UCLouvain

linfo1115

2020

Reasoning about a highly connected world: graph theory, game theory and networks

Due to the COVID-19 crisis, the information below is subject to change, in particular that concerning the teaching mode (presential, distance or in a comodal or hybrid format).

5 credits	30.0 h + 30.0 h	Q2

Teacher(s)	Van Roy Peter ;
Language :	English
Place of the course	Louvain-la-Neuve
Prerequisites	This course assumes the student already masters the discrete mathematical skills targeted by the course LINFO1114 *The prerequisite(s) for this Teaching Unit (Unité d'enseignement – UE) for the programmes/courses that offer this Teaching Unit are specified at the end of this sheet.*
Main themes	• Graphs (basic concepts, paths and connectivity) • Applications of graphs, for example, to model social networks (links, homophilia, closing) • Discrete structures on the Internet: graphs and properties of graphs, giant components, strong and weak links, triadic closure, structural equilibrium, equilibrium theorem, web structure, PageRank, power laws, the long tail • Introduction to game theory
Aims	Given the learning outcomes of the "Bachelor in Engineering" program, this course contributes to the development, acquisition and evaluation of the following learning outcomes: • S1.I1, S1.G1 • S2.2 Students completing successfully this course will be able to 1 • identify and precisely define the basic concepts of graphs and trees by providing contextualized examples that highlight them. • explain various methods of traversing graphs • model various real-world problems encountered in computer science using the appropriate forms of graphs and trees, for example social networks and the Web • explain the main concepts of game theory (the type of game, the type of strategy of the agents) with the help of appropriate examples • define and interpret concepts with precision • avoid misinterpretations and detect reasoning errors - - - - *The contribution of this Teaching Unit to the development and command of the skills and learning outcomes of the programme(s) can be accessed at the end of this sheet, in the section entitled "Programmes/courses offering this Teaching Unit".*
Evaluation methods	**Due to the COVID-19 crisis, the information in this section is particularly likely to change.** • Dispensatory test 25% (around week 7) • Project 25% • Final exam 50% (or 75% if redoing test part) The project is mandatory and is done during the quadrimester. It can only be done only once and it counts for the whole academic year. The optional dispensatory test and the final exam may be done in auditorium or online, depending on university requirements.
Teaching methods	**Due to the COVID-19 crisis, the information in this section is particularly likely to change.** • Weekly lectures (in auditorium or online, according to university requirements) • Practical lab sessions in the computer room every week, to solve simplified problems using concepts explained during the lectures. • One major design and programming project to apply these concepts to a more complex application
Content	• Graphs (basic concepts, paths and connectivity). • Graph applications, for example modeling social networks (links, homophily, closure).

	• Discrete structres on the Internet: graphs and graph properties, giant components, strong and weak links, triadic closure, structural equilibrium, equilibrium theorem, structure of the Web, PageRank, power laws, the long tail. • Introduction to game theory and application to Internet graphs.
Inline resources	LINFO1115 Moodle.
Bibliography	David Easley and Jon Kleinberg, Networks, Crowds and Markets: Reasoning About a Highly Connected World, Cambridge University Press, 2010.
Other infos	With respect to the AA benchmark of the programme "Bachelier en sciences informatiques", this course contributes to the development, acquisition, and evaluation of the following learning outcomes: • S1.I1, S1.G1 • S2.2 Students who have succeeded in this course will be able to: • precisely identify and define basic concepts of graphs and trees with contextual examples that illuminate them, • make explicit diverse methods of graph traversal, • model various problems of the real world encountered in information technology using the appropriate graphs and trees, for example in social networks and the Web, • make explicit the principal concepts of game theory (form of game, form of agent strategy) by means of appropriate examples, • apply these concepts to Internet structures, • define and interpret rigorously the concepts, • avoid wrong interpretations and detect reasoning errors.
Faculty or entity in charge	INFO

Programmes containing this learning unit (UE)				
Program title	Acronym	Credits	Prerequisite	Aims
Bachelor in Computer Science	SINF1BA	5	LINFO1114	🔍