COURSE DETAILS

Course Code: F71RB
Full Course Title: Machine Learning for Risk and Insurance 2
SCQF Level: 11
SCAF Credits: 15
Available as Elective: No

DELIVERY LEVEL

Undergraduate: No  Postgraduate Taught: Yes  Postgraduate Research: No

COURSE AIMS

The intention of this course is to introduce students to core mathematical and statistical components of modern machine learning methods that are directly of applicability in the risk, insurance and financial mathematics contexts. In addition, the applications presented, and Python computer packages explored in the applications will be focussed primarily on this discipline specific context.

LEARNING OUTCOMES – SUBJECT MASTERY

- An understanding of selected core fundamental concepts in data science, statistics and machine learning of supervised learning.
- An ability to apply supervised learning methods to problems involving risk, insurance and finance.
- An understanding of the mathematics underpinning supervised machine learning techniques.

- Critical awareness of the appropriateness and performance of the different techniques, as well as the relationships between them.
LEARNING OUTCOMES – PERSONAL ABILITIES

- Rational problem identification and definition.
- Proficiency in the implementation of machine learning methods in Python software for risk and insurance applications and data analysis.
- Critical analysis and solution selection

- Demonstrate the ability to learn independently.
- Manage time, work to deadlines, and prioritise workloads.

- Use appropriate computer software to process data.
- Present results in a way that demonstrates a good understanding of the technical and broader issues of data mining and machine learning.

SYLLABUS

Supervised Learning Methods

- **Generalised Linear Models and Regularisation**
  - Lasso, Elastic Net, Grouped Lasso, Graphical Lasso
  - Bayesian GLM and regularization priors
  - PCA Regression in elliptical models

- **Generalised Additive Models**
  - Spline models, B-Splines and tensor splines in interpolation for spatial data

- **Kernel Generalised Linear Models**
  - Kernelized Natural Exponential Family

- **Generalised Additive Models for Location Shape and Scale GAMLSS**
  - Properties and Estimation

- **Functional Regression**
  - Properties, Estimation and Interpretation

- **Kernel Machines**
- Classes of kernel functions, properties and model structures
- Support Vector Machines: Classification and Regression
- Support Measure Machines

- Gaussian Processes
  - Regression
  - Warped Gaussian Processes
  - Constrained Gaussian Processes

- Ensemble Methods
  - Combining Rules, Random Forest, Bagging, Boosting and AdaBoost

### COURSE RELATIONSHIPS

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### LOCATION AND ASSESSMENT METHODS

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Re-assessment is in the next academic year