

Hong Kong Baptist University
Faculty of Science
Department of Mathematics

Title (Units): ORBS7070 Machine Learning and Forecasting (3,3,0)

Course Aims: In this course, students will learn about the fundamentals of machine learning and forecasting techniques and gain hands-on experience with analysing and solving a variety of problems encountered in industrial development.

Prerequisite: No

Prepared by: Luo Dehui

Remark: This course is delivered by staff of University of Kent.

Course Intended Learning Outcomes (CILOs):

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

No.	Course Intended Learning Outcomes (CILOs)
1	Explain advanced knowledge of the types of data analysis problems that can be appropriately dealt with using machine learning and forecasting techniques.
2	Understand and critically discuss research issues within the area of machine learning and forecasting.
3	Successfully develop machine learning and forecasting models and apply them to real-world problems related to economic development.

Teaching & Learning Activities (TLAs):

CILO	TLAs will include the following:
1, 2	New concepts will be introduced in lectures, together with instructions and any requisite theory. Where possible, theory will be demonstrated using practical examples.
1, 2, 3	Computer terminals will afford students the opportunity of putting theory into practice and will include learning how to perform statistical analyses using SPSS and Excel.

Assessment:

No.	Assessment Methods	Weighting	CILO Addressed	Remarks
1	Project	100%	all	The course will be assessed 100% by coursework covering all content taught in the course. Students will be given a real-world dataset and asked a series of questions in which they must perform various data mining and forecasting techniques and provide written commentaries. The coursework will assess students' comprehension of key topics introduced in the course, as well as require them to demonstrate their model building and analytical skills.

Course Intended Learning Outcomes and Weighting:

Content	CILO No.	Teaching (in hours)
1. Machine learning	1,2,3	13
2. Forecasting	1,2,3	13
3. Data analysis	1,2,3	13

References:

1. Box, G.E.P., Jenkins, G.M., Reinsel, G.C., Ljung, G.M. (2015) *Time Series Analysis: Forecasting and Control*, 5th Edn. Hoboken: Wiley. (ISBN: 978-1118674918)
2. James, G., Witten, D., Hastie, T., Tibshirani, R. (2013) *An Introduction to Statistical Learning with Applications in R*. New York: Springer. (ISBN 978-1461471370)
3. Hyndman, R.J., Athanasopoulos, G. (2018) *Forecasting: Principles and Practice*. OTexts. (ISBN 978-0987507112)
4. Witten, I.H., Eibe, F. (2011) *Data Mining: Practical Machine Learning Tools and Techniques*, 3rd Edition. San Francisco: Morgan Kaufmann. (ISBN: 978-0123748560).

Course Content in Outline:

1. Machine learning: The introduction of modern machine learning techniques used in business data analysis, including both supervised learning (e.g. regression, classification, and artificial neural networks) and unsupervised learning (e.g. association rule discovery and cluster analysis).
2. Forecasting: Students will learn about various forecasting methods, including exponential smoothing methods and the Box-Jenkins method (i.e. the ARIMA model and variants).
3. Data analysis report writing. Students will systematically carry out a data analysis project and write a data analysis report.

The data analysis packages such as R, SPSS, and Weka may be used in this module.

(Approved by the Science Faculty Board Meeting by circulation in August 2024)

(Approved by the Department Management Committee on 7 August 2024)

(Approved by the Science Faculty Board Meeting 31 October 2023)

(Approved by the Department Management Committee on 5 September 2023)