Complex Networks Orientation

2015.10.05(Mon)

Complex Networks

- Instructor: T. Murata (room E503, West8 building, murata @ cs.titech.ac.jp)
- Goal: acquire knowledge for understanding and analyzing networks (graphs)
- Score：quizzes (every week), assignments (2 or 3 times)
- Schedules & teaching materials : available online
  - Tokyo Tech OCW and www.ai.cs.titech.ac.jp/lecture/cn
- Caution:
  - Some classes are not on Mondays (Jan. 12(Tue))
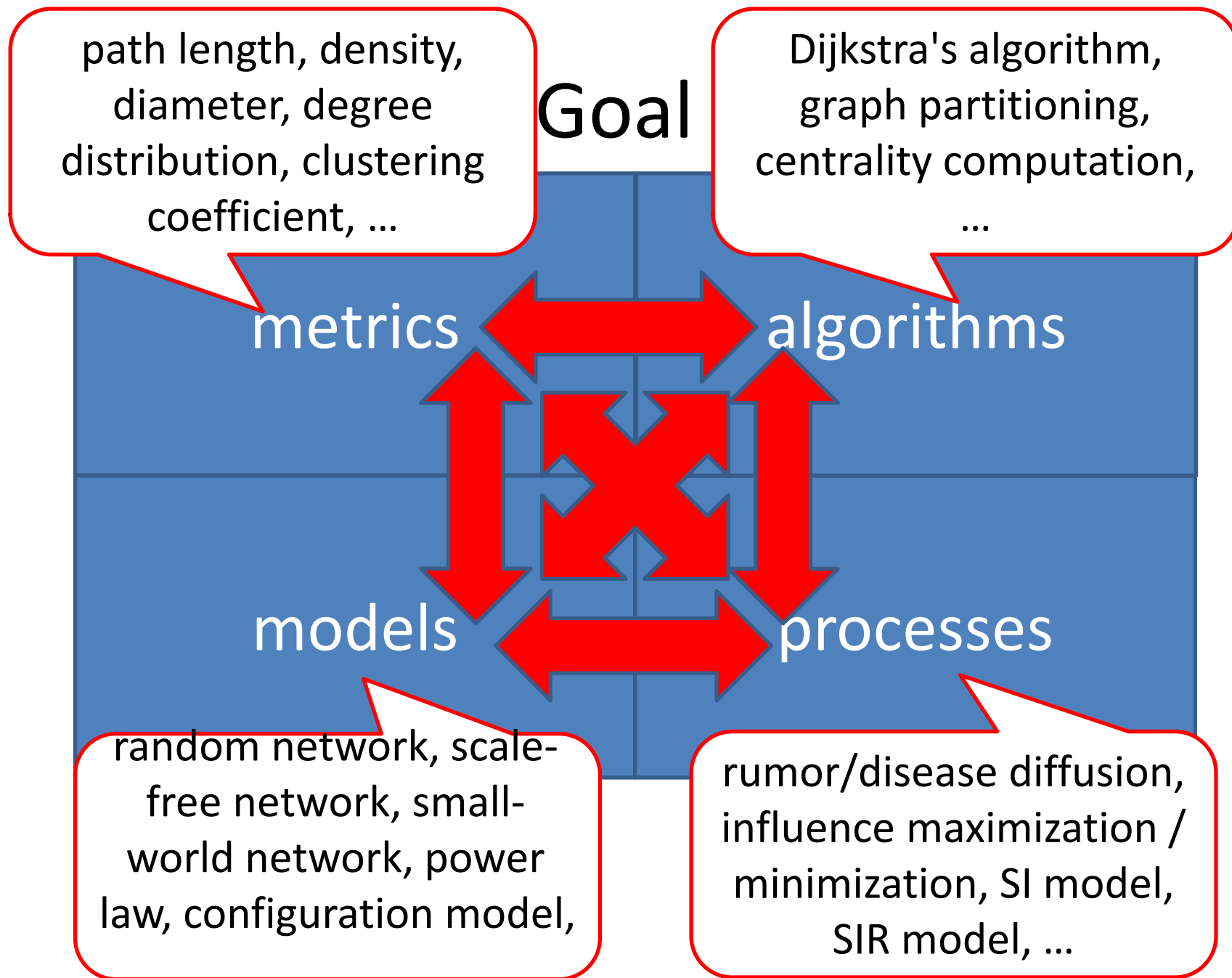 - Courses next year will be quite different

Goal

|	
metrics	algorithms
models	processes

textbook / reference

- Networks: An Introduction, Mark Newman, Oxford University Press, 2010.

  http://www-personal.umich.edu/~mejn/networks-an-introduction/

- Networks, Crowds, and Markets: Reasoning About a Highly Connected World, David Easley and Jon Kleinberg, Cambridge University Press, 2010.

  http://www.cs.cornell.edu/home/kleinber/networks-book/
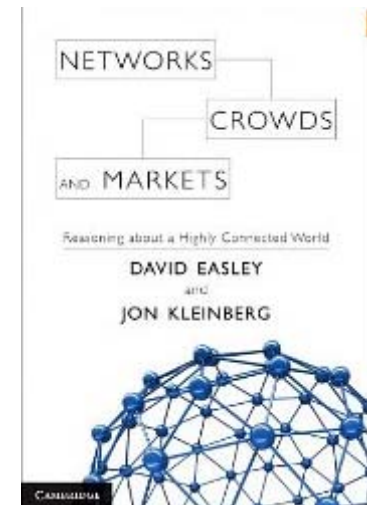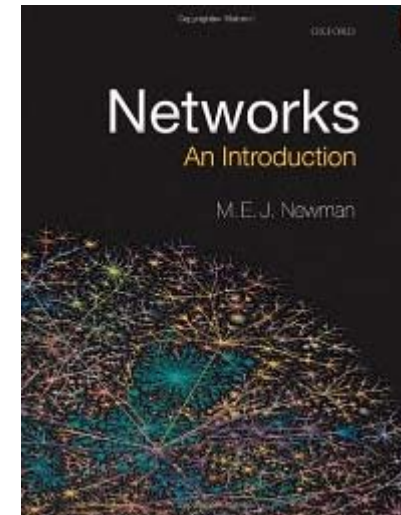
Japanese books

- 「複雑ネットワーク」とは何か, 増田直紀 今野紀雄著, 講談社ブルーバックス, 2006.
- Rで学ぶデータサイエンス 8 ネットワーク分析, 鈴木努著, 共立出版, 2009.

contents of this course

- Basic knowledge for understanding/analyzing networks
  - fundamentals of network
  - network algorithms
  - network models
  - processes on networks

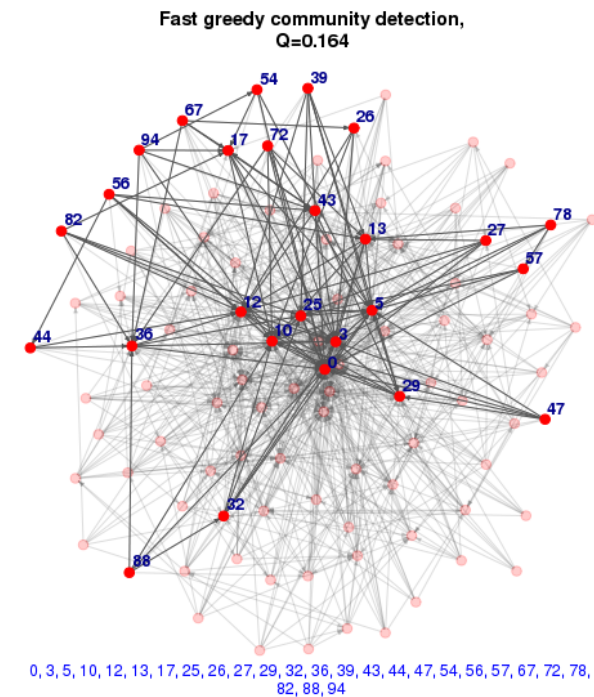 - tools for analyzing and visualizing networks

topics (1)

- 1. introduction
- 2. tools for analyzing networks
- 3. fundamentals (1) mathematics of networks
- 4. fundamentals (2) measures and metrics
- 5. fundamentals (3) the large-scale structure of networks
- 6. network algorithms (1) representation

topics (2)

- 7. network algorithms (2) matrix algorithms
- 8. network algorithms (3) graph partitioning
- 9. network models (1) random graphs
- 10. network models (2) network formation
- 11. network models (3) small-world model
- 12. processes on networks (1) percolation
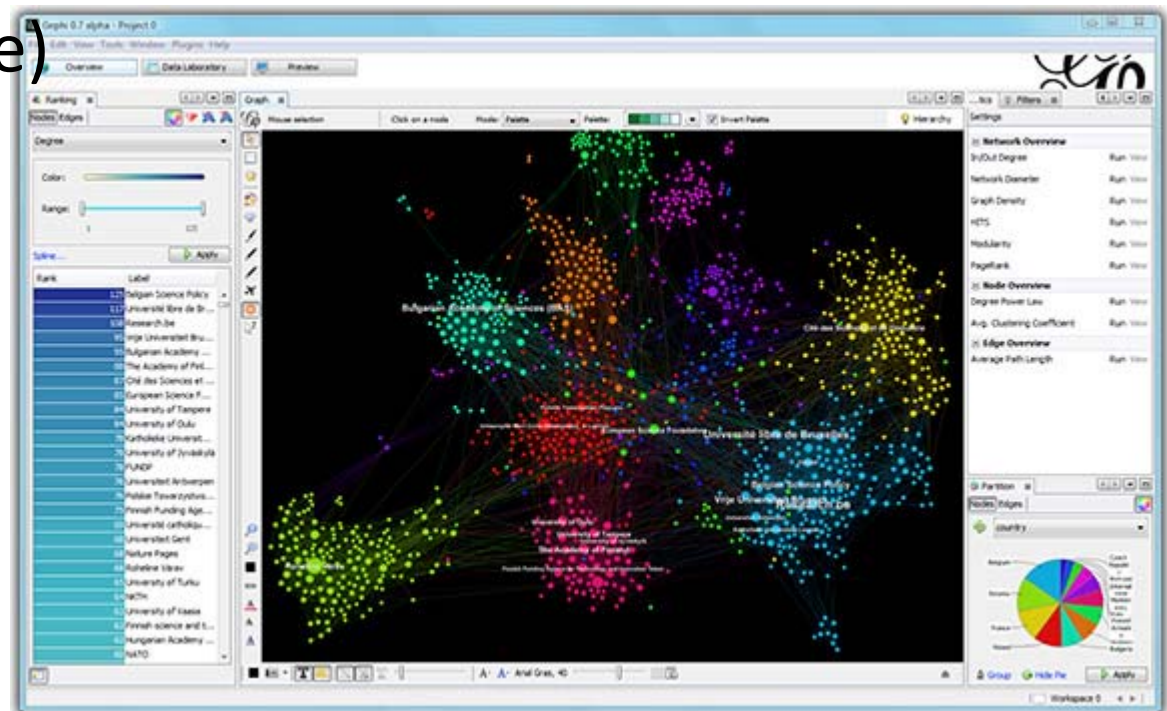- 13. processes on networks (2) epidemics
- 14. summary

tools : igraph

- software for analyzing networks
  - A rich set of functions calculating various structural properties
  - http://igraph.org/

Fast greedy community detection, Q=0.164

0, 3, 5, 10, 12, 13, 17, 25, 26, 27, 29, 32, 36, 39, 43, 44, 47, 54, 56, 57, 67, 72, 78, 82, 88, 94

tools : Gephi

- new software for analyzing networks
  - easy to use, online tutorials available
  - https://gephi.github.io/ (English)
  - http://oss.infoscience.co.jp/gephi/gephi.org/index.html (Japanese)

Remarks

- All lectures, quizzes, assignments will be in English. <u>I will not accept quizzes/assignments written in Japanese.</u>

- Non-CS students (undergraduate students, YSEP, ACAP, TiROP, …) are also welcome. All students are graded based on the same evaluation criteria.

- Copying the assignments of other students is strictly prohibited. "Similar" assignments will be rejected.