EKONOMIHÖGSKOLAN
Lunds universitet

Institutionen för Informatik
Professor Liaquat Hossain
The Swedish Research School of Management and Information Technology

Transdisciplinary Science in Complex Social Networks (CSN) (7.5 HEC)

Admission Requirements
Enrolled as Ph.D. student. It is assumed that the students have an understanding of different research approaches, methodologies, and methods in the social sciences.

Objectives
The aim of the course would be to provide a comprehensive overview of transdisciplinary science approach to studying complex social networks (CSN). We will engage the students and create awareness of the fundamentals of investigating CSN, highlight the overall approach to design of the instrument or procedure for observing/collecting data from existing sources, and discuss the process involved in analysis of CSN dataset. We will then orient students with a number of existing research, which provides a good coverage of broader context of CSN in life, engineering, information, physical as well as organizational science so that students are able to appreciate the applications of CSN theory and methods using the basis of transdisciplinary science.

1. Towards a Transdisciplinary Science Research Paradigm
2. Studying Complex Social Networks (CSN)
    a. Overview of CSN
    b. Application of CSN in different research disciplines
    c. Strategies for data collection: studying active/passive networks
    d. CSN data analysis procedure
3. Current research in CSN
    a. Key questions guiding this research area
    b. Overview of different research labs in CSN
    c. CSN research in different disciplines
        i. Organizational Context
        ii. IS and Knowledge Management Context
        iii. Financial Markets and Systems
        iv. Computer, IT and/or socio-technical systems
4. Exploring common ground/framework for studying different systems and their interaction

Format
The course involves heavy reading, intense discussion in seminars, and regular research writing. Participants will write three short papers and one publishable paper. The seminars require high involvement of its participants. A prerequisite for high involvement is preparation (i.e. reading and reflecting on the assigned articles). Each seminar, or part of a seminar, will be led by two students—based on the seminar title and the associated reading list; they have to lead the seminar. The seminar leaders are required to generate and put forward a number of issues to debate. The rest of the group will discuss the issues, raise issues, and pose questions.

Examination

- Active participation in class.
- Four position papers (single-authored, three pages). The position papers should address the course's four themes.
- One publishable paper (single-authored or co-authored) showing a good understanding of the issues addressed in the course and how they apply to the student's research area(s) and question(s).

The grades are "pass" or "fail".

Structure and Readings

The course has four themes:

- Understanding of transdisciplinary science, computational science and network science research paradigm;

- Awareness and understanding of classical social network theories-SNT;

- Awareness of the social networks analysis-SNA methodological foundations which involves overall understanding of social networks analysis, approaches to data collection and analysis; and,

- Awareness of the application and use of SNT and SNA for research in information systems/science and management

Each theme has one or several seminars.

Literature

See the separate literature list.

Theme I: Transdisciplinary Science, Computational Social Science and Network Science

Issues addressed include: 1) what is transdisciplinary science research 2) how has the complex social science or computational social science field evolved and where is it going, and 3) the international academic field of complex networks research and theories. **Please write a 3 page review focussing on transdisciplinary, computational and network science (Assessment 1).**

