INSA INSTITUT NATIONAL DES SCIENCES APPLIQUÉES LYON

DPT GENIE ENERGETIQUE ET ENVIRONNEMENT
ENERGETICS AND ENVIRONMENTAL ENGINEERING
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Energy

Data Science for Energy

IDENTIFICATION

CODE : GEN-5-S1-EC-SDPE
ECTS : 2.0

HOURS

Lectures :	14.0 h
Seminars :	0.0 h
Laboratory :	10.0 h
Project :	0.0 h
Teacher-student contact :	24.0 h
Personal work :	10.0 h
Total :	34.0 h

ASSESSMENT METHOD

Evaluation is done through a data science project (see GEN-5-PROJ-S1).

TEACHING AIDS

TEACHING LANGUAGE

French

CONTACT

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AIMS

Understand the tools of data science

Understand and manage a project related to data science, in particular AI (Artificial Intelligence) projects

Get the most out of the data provided by data science / AI

Understand the stakes, the risks related to data science and the specific conduct of an AI project

CONTENT

2-hour lecture: introductory course
- Data science: short history
- Motivation
- Processes of data valuation
- Data science: limitations and risks

1-hour lecture: Datasets and data
- Characterization and type of data/dataset
- Data quality
- Preprocessing

2-hour lecture: Supervised learning (regression)
- Regression (linear and polynomial regression)
- Cross-validation
- Bias and variance

2-hour lecture: Supervised learning (classification)
- Binary classification (logistic regression and decision tree)
- Search for better hyperparameters
- Performance of a classifier
- Multi-class classification (+ random forest)

4-hour practical work: Datasets and classification

1-hour lecture: Unsupervised learning
- Distance-based clustering (k-means)
- Density-based clustering (DBSCAN)
- Examples of clustering applications

2-hour practical work: Unsupervised learning

4-hour lecture: Neural networks
- The biological neuron
- The Perceptron and the Multilayer Perceptron (MLP)
- Deep Learning
- Convolutional neural networks (CNN). Application to vision
- Recurrent neural network. Application to time series
- Reinforcement learning
- Transfer learning
- Examples

4-h practical work: Neural networks

2-hour lecture: Machine Learning models, strategies and limits

BIBLIOGRAPHY

A. GERON, Hands-On Machine Learning with Scikit-Learn, Keras, and Tensorflow: Concepts, Tools, and Techniques to Build Intelligent Systems, O'REILLY, 2019

PRE-REQUISITE

Basics of algorithms; basics of mathematics

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