Information Dynamics in Social Networks *Syllabus*

Prof. Yaron Singer Summer 2015

Course description: This course will cover algorithms for acquiring and disseminating information in networks. We will discuss mathematical models of networks and information diffusion, algorithms, and incentives-based mechanisms, all designed for predicting and engineering information processes in social networks. The material will draw upon topics in sociology, theoretical computer science, probability theory, and data mining.

Course goals: The goal of this course is to provide an introduction to social data analysis, and expose the frontier of research on algorithmic topics in this exciting area. In addition, there will be coverage of fundamental topics in approximation algorithms, probability, and data mining.

List of topics: We will cover the following topics in the course:

1. Graph theory basics
   - Paths, connectivity
   - Random graphs
2. Small-world phenomenon
   - Strong and weak ties
   - Small-world models
3. Power-laws
   - Power-law distributions
   - Models for power-law networks
4. Cascading behavior in networks
   - Models of influence
   - Maximizing influence in networks

Readings. The recommended textbook for the course is:

- *"Networks, Crowds, and Markets: Reasoning about a Highly Connected World"*, by David Easley and Jon Kleinberg. The book is available for free online:
  http://www.cs.cornell.edu/home/kleinber/networks-book/

Additional material:

- *"Social and Economic Networks"*, by Matthew Jackson
- *"Structure and Dynamics of Networked Information"*, lecture notes by David Kempe available online:
  http://www-bcf.usc.edu/∼kempe/teaching/structure-dynamics.pdf

Prerequisites. We will require undergraduate level calculus, linear algebra, and probability. There will be simple programming exercises for students interested in analysis of network data.