Course guide
230721 - SNET - Social Networks: Theory and Implementation

Last modified: 25/05/2023

Unit in charge:	Barcelona School of Telecommunications Engineering
Teaching unit:	739 - TSC - Department of Signal Theory and Communications.

Degree: MASTER'S DEGREE IN TELECOMMUNICATIONS ENGINEERING (Syllabus 2013). (Optional subject). MASTER'S DEGREE IN ADVANCED TELECOMMUNICATION TECHNOLOGIES (Syllabus 2019). (Optional subject).

Academic year: 2023 **ECTS Credits:** 5.0 **Languages:** English

LECTURER

Coordinating lecturer:	Consultar aquí / See here: https://telecos.upc.edu/ca/estudis/curs-actual/professorat-responsables-coordinadors/responsables-assignatura
Others:	Consultar aquí / See here: https://telecos.upc.edu/ca/estudis/curs-actual/professorat-responsables-coordinadors/professorat-assignat-idioma

PRIOR SKILLS

None

REQUIREMENTS

Knowledge of linear algebra and probability

TEACHING METHODOLOGY

blackboard classes, individual work and simulations in python

LEARNING OBJECTIVES OF THE SUBJECT

The aim of this course is to train students in understanding the techniques and tools for describing social networks and www. The course will teach techniques for ranking (ex. google?s pagerank for web pages), recommender systems (ex. amazon?s recommendations of similar products), Auctions of advertisements (i.e. googles adwords), Finding influencers in social networks, finding communities in social networks, finding text similarity between documents by meaning (i.e. similarity between posts in blogs). In addition, a web search engine will be designed in python, and then the social graph will be created and the techniques explained in theory will be applied in a practical way.

STUDY LOAD

Type	Hours	Percentage
Self study	86,0	68.80
Hours large group	26,0	20.80
Hours small group	13,0	10.40

Total learning time: 125 h

CONTENTS

Ranking Systems.

Description:
Description algorithms for sorting websites by relevance. Algorithms for graphs made of links between pages: Google's Pagerank and HITS. Practical examples.

Specific objectives:
Understanding google's Pagerank and HITS equations from different points of view; flow graph, random walk, probability of visiting a node.
Understand the application examples.

Related activities:
Individual Deliverable.
Laboratory activities.

Full-or-part-time: 15h
Theory classes: 6h
Practical classes: 3h
Self study : 6h

Social Networks as graphs

Description:
Techniques for finding influencers and communities in graphs. Specific properties of twitter type graphs and facebook type graphs.
Practical examples.

Specific objectives:
Understand the techniques to perform the partition of graphs in communities, techniques to find nodes of influence, techniques to model the effects of propagation of information in a viral manner.
Practical applications

Related activities:
Individual Deliverable.
Laboratory activities.

Full-or-part-time: 15h
Theory classes: 6h
Practical classes: 3h
Self study : 6h

Finding text similarity between documents by meaning. Application to twitter and blogs.

Description:
Bag of words model for texts, stemming and word-term matrix. Latent semantic analysis.
Application to twitter and blog data.

Related activities:
Individual Deliverable.
Laboratori Practices.

Full-or-part-time: 15h
Theory classes: 6h
Practical classes: 3h
Self study : 6h

Recommender systems. Amazon/Netflix cases

Description:
Description of the recommender systems based on Collaborative and content based. Description of different recommender systems; amazon, netflix.

Specific objectives:
Be able to adapt the general methods of recommender systems to specific situations.

Related activities:
Individual Deliverable.
Laboratory activities.

Full-or-part-time: 10h
Theory classes: 4h
Practical classes: 2h
Self study : 4h

Auctions of web advertisements. Google Adwords case.

Description:
Description of systems for making auctions of online advertisements. Summary of the modified Vickrey auction system used by google's adwords.

Related activities:
Individual Deliverable.
Laboratory activities.

Full-or-part-time: 10h
Theory classes: 4h
Practical classes: 2h
Self study : 4h

GRADING SYSTEM

Individual assessments: 40%
Final examination: 60%

BIBLIOGRAPHY

Basic:
- Easley, D.; Kleinberg, J. Networks, crowds, and markets: reasoning about a highly connected world. New York: Cambridge University Press, 2010. ISBN 9780521195331.
- Skillicorn, D.B. Understanding complex datasets: data mining with matrix decompositions. Boca Raton: Taylor and Francis : CRC Press, 2007. ISBN 9781584888321.
- Langville, A.; Meyer, C.D. Google's pagerank and beyond: the science of search engine rankings. Princeton, N.J. [etc.]: Princeton University Press, 2006. ISBN 0691122024.