



北京理工大学国际特色课程

Beijing Institute of Technology Global Courses

CSE9204 - PREDICTIVE AND ADVANCED ANALYTICS

Syllabus

July. 1 - July. 19, 2024

Term Duration: July. 1 - July. 19, 2024

Credit Points: 4

Level: Postgraduate

Instructor Name: TBA

Home Institution: Beijing Institute of Technology

Lecture Hour: 15:40-18:40

Course Description

This course introduces students to the science of forecasting and time series analysis. Students will begin with the basics of forecasting, learning about time series graphics and regression models. They will then progress to more complex techniques, including time series decomposition, and understand the statistical foundations for forecasting. The course will cover a range of forecasting methods such as exponential smoothing and ARIMA models, along with dynamic regression and hierarchical time series analysis. Students will also study transfer functions and intervention models to grasp the effects of external interventions on time series. A survey of various forecasting methods and practical issues in forecasting will provide students with a broad spectrum of analytical tools.

Course Aims:

Upon successful completion of this course, students should be able to:

1. understand the principles and practices of forecasting and its importance in predictive analytics;
2. develop proficiency in using time series graphics and constructing time series regression models
3. master time series decomposition and the application of exponential smoothing techniques;
4. examine and interpret real-world business data through the lens of time-series characteristics, effectively identifying trends, seasonality, and anomalies;
5. gain expertise in developing and analyzing ARIMA and dynamic regression models
6. perform model selection to identify the most important predictors out of a potentially very large set of predictor variables;
7. acquire a broad knowledge of various forecasting methods and tackle practical forecasting issues.

Language of Instruction

English

Required Textbook

Forecasting: principles and practice

Author: Rob J. Hyndman, George Athanasopoulos

Publisher: OTexts

ISBN: 9780987507112

Introduction to Time Series Analysis and Forecasting, 2nd Edition

Author: Douglas C. Montgomery, Cheryl L. Jennings, and Murat Kulahci

Publisher: Wiley

ISBN: 9781118745113

Course Hours

This course requires 48 hours of contact including 42 hours of lectures and one 6-hour field trip. Lectures are from Monday to Friday.

Prerequisite Course

Students are expected to have taken **Mathematics** or to possess a thorough knowledge of the topics covered in the mentioned course.

Course Schedule

Week	Day	Lecture	Topic	Assignment/ Notes
Week 1	Day 1	Lecture 1	Introduction to Forecasting	Douglas C. Montgomery (Chap 1)
	Day 2	Lecture 2	Time Series Graphics	Rob J. Hyndman (Chap 2)
	Day 3	Lecture 3	Time Series Regression Models	Rob J. Hyndman (Chap 5)
	Day 4	Lecture 4	Time Series Decomposition	Rob J. Hyndman (Chap 6)
	Day 5	Lecture 5	Judgmental Forecasts; Statistics Background for Forecasting	Rob J. Hyndman (Chap 4); Douglas C. Montgomery (Chap 2)
Week 2	Day 6	Lecture 6	Exponential Smoothing	Rob J. Hyndman (Chap 7); Douglas C. Montgomery (Chap 4)
	Day 7	Lecture 7	ARIMA Models	Rob J. Hyndman (Chap 8)
	Day 8	Lecture 8	Dynamic Regression Models	Rob J. Hyndman (Chap 9)
	Day 9	Lecture 9	Forecasting Hierarchical or Grouped Time Series;	Rob J. Hyndman (Chap 10);
	Day 10	Industrial Visit		
Week 3	Day 11	Lecture 10	Transfer Functions and Intervention Models	Douglas C. Montgomery (Chap 6)
	Day 12	Lecture 11	Survey of other Forecasting Methods	Douglas C. Montgomery (Chap 7)
	Day 13	Lecture 12	Some Practical Forecasting Issues	Rob J. Hyndman (Chap 12);
	Day 14	Guided Revision		

	Day 15	Final Exam
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Note: Students will be notified if the schedule of the field trip changes according to the situation.

Grading Policy

Method	Percentage
Participation	10%
Assignment	20%
Mid-semester Test	20%
Final Exam	50%
Total	100%

Participation: Students are expected to attend all course sessions punctually. Absences will impact the attendance grade. We will have some case studies, topic discussion and group discussion in class and the performance will be considered as partial attendance points or bonus.

Assignment: Assignment will require students to work in groups. Write a report (at least 3500 words), present it and submit both the report and presentation slides after the presentation. Each group's presentation should last between 20 to 30 minutes in total.

Mid-Semester Test: The test will span a duration of 2 hours and will assess students on the material covered in the first half of the course. Students are expected to demonstrate their knowledge and analytical skills through this examination.

Final Exam: The final exam will be a comprehensive assessment encompassing all course content. This exam will have a duration of 3 hours, and students will be evaluated on their understanding and application of the material covered throughout the course.

Academic Honesty

Academic honesty is not only a fundamental part of learning and teaching, but also a core value that this course embraces. Behaviors of academic dishonesty, as outlined hereinafter, are unacceptable and will be penalized:

- a) Plagiarism where students present work for assessment, publication or otherwise that is not their own, without appropriate attribution or reference to the original source.
Plagiarism can include:
 - i) paraphrasing or copying published and unpublished work without a reference;
 - ii) adopting the ideas or concepts of others, including the structure of an existing analysis without due acknowledgement by way of reference to the original work or source.

- b) Collusion, where students present work as independent work when it has in fact been produced in whole or in part with others unless prior permission for joint or collaborative work has been given by the Course Coordinator. Collusion can include:
 - i) a student inappropriately assisting with or accepting assistance with the production of an assessment task;
 - ii) submitting work which is the same or substantially similar as another student's work for the same assessment task.
- c) Cheating, where a student acts in such a way as to seek to gain unfair advantage or assist another student to do so. Cheating can include:
 - i) submitting falsified, copied or improperly obtained data relating to results of practicum, field trips or other work as if they were genuine; submitting an assessment task with the intention of deceiving or misleading the instructor about the student's contribution to the work;
 - ii) submitting an assessment task written or answered for the student by another person or which the student has copied from another person;
 - iii) submitting the same or a substantially similar piece of work for assessment in two different courses (except in accordance with approved study and assessment schemes);
 - iv) a student falsely indicating that they have been present at an activity where attendance is required;
 - v) completing an assessment task outside the conditions specified for that task.
- d) Cheating in Examinations means engaging in dishonest practice or breaching the rules regarding examinations, which can include:
 - i) communicating in any way during an examination with any person who is not an examination supervisor inside or outside the examination venue;
 - ii) giving or accepting assistance from any person who is not an examination supervisor whilst in the examination venue;
 - iii) reading, copying from or otherwise using another student's work in an examination or knowingly allowing a student to do so;
 - iv) possessing, referring to or having access to any material or device containing information directly or indirectly related to the subject matter under examination, other than that explicitly approved by the Course Coordinator;
 - v) acquiring, or attempting to acquire, possess or distribute examination materials or information without approval;
 - vi) permitting another person to attend an examination on a student's behalf or attending an examination on behalf of another student;
- e) Other dishonest acts including but not limited to:
 - i) altering or falsifying any document or record for the purposes of gaining academic advantage;
 - ii) offering or giving money or any item or service to a University staff member or any other person to gain academic advantage for the student or another person;
 - iii) inventing references.