MGT-302  Data driven business analytics

Kiyavash Negar, Ulrych Urban

<table>
<thead>
<tr>
<th>Cursus</th>
<th>Sem.</th>
<th>Type</th>
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<tbody>
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<td>Humanities and Social Sciences</td>
<td>BA6</td>
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<th>Language of teaching</th>
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<tbody>
<tr>
<td>Credits</td>
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<tr>
<td>Session</td>
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<td>Semester</td>
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<td>Exam</td>
<td>During the semester</td>
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<td>Workload</td>
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<tr>
<td>Weeks</td>
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<td>Hours</td>
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Remark
Une seule inscription à un cours SHS+MGT autorisée. En cas d'inscriptions multiples elles seront toutes supprimées sans notification.

Summary
This course focuses on methods and algorithms needed to apply machine learning with an emphasis on applications in business analytics.

Content
The following topics will be covered in the course:

1. Supervised learning
   - Linear Regression
   - Gradient Descent and Stochastic Gradient Descent
   - Multiclass Classification
   - K-NN
   - Support Vector Machines
   - Decision Tree and Random Forest

2. Unsupervised learning
   - Regularization and Model Selection
   - Cross Validation
   - PCA

3. Deep Learning
   - Deep Neural Networks
   - Back propagation

4. Graphical models
   - Bayesian networks
   - Inference and structure learning

5. Causal inference in time series
   - Granger causality
   - Directed information Graphs
6. Quantitative Risk Management
   • Risk Measures: Value at Risk and Expected Shortfall
   • Statistical Estimation and Risk Measurement

7. Statistical Learning for Finance
   • Shrinkage, Ridge Regression, LASSO and Dimension Reduction
   • Predicting Financial Returns

Keywords
machine learning, causal inference, time series, quantitative risk management

Learning Prerequisites
Required courses
A course in basic probability theory
A course in basic linear algebra
Calculus
Familiarity with Python or Matlab

Important concepts to start the course
Students should be familiar with basic concepts of probability theory, calculus, linear algebra, and programming.

Learning Outcomes
By the end of the course, the student must be able to:
• Formulate supervised and unsupervised learning problems and apply it to data

Transversal skills
• Assess one's own level of skill acquisition, and plan their on-going learning goals.

Teaching methods
Formal teaching interlaced with practical exercises.

Expected student activities
Attending lectures and working on homework and projects.

Assessment methods
Three homeworks (33.33333333% each)

Supervision
Office hours Yes
Assistants Yes
Forum No

Resources
Moodle Link