IB99P-20 Data Science, AI and Machine Learning

25/26

Department
Warwick Business School
Level
Taught Postgraduate Level
Module leader
Caspar Kaiser
Credit value
20
Module duration
10 weeks
Assessment
100% coursework
Study location
Distance or Online Delivery

Description

Introductory description

This module introduces big data wrangling and machine learning in the context of central banking.

Module aims

The module introduces big data analysis and machine learning in the context of central banking. Data analytics and visualisation is introduced, following machine learning techniques for regression, classification, and clustering. Ethics and applications in central banking are introduced.

Outline syllabus

This is an indicative module outline only to give an indication of the sort of topics that may be covered. Actual sessions held may differ.

-Wrangling data (preparing data for a machine learning application) in R with data.tables
-Visualising data with ggplot2
-Regression: OLS, penalized regression, KNN regression, decision trees and model trees, gradient boosting machines

-Classification: KNN, decision trees and random forests, support vector machines and random forests
-Clustering and dimensional reduction: K-means clustering, hierarchical agglomerative clustering, principal components analysis, uniform manifold approximation, latent Dirichlet analysis
-Neural networks
-Concepts: feature selection, optimisation metrics, overfitting and out of sample generalisation, bias-variance dilemma, tuning, boosting and ensemble learning, interpretability vs prediction, curse of dimensionality, eager vs lazy learning.
Application to finance is via a series of worked exemplars using typical financial scenarios. For example, we will look at modelling decisions at a retail stockbrokers and look at the classification of companies by systemic financial risk.

Learning outcomes

By the end of the module, students should be able to:

- Demonstrate a precise understanding of core concepts in machine learning
- Demonstrate insight into the scope of questions big data and machine learning can address, and how.
- Demonstrate a critical awareness of research and advanced scholarship in big data analytics
- Reflect on and learn from some prior experience and thus be able to integrate new knowledge with past experience and apply it to a new situation
- Make sound judgements whilst understanding the limitations on judgements made in the absence of complete data

Indicative reading list

Reading lists can be found in Talis

Research element

Yes

International

The course is global banking, so inherently covers a variety of international dimensions.

Subject specific skills

- Wrangle data
- Visualise data
- Apply and evaluate machine learning algorithms

Transferable skills

Written communication

Independent learning

Study

Study time

Type	Required
Lectures	(0%)
Online learning (scheduled sessions)	4 sessions of 1 hour (2%)
Online learning (independent)	54 sessions of 1 hour (27%)
Private study	82 hours (41%)
Assessment	60 hours (30%)
Total	200 hours

Private study description

82 hours of self-study. 60 hours of preparation for assessments

Costs

No further costs have been identified for this module.

Assessment

You must pass all assessment components to pass the module.

Assessment group A1

Assessment component	Weighting	Study time	Eligible for self-certification
Individual Assignment Machine Learning Application - 4000 words	100%	60 hours	Yes (extension)

Reassessment component is the same

Feedback on assessment

via my.wbs

Availability

Courses

This module is Optional for:

- TIBS-N1CA Postgraduate Taught Global Central Banking & Financial Regulation
  - Year 1 of N1CH Comparative Central Banking : Global Central Banking & Financial Regulation (PGA)
  - Year 1 of N1CJ Financial Markets and Financial Risk Management: Global Central Banking & Financial Regulation (PGA)
  - Year 1 of N1CA Global Central Banking & Financial Regulation
  - Year 1 of N1CC Global Central Banking & Financial Regulation (PGCert)
  - Year 1 of N1CB Global Central Banking & Financial Regulation (PGDip)
  - Year 1 of N1CE Money, Banks and Macroeconomics: Global Central Banking & Financial Regulation (PGA)
  - Year 2 of N1CH Comparative Central Banking : Global Central Banking & Financial Regulation (PGA)
  - Year 2 of N1CJ Financial Markets and Financial Risk Management: Global Central Banking & Financial Regulation (PGA)
  - Year 2 of N1CA Global Central Banking & Financial Regulation
  - Year 2 of N1CC Global Central Banking & Financial Regulation (PGCert)
  - Year 2 of N1CB Global Central Banking & Financial Regulation (PGDip)
  - Year 2 of N1CE Money, Banks and Macroeconomics: Global Central Banking & Financial Regulation (PGA)
- TIBS-N1CB Postgraduate Taught Global Central Banking & Financial Regulation (PG Diploma)
  - Year 1 of N1CC Global Central Banking & Financial Regulation (PGCert)
  - Year 1 of N1CB Global Central Banking & Financial Regulation (PGDip)
  - Year 2 of N1CC Global Central Banking & Financial Regulation (PGCert)
  - Year 2 of N1CB Global Central Banking & Financial Regulation (PGDip)
- TIBS-N1CC Postgraduate Taught Global Central Banking & Financial Regulation (PGCert)
  - Year 1 of N1CK Behavioural Finance and Big Data: Global Central Banking & Financial Regulation (PGA)
  - Year 1 of N1CH Comparative Central Banking : Global Central Banking & Financial Regulation (PGA)
  - Year 1 of N1CF Financial Regulation and Supervision: Global Central Banking & Financial Regulation (PGA)
  - Year 1 of N1CC Global Central Banking & Financial Regulation (PGCert)
  - Year 1 of N1CE Money, Banks and Macroeconomics: Global Central Banking & Financial Regulation (PGA)
  - Year 2 of N1CK Behavioural Finance and Big Data: Global Central Banking & Financial Regulation (PGA)

- Year 2 of N1CH Comparative Central Banking : Global Central Banking & Financial Regulation (PGA)
- Year 2 of N1CF Financial Regulation and Supervision: Global Central Banking & Financial Regulation (PGA)
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