1. Wagner, C. S., & Leydesdorff, L (2005) "Network structure, self-organization, and the growth of international collaboration in science", *Research policy*, *34*(10), 1608-1618.
2. Wickson, F., Carew, A.L and Russell, A.W (2006) "Transdisciplinary research: characteristics, quandaries and quality", *Futures*, Volume 38, Issue 9, November, Pages 1046–1059.
3. Daniel Stokols (2006) "Toward a Science of Transdisciplinary Action Research", *American Journal of Community Psychology*, September, Volume 38, Issue 1-2, pp 63-77.
4. Wiek, Arnim (2007) "Challenges of Transdisciplinary Research as Interactive Knowledge Generation - Experiences from Transdisciplinary Case Study Research", *GAIA - Ecological Perspectives for Science and Society*, Volume 16, Number 1 pp. 52-57.
5. Christian Pohl (2008) "From science to policy through transdisciplinary research", *Environmental Science & Policy*, Volume 11, Issue 1, February, Pages 46–53.
6. Lazer, D., Pentland, A., Adamic, A., Aral, S., Barabasi, A. L., et al. (2009) "Life in the network: the coming age of computational social science", *Science*, February 6; 323(5915): 721–723. doi: 10.1126/science.1167742.
7. Barabási, A. L (2009) "Scale-free networks: a decade and beyond", *Science*, *325*(5939), 412-413.
8. Cioffi-Revilla, C (2010) "Computational social science", *Wiley Interdisciplinary Reviews: Computational Statistics*, *2*(3), 259-271.
9. Bankes, S., Lempert, R., & Popper, S (2002) "Making Computational Social Science Effective Epistemology, Methodology, and Technology", *Social Science Computer Review*, *20*(4), 377-388.
10. Börner, K., Sanyal, S., & Vespignani, A (2008) "Network science", *Annual review of information science and technology*, *41*(1), 537-607.
11. Kocarev, L., & In, V (2010) "Network science: A new paradigm shift", *Network, IEEE*, *24*(6), 6-9.

Theme 2: SNTs-Social network theories and review articles

Please review and discuss different SNT during class and **submit a 3 page review of a particular theory highlighted below (Assessment 2)**.

12. Bavelas, A (1950) "Communication patterns in task-oriented groups", *Journal of the acoustical society of America*, 22: 725-730.
13. Coleman, J., E. Katz, et al. (1957) "The diffusion of an innovation among physicians", *Sociometry*: 253-270.
14. Granovetter, M. (1973) "The strength of weak ties", *American journal of sociology* 78(6): 1360.
15. Emerson, Richard M (1976) "Social exchange theory", *Annual review of sociology*, 2: 335-362.
16. Feld, S (1981) "The Focused Organization of Social Ties," *The American Journal of Sociology*, Vol. 86, No. 5 (Mar., 1981), pp. 1015-1035.

17. Markovsky, B., Skvoretz, J., Willer, D., Lovaglia, M.J., and Erger, J (1993) “The seeds of weak power: An extension of network exchange theory”, *American Sociological Review*, 197-209.
18. Watts, D. and S. H. Strogatz (1998) “Small world”, *Nature*, 393: 440-442.
19. Watts, D. J. and S. H. Strogatz (1998) “Collective dynamics of ‘small-world’networks”, *Nature*, 393(6684): 440-442.
20. Walker, H.A., Thye, S. R., Simpson, B., Lovaglia, M. J., Willer, D., and Markovsky, B (2000) “Network Exchange Theory: Recent Developments and New Directions”, *Social Psychology Quarterly* , Vol. 63, No. 4, Special Millenium Issue on the State of Sociological Social Psychology (Dec.), pp. 324-337.
21. Burt, R.S (2002) “Bridge decay”, *Social Networks,* Vol. 24, Issue 4, October, Pp 333–363.
22. Burt, R. S. (2004) “Structural Holes and Good Ideas 1”, *American journal of sociology*, 110 (2): 349-399.
23. Watts, D. J (2004) “The" new" science of networks”, *Annual review of sociology*, 243-270.
24. Cropanzano, R and Mitchell, M.S (2005) “Social Exchange Theory: An Interdisciplinary Review”, *Journal of Management*, December, 31: 874-900, doi:10.1177/0149206305279602.
25. Salancik, G.R (1995)”Wanted: A good network theory of organization”, *Administrative Science Quarterly*, Vol. 40, number 2, pages 345—349.
26. Lin, N. (1999) “Building a network theory of social capital”, *Connections*, *22*(1), 28-51.

Theme 3: SNA-Social Networks Analysis

Issues addressed include: 1) approaches, methodologies, and methods in SNA research, 2) combining different approaches, methodologies, and methods, and 3) social science and network science research. **Please review and discuss different SNA during class and submit a 3 page review of SNA (Assessment 3).**

27. Alt, C., Astrachan, O., Forbes, J., Lucic, R., & Rodger, S (2006) “Social networks generate interest in computer science’, *ACM SIGCSE Bulletin*, *38*(1), 438-442.
28. Scott, J. (1988). Social network analysis. *Sociology*, *22*(1), 109-127.
29. Breiger, R. L. (2004). The analysis of social networks. *Handbook of data analysis*, 505-526.
30. Haythornthwaite, C (1996) “Social network analysis: An approach and technique for the study of information exchange”, *Library & Information Science Research*, *18*(4), 323-342.
31. Freeman, L. C (1979) “Centrality in social networks conceptual clarification”, *Social networks*, *1*(3), 215-239.
32. Borgatti, S. P (2005) “Centrality and network flow”, *Social networks*, *27*(1), 55-71
33. Burt, R. S. (1984). Network items and the general social survey. *Social Networks*, *6*(4), 293-339.
34. Marsden, P. V. (1990). Network data and measurement. *Annual review of sociology*, 435-463.
35. Ruan, D (1998) “The content of the General Social Survey discussion networks: an exploration of General Social Survey discussion name generator in a Chinese context”, *Social Networks*, 20, 247–264.
36. Klovdahl, A. S., Potterat, J., and Woodhouse, E (1994) “Social networks and infectious disease: the colorado springs study”, *Soc Sci Med*, Vol. 38, no. 1, pp. 79-88.

37. Garton, L., Haythornthwaite, C., & Wellman, B. (1997). Studying online social networks. *Journal of Computer-Mediated Communication*, *3*(1), 0-0.
38. Mislove, A., Marcon, M., Gummadi, K. P., Druschel, P., & Bhattacharjee, B. (2007, October). Measurement and analysis of online social networks. In *Proceedings of the 7th ACM SIGCOMM conference on Internet measurement* (pp. 29-42). ACM.
39. Newman, M. E. (2001). The structure of scientific collaboration networks. *Proceedings of the National Academy of Sciences*, *98*(2), 404-409.
40. Newman, M. E. (2001). Scientific collaboration networks. I. Network construction and fundamental results. *Physical review E*, *64*(1), 016131.
41. Berger-Wolf, T. Y., & Saia, J. (2006, August). A framework for analysis of dynamic social networks. In *Proceedings of the 12th ACM SIGKDD international conference on Knowledge discovery and data mining* (pp. 523-528). ACM.
42. Freeman , L. C (2000). "Visualizing Social Networks," *Journal of Social Structure*, Volume 1.
43. Batagelj, V., & Mrvar, A. (1998). Pajek-program for large network analysis. *Connections*, *21*(2), 47-57.
44. Borgatti, S. P., Everett, M. G., & Freeman, L. C. (2002). Ucinet for Windows: Software for social network analysis.
45. Batagelj, V., & Mrvar, A. (2000). Some analyses of Erdos collaboration graph. *Social Networks*, *22*(2), 173-186.
46. Batagelj, V., & Mrvar, A. (2004). Pajek—analysis and visualization of large networks. *Graph drawing software*, 77-103.

Theme 4: Application and use of SNT and SNA for research in information systems/science and management

Please review and discuss applications of SNT and SNA in IS/management or KM research during class and submit a 3 page review demonstrating your understanding of the application of SNT and SNA in IS research.

47. Dooley, K.J (1997) "A Complex Adaptive Systems Model of Organization Change", *Nonlinear Dynamics, Psychology, and Life Sciences, Vol. 1, No. 1, pp. 69-97.*
48. Borgatti, S. P., & Foster, P. C. (2003). The network paradigm in organizational research: A review and typology. *Journal of management*, *29*(6), 991-1013.
49. Merali, Y., & McKelvey, B. (2006). Using Complexity Science to effect a paradigm shift in Information Systems for the 21st century. *Journal of Information Technology*, *21*(4), 211-215.
50. Amaral, L. A. N., & Uzzi, B. (2007). Complex systems—A new paradigm for the integrative study of management, physical, and technological systems. *Management Science*, *53*(7), 1033-1035.
51. Cravens, D. W., Piercy, N. F., & Shipp, S. H. (2005). New organizational forms for competing in highly dynamic environments: the network paradigm. *British Journal of management*, *7*(3), 203-218.
52. Oliver, A. L., & Ebers, M. (1998). Networking network studies: an analysis of conceptual configurations in the study of inter-organizational relationships. *Organization studies*, *19*(4), 549-583.
53. Schwartz, D. F., & Jacobson, E. (1977). Organizational communication network analysis: The liaison communication role. *Organizational Behavior and Human Performance*, *18*(1), 158-174.
54. Tichy, N. M., Tushman, M. L., & Fombrun, C. (1979). Social network analysis for organizations. *Academy of Management Review*, 507-519.

55. Perarce, J. A and David, F. R (1983). “A Social network approach to organisational design-performance,” *The Academy of Management Review*, Vol. 8, No. 3, 436-444.
56. Carroll, G. R and Teo, A. C (1996). “On the Social networks for managers,” *The Academy of Management Journal*, Vol. 39, No. 2, 421-440.
57. Sparrowe, R. T., Liden, R. C., Wayne, S. J., & Kraimer, M. L. (2001). Social Networks and the Performance of Individuals and Groups. *Academy of management journal*, *44*(2), 316-325.
58. Inkpen, A. C., & Tsang, E. W. (2005). Social capital, networks, and knowledge transfer. *Academy of management review*, *30*(1), 146-165.
59. PRUSAK, R. C. A. P. L., & Borgatti, S. P. (2001). Supporting knowledge creation and sharing in social networks. *Organizational dynamics*, *30*(2), 100-120.
60. Alavi, M., & Leidner, D. E. (2001). Review: Knowledge management and knowledge management systems: Conceptual foundations and research issues. *MIS quarterly*, 107-136.
61. Tsai, W. (2001). Knowledge transfer in intraorganizational networks: effects of network position and absorptive capacity on business unit innovation and performance. *Academy of management journal*, *44*(5), 996-1004.
62. Earl, M. (2001). Knowledge management strategies: Toward a taxonomy. *Journal of management information systems*, *18*(1), 215-233.

Assessment 4: One publishable 10-12 pages paper (single-authored or co-authored) showing a good understanding of the issues addressed in the course and how they apply to the student's research area(s) and question(s). Please follow the structure provided below for the Final assessment 4 which is essentially your term paper.

Title
Abstract

1 Introduction and Background
- 1.1 Overview of paper
- 1.2 Aims and objectives
- 1.3 Research questions, rationale and problem statement
- 1.4 Conceptual framework of the paper and description
- 1.5 Introduction to forthcoming sections

2 Critical review of literature and framework development
- 2.1 Overview of literature review/summary of what is being covered
- 2.2 Critical review of key research in an area relevant to the research questions
- 2.3 Synthesis of the research work reviewed
- 2.4 Development and description of research framework
  - 2.4.1 Propositions and/or research hypotheses plus description
  - 2.4.2 Approaches to testing and validation of 2.4.1
- 2.5 Possible sources of primary and secondary data

3 Research Methods in data collection and analysis
- 3.1 Overview of research design and description
- 3.2 Sources of data and its collection approaches
  - 3.2.1 Instrument development for the collection of primary data
  - 3.2.2 Reliability and validity issues related to 3.2.1
  - 3.2.3 Possible approaches to dealing with 3.2.2
- 3.3 Treatment and analytical approaches to primary and secondary dataset
  - 3.3.1 Overall strategy for dealing with data analysis
  - 3.3.2 Qualitative and quantitative approaches to data analysis
  - 3.3.3 Problems and suggested strategies for dealing with testing and validating results

4 Results and Discussions of the investigation
- 4.1 Results from the qualitative and quantitative inquiry
- 4.2 Results from the testing of hypotheses
- 4.3 Discussions and comparisons of 4.2 with Chapter 2
- 4.4 Implications of the results for practice

5 Conclusions, Recommendations and Future Directions
- 5.1 Over key conclusions of the investigation
- 5.2 Development of a set of recommendations and description
- 5.3 Future directions and extensions of this study