

Algorithms in multimedia and machine learning using Python

Lecture & drill

Lecture: 2 hours, Drill: 3 hours, Overall 5 hours

Credits: 3.5

Prerequisites: Linear Algebra, Introduction to Computer Science

About the course:

This course provides basic knowledge for advanced courses on multimedia, machine learning and python programming. The participants will learn the basics of python programming, will encounter the object oriented approach and work with different open source libraries. The students will analyze and process multimedia data and will implement some data mining techniques.

Fields and Topics:

1. PyCharm IDE for python programming.
2. Built in functions and basics of python programming.
3. Open source libraries such as Numpy and OpenCV.
4. Lists, Tuples, Dictionaries, Vectors and Matrices in python.
5. Graph representations.
6. Basic Image Processing, Edge Detection, Blurring, Sharpening and Histogram uses.
7. Masking/Kernel application for filtering, Gaussin and Moving Average filters as well as Median filter.
8. Basic understanding of Optimization methods and Gradient Descent algorithm.
9. Machine learning and Data mining basic algorithms such as KNN, Kmeans and Logistic Regression.
10. Dimension reduction using PCA and face recognition with Eigenfaces.

Score breakdown:

Students must attend all lectures and drills.

- Project 70%
 - ❖ Project implementation
 - ❖ Preparation of presentation and digital poster
 - ❖ Project presentation in class
- Exam 30%
 - ❖ Exam on computer in computer lab

Students must score 60 or higher both on the exam and in the project.

Relevant Books:

1. Langtangen, H.P., *A Primer on Scientific Programming with Python*, Springer, 2014
2. Lubanivich, B., *Introducing Python: Modern Computing in Simple Packages*, O'Reilly, 2015
3. Layton, R., *Learning Data Mining with Python*, Packt Publishing, 2015
4. Hilpisch, Y., *Python for Finance: Analyze Big Financial Data*, O'Reilly, 2014
5. Slatkin, B., *Effective Python: 59 Specific Ways to Write Better Python*, Addison-Wesley, 2015
6. Chityala, R., Pudipeddi, S., *Image Processing and Acquisition using Python*, Chapman & Hall/CRC, 2014
7. Richert, W., Coelho, L.P., *Building Machine Learning Systems with Python*, Packt Publishing, 2013
8. Pilgrim, M., *Dive Into Python 3*, CreateSpace, 2012

Useful Links:

- <http://cyber.org.il/python/python.pdf>
- <http://vlib.eitan.ac.il/python/>
- <http://scikit-learn.org/stable/>
- <https://github.com/spyder-ide/spyder>
- <http://www.activestate.com/activepython/downloads>
- <http://ipython.org/>
- <http://pandas.pydata.org/>