Supply Chain Analytics I: Predictive Analytics

See Ilias for information on accessing the course material.

Description

Today's supply chains are complex and create a vast amount of data. Supply Chain Analytics I is about extracting valuable information from this data to identify patterns and make accurate predictions and inferences. The course covers core concepts of statistical or machine learning and its application using Python.

The course consists of lectures and a project. In the project, the concepts covered in the lectures are applied to a data set. It prepares students to identify improvement opportunities that exist in actual supply chains, quantify possible improvements, and control supply chain performance.

Administration

Class times	Monday, 14:00–15:30, Hörsaal XVIII Monday, 16:00–17:30, Hörsaal XVIII Wednesday, 14:00–15:30, Hörsaal XXI
Faculty	Florian Sachs Email: florian.sachs@uni-koeln.de Office hours: by appointment
Secretary	Stephanie Rauscher Email: rauscher@wiso.uni-koeln.de
Teaching assistant	Dylan Gellert Email: dylan.gellert@uni-koeln.de Office hours: by appointment
Assignments	There are homework assignments covering the theoretical concepts. Students can earn one bonus point per assignment by uploading complete solutions to Ilias on time.
Grading	Project 40%, exam 60%
Exam	02nd December 2023, 11:00 – 12:00
Project deadline	24th November 2023, 23:59
Language	The lectures and discussion sessions are taught in English.
Prerequisites	Basic knowledge of statistics and Python. The necessary knowledge about Python can, e.g., be acquired in the free online course Python Basics for Data Science (https://www.edx.org/course/python-basics-for-data-science).

Overview

1. Self-learning phases

   During the self-learning phases, you should read and understand the chapters of the book An Introduction to Statistical Learning. You will apply this knowledge in the Assignments. The schedule tells you when to read which chapters.

2. Concepts plenum

   The concepts plenum sessions will take place on Mondays. In these sessions, we will discuss the concepts you read during the self-learning phases and will answer your questions. Furthermore, students will present their uploaded solutions to the assignments.

   Note: For a better learning experience, we will split the course from week 2 onward. The assignment to one of the two groups will be made in the first week.

3. Python plenum

   The plenum sessions will take place on Wednesdays. In these sessions, we will solve Python exercises. These sessions implement the concepts covered in the concepts plenum and enable you to work on the project.

4. Group sessions

   We recommend preparing your assignments and your project in groups of up to four members.

5. Python office hour

   If you have difficulties getting Python to work properly, you can make appointments with the teaching assistant or a student assistant on short notice. During the semester, you can post your questions in the discussion forum on Ilias.

Submissions

1. Assignments

   To earn bonus points, you have to upload your complete solutions to Ilias on time. Assignments on the theoretical concepts are due on Fridays at 18:00. By uploading your solutions, you agree to present the solutions in the plenum. If you are randomly selected, you will only get bonus points if you present your solutions. The presentation of the solutions will not be graded. For each assignment, you can get one bonus point.

   You can prepare your solutions in groups of up to 4 members, but each student has to upload their own solutions individually. Prepare slides with your solutions and upload them as a PDF file. You can write down your answers in note form. Templates for LaTeX and PowerPoint are provided at Ilias.

2. Project

   During the semester, you will work on a project. You can find the dataset and a Jupyter Notebook including a detailed description of your task at Ilias. You can work on and hand in the project in groups of up to four members. Save your solution and upload it to Ilias.

   Note: Most of the tools and commands needed to complete the project will be discussed in the Python plenum. However, programming always implies browsing documentation and searching via Google.

Resources

1. Concepts, core

   James, G., Witten, D., Hastie, T., & Tibshirani, R. (2021). An Introduction to Statistical Learning. New York: Springer

2. Concepts, additional

   In addition to reading the book, you can watch online lectures based on the first edition of the book on edX.

   If you want to check your understanding of the book and practice, you can find sample questions with solutions at JakobGM.

   If you are interested in the mathematical background of the concepts, check out: Hastie, T., Tibshirani, R., & Friedman, J. (2009). The Elements of Statistical Learning. New York: Springer.

3. Programming

   We recommend downloading and installing Anaconda for running Python.

   We provide notebooks for the Python assignments and the project. You can find out more about it at Jupyter.

   You can find additional information about the Python libraries used in this course at the following websites: pandas, statsmodels, NumPy, scikit-learn, graphviz, seaborn, matplotlib.

Schedule

	Monday	Tuesday	Wednesday	Thursday	Friday
October	09	10	11	12	13
	Plenum Welcome **Self-Learning** Statistical Learning (Chapters 2.1-2.2)		**Python Plenum** Introduction to Python		**Group Session** Statistical Learning **Trouble-Shooting** Python
	16	17	18	19	20
	Concepts Plenum Statistical Learning **Self-Learning** Linear Regression (Chapters 3.1-3.4)		**Python Plenum** Statistical Learning		**Group Session** Linear Regression
	23	24	25	26	27
	Concepts Plenum Linear Regression **Self-Learning** Classification (Chapters 4.1-4.4)		**Python Plenum** Linear Regression		**Group Session** Classification
	30	31	01 (Allerheiligen)	02	03
	Plenum Guest Lecture CHEP: Supply Chain Forecasting				**Group Session** Project
November	06	07	08	09	10
	Concepts Plenum Classification **Self-Learning** Resampling & Model Selection (Chapters 5.1-5.2, 6.1-6.2)		**Python Plenum** Classification		**Group Session** Resampling & Model Selection
	13	14	15	16	17
	Concepts Plenum Resampling & Model Selection **Self-Learning** Tree-based Methods (Chapters 8.1-8.2)		**Python Plenum** Resampling & Model Selection		**Group Session** Tree-based Methods
	20	21	22	23	24
	Concepts Plenum Tree-Based Methods **Python Plenum** Tree-based Methods		**Plenum** Q&A		
	27	28	29	30	01