MGT-424

Advanced data driven business analytics

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Cursus	Sem.	Type
Management, Technology and Entrepreneurship minor	H	Opt.
Managmt, tech et entr.	MA1, MA3	Opt.

Language of teaching	English
Credits	4
Session	Winter
Semester	Fall
Exam	During the semester
Workload	120h
Weeks	14
Hours	**3 weekly**
Lecture	2 weekly
Exercises	1 weekly
Number of positions	

Summary

This course aims to provide graduate students a grounding in the methods, theory, mathematics and algorithms needed to apply machine learning techniques to in business analytics domain. The course covers topics from machine learning, classical statistics, and data mining.

Content

List of topics:

- General Introduction
- Supervised Learning, Discriminative Algorithms:
  Supervised Learning Concept, Linear Regression, Maximum Likelihood, Normal Equation Gradient Descent, Stochastic Gradient, SVRG.
  Linear Classification, Logistic Regression, Newton Method,
- Generative Algorithms:
  Multivariate Normal, Linear Discriminant Analysis
  Naive Bayes, Laplacian Smoothing
  Multiclass Classification, K-NN
  Support Vector Machines and Kernel Methods:
  Intuition, Geometric Margins, Optimal Margin Classifier
  Lagrangian Duality, Soft-margin, Loss function, Stochastic Subgradient Method.
- Unsupervised Learning:
  PCA, Mixture Models, Bayesian Graphical Models
- Regularization and Model Selection:
- Decision Tree and Random Forest:
  Entropy, Bagging features, Bagging Samples, Random Forest
- Neural Network:
  Concept; Deep Neural Network; Backpropagation Convolutional Neural Network
- Causal Inference:
  Potential outcomes, DiD, CiC, IVs.
- Applications to business analytics.

Keywords

Supervised and unsupervised learning, Model selection, Generative models, causality, cases and applications to business analytics.

Learning Prerequisites

Required courses
A course in basic probability theory and linear algebra. Ability to program in Python or Matlab.

Recommended courses
Statistics.

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

Learning Outcomes

- Formulate supervised and unsupsuervised learning problems and apply it to data.
- Analyze and apply generative models.
- Explore and train basic neural networks and apply them to data
- Identify causal inference vs association and perform inference tasks on data.

Transversal skills

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

Teaching methods

Classical formal teaching interlaced with practical exercices.

Expected student activities

Active participation in exercise sessions is essential.

Assessment methods

30% Homework
30% Midterm project
40% Final project

Supervision

Office hours	Yes
Assistants	Yes
Forum	Yes

Resources

Moodle Link

- https://go.epfl.ch/MGT-424