International Programs Department

Academic Year: 2019-2020

Python and Algorithm Workshop: Initiation

Description

This course is associated to the algorithmic and programming courses "Algorithms & Data Structures", “Python” etc.

It is more a workshop or lab activity than a classical course. The goal is to be sure you know what an algorithm is, how it works, how to design a new algorithm (or how to modify a known algorithm) to solve a new problem and of course how to write an efficient program (in Python) to implement the algorithm.

Some selected problems that we will study:

- Problems on numbers (fast computation of Fibonacci numbers, fast exponentiation, …)
- Problems on arrays (min, max, min & max, partition, sort, research, etc.)
- Problems on graphs: traversal (BFS/DFS), shortest paths, approximate and exact computation of the diameter, radius and center of a graph center, etc.

Learning Objectives and Outcomes

You will learn:

- How to find an algorithm on some selected problems
- How to design an algorithm
- How to analyze an algorithm
- How to optimize an algorithm
- How to program it in Python
- How to write efficient programs in Python

Course Schedule and Contents

Session#1
- Algorithms on numbers 1/
  - Fast computation of Fibonacci numbers
  - Recursivity, Iteration and Terminal Recursivity

Session#2
- Algorithms on numbers 2/
  - Fast exponentiation
  - Some algorithms to solve it
- Assignment # 1 – case study

Session#3
- Graph problems 1/
  - How to represent a graph
  - Some path problems

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Session#4	▪ Graph problems 2/ ○ Graph traversal ○ BFS ○ DFS
Session#5	▪ Graph problems 3/ ○ Diameter ○ Radius and Center ○ Approximation algorithms for diameter and radius
Session#6	▪ Array problems 1/ ○ How to create/modify large arrays ○ Some array problems ○ Sorting & Searching

Grading

Ass#1 Course case study:	40%
Quiz:	0%
Ass#2 Course Project:	60%

Policies

- I expect you to turn-in your reports on time to receive proper credit/grade.
- Any work submitted must be your own.
- I expect everyone to contribute equally to group assignments
- Attendance in every class is expected and class participation and discussion is strongly encouraged.
- Late work will not be accepted unless prior arrangements have been made directly with me.
- Cases will be decided on an individual basis.

Good Luck!