Complex Network Analysis, MS

Complex network analysis is the quantitative study of interconnected systems that influence every aspect of our lives—from where we get our news and who we share ideas with, to how we travel and the people we interact with, to the products we purchase and the foods we eat. Networks are ubiquitous across natural and human-made systems, and their structure and dynamics can explain and help improve the greatest challenges of the next century, such as pandemics, food scarcity, cultural polarization, and climate change. Expertise in the emerging field of complex network analysis, within the landscape of the rapid growth of artificial intelligence and machine learning, forms the foundation of the next generation of thought leaders. Northeastern University leads the way in this burgeoning field, offering a unique master's degree program in complex network analysis methodologies. The program is designed to equip students with the conceptual and analytical tools needed to find patterns of connections in networked systems and apply these techniques in real-world settings. The curriculum includes industry-aligned concentration areas of focus, enabling graduates to apply complex network analysis skills in impactful careers in the public and private sectors as well as in research. The concentrations for this program correspond directly to the following industry sectors:

1. Public health and life sciences fields such as epidemiological modeling, public policy, informatics, and behavioral research
2. Social or urban science and research fields such as urban planning, social network research, economics, education, criminal science, or public policy
3. Finance or technological fields such as financial analytics, market research, or network analysis for business

In this degree program, students are admitted to the college associated with their concentration, and their degree is awarded by that college. The concentrations are associated with the following colleges:

- Complex Social Systems – College of Social Sciences and Humanities
- Economic and Technological Networks – Khoury College of Computer Sciences
- Population Health Dynamics – College of Science and Bouvé College of Health Sciences (*with student choice of college*)

Students will follow all policies associated with their home college.

Program Requirements

Complete all courses and requirements listed below unless otherwise indicated.

Required Courses

Code	Title	Hours
INSH 5301	Introduction to Computational Statistics	4
NETS 5050	Fundamentals of Complex Networks	4
NETS 5051	Analyzing Complex Network Data	4
NETS 5052	Advanced Tools for Complex Network Analysis	4
NETS 5901	Visualizing Complex Networks	2
NETS 5902	Communicating Network Data	2

Concentrations

Complete one of the following concentrations:

- Complex Social Systems (p. 2) (College of Social Sciences and Humanities)
- Economic and Technological Networks (p. 2) (Khoury College of Computer Sciences)
- Population Health Dynamics (p. 2) (College of Science and Bouvé College of Health Sciences)

Experiential Courses

Code	Title	Hours
Complete a total of 4 semester hours from the following (course may be repeated):		4
NETS 6107	Complex Network