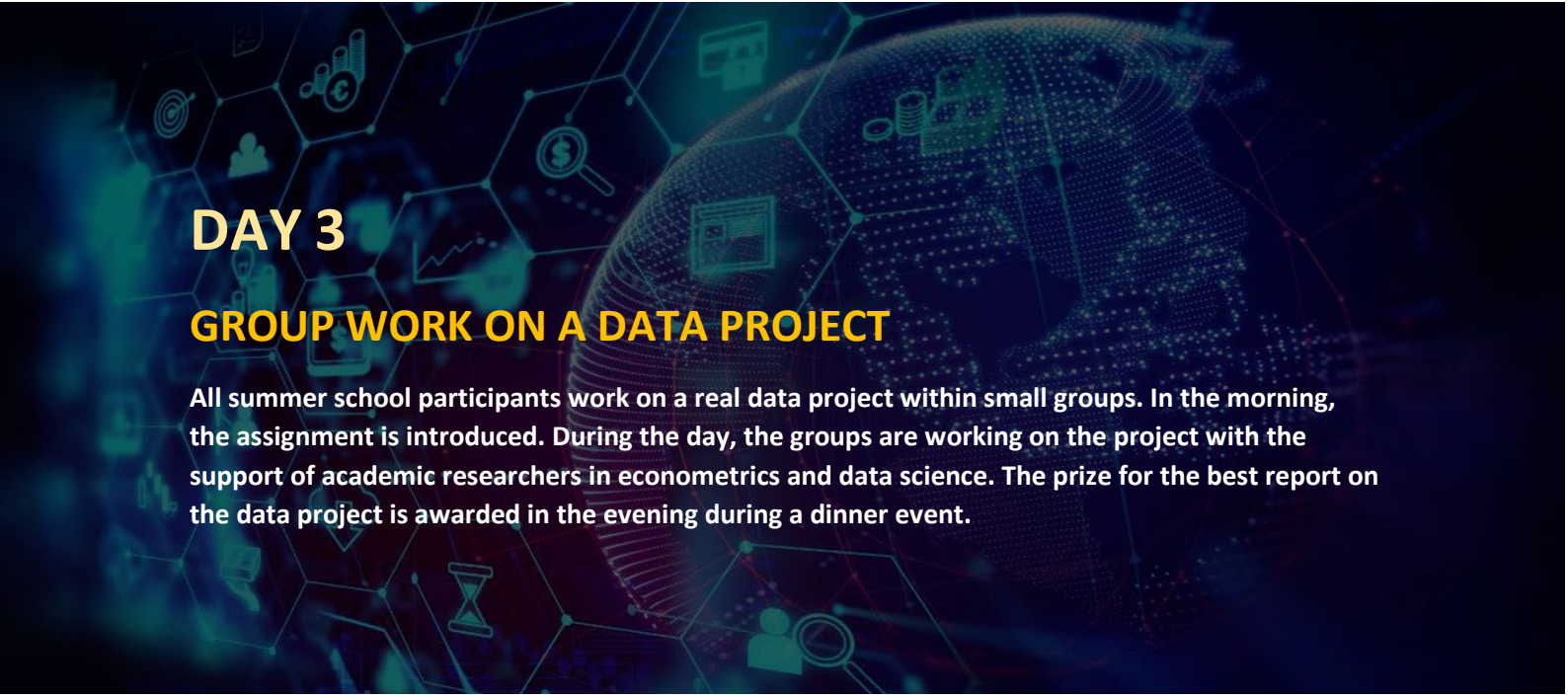

DAY 3

GROUP WORK ON A DATA PROJECT

All summer school participants work on a real data project within small groups. In the morning, the assignment is introduced. During the day, the groups are working on the project with the support of academic researchers in econometrics and data science. The prize for the best report on the data project is awarded in the evening during a dinner event.

WHO IS IT FOR

All summer school participants. This course presumes that participants are familiar with predictive methods, and basic probability and statistics. Some prior understanding of data science and machine learning is relevant.

DAY 4

SIGNAL EXTRACTION, FILTERING AND SCENARIO ANALYSIS

Data handling is challenging for many organizations. The construction of historical data sets requires serious efforts and investment. But still, the data will never be perfect. However, even incomplete data sets still contain much valuable information. This workshop will show how the key signals can be captured from noisy and incomplete data sets. We will explore how to extract the signal and how to identify the noise using basic and advanced filtering methods, in settings of practical relevance. Once the features of the signal and the methods of extracting the signal are well understood, we will show how the signal can be used in predictive analysis. Also, we show how it can be used in solutions for conducting policy evaluation and scenario analysis.

WHO IS IT FOR

Anyone with an interest in data science, time-series data, policy analysis, prediction and forecasting. This workshop will appeal to professionals seeking to gain knowledge of signal extraction, filtering, prediction, and time-series data analysis, as well as data scientists and analysts interested seeking to strengthen their research/studies with dynamic datasets.

This workshop presumes that participants are familiar with introductory quantitative methods, and basic probability and statistics. Some prior understanding of linear regression analysis and statistical inference is relevant.

LEARNING OBJECTIVES

By the end day 4, participants will:

- Be familiar with the concepts of signal extraction, unobserved components, and the state space model.
- Know what the Kalman filter does, and know when and how to use it
- Understand how to model noisy and incomplete time-series.
- Know how to use the signal for forecasting and scenario analysis;
- Be exposed to practical real-world problems faced by private companies, governmental agencies, and research institutes devoted to data analysis.

COURSE CONTENT

This workshop covers the following aspects of signal extraction:

- Local level and trend models, with and without regression effects;
- Filtering, smoothing and forecasting using state space methods;
- Messy features: missing data, noise and outliers, intervention analysis;
- Scenario analysis and decision-making.

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DAY 5

DYNAMIC BIG DATA, FACTOR ANALYSIS AND NOWCASTING

Business data grow easily to high dimensions, especially when data analysis is carried out to support planning decisions, supply-chain operations, and marketing campaigns. The handling of vast amounts of data that are collected over short or medium periods in the remote past, requires effective methods but also computationally efficient methods. Furthermore, vast databases are typically incomplete and contain much "garbage" data. We will explore how to treat and analyze vast, messy data sets for a selection of tasks. In particular, given that such data sets are (partially) revised on a regular basis, often on a daily basis, we will argue the importance of nowcasting in conducting policy evaluation and decision making.

WHO IS IT FOR

Anyone with an interest in data science, vast data, policy analysis, planning, optimization and nowcasting. This workshop will appeal to professionals seeking to gain knowledge of the latest techniques on dynamic multivariate data analysis, factor analysis, and nowcasting, as well as data scientists and analysts interested seeking to strengthen their research/studies with high-dimensional datasets.

This workshop presumes that participants are familiar with introductory quantitative methods, and basic probability and statistics. Some prior understanding of linear regression analysis and statistical inference is relevant.

LEARNING OBJECTIVES

By the end day 5, participants will:

- Be familiar with the concepts of principal components, factor analysis, and the dynamic factor model.
- Know what multivariate methods contribute in a dynamic data analysis, and know when and how to use it
- Understand how to handle vast, noisy and incomplete data sets of short time-series variables.
- Know how to use dynamic multivariate analysis for nowcasting
- Be exposed to practical real-world problems faced by private companies, governmental agencies, and research institutes devoted to big data analysis.

COURSE CONTENT

This workshop covers the following aspects of multivariate dynamic analysis:

- Principal components, factor analysis, and dynamic factor models;
- Filtering, smoothing and forecasting using multivariate state space methods;
- Messy features in high-dimensional settings: missing data, noise and outliers, unbalanced panels;
- Nowcasting, scenario analysis and decision-making.

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Prof. dr. Siem Jan Koopman

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