



## Information Dynamics on the Internet

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### Course description:

With the advent of online social networks such as Facebook or Twitter, the methods we use to access information and propagate it to other users have become extremely complex and diverse. This lecture series aims to provide an explanation of the way in which information is propagated among different users of the Internet. We give an overview of mathematical models and techniques, which have recently been developed to describe such phenomena, and to address certain practical questions, such as:

- \* How to distinguish "trending" information from uninteresting noise or spam in a social network?
- \* How to boost the propagation of a piece of information so that it reaches as many users of the network as possible?
- \* How to perform effective marketing campaigns and how to influence users in a social network?

We start this lecture series with an introduction to "Network Science" --- an interdisciplinary academic field which deals with the dynamics of complex networks. In the first block (topics 1 to 4), we explain how a "snapshot" of the network topology is related to the mechanism of the evolution of the network in time, and we discuss the practical implications of the observed structural properties of the network. In the next block (topics 5 to 8), we consider so-called "walks" on networks (of the sort taken by Googlebot when crawling the web, or by a human user following links on Wikipedia), and we explain how such a walk can be guided to obtain a given objective. Finally, the last block (topics 9 to 15) deals with complex flows of information in the network, where different types of information spread in parallel, interacting with each other.

This lecture series is intended to be self-contained and no prior knowledge is required on the part of the audience, beyond some very basic concepts of graph/network theory. Most of the considered topics concern modeling and algorithm design.

### Syllabus of the lecture subjects (enlisted):

1. Random-graph models of networks
2. Models of network growth
3. Analyzing social networks
4. The small world property
5. Locating a target in a small world
6. Network exploration, crawling, and sampling
7. The random walk model
8. Introducing bias: Metropolis, machine learning, and PageRank-type walks



9. Diffusion of information through networks
10. Cascade and threshold-based diffusion models
11. Measures of influence in a social network
12. Maximizing the spread of influence
13. Push- and pull-type rumour spreading
14. Evolutionary dynamics on networks
15. Voting processes on networks

TERMINY ZAJĘĆ			
Data	Dzień tyg.	Godz.	Sala
18 maj 2015	poniedziałek	16:15 - 19:00	NE 104 (nowy budynek WETI)
19 maj 2015	wtorek	15:15 - 18:00	NE 109 (nowy budynek WETI)
20 maj 2015	środa	15:15 - 18:00	NE 110 (nowy budynek WETI)
21 maj 2015	czwartek	15:15 - 18:00	NE 106 (nowy budynek WETI)
22 maj 2015	piątek	15:15 - 18:00	NE 104 (nowy budynek WETI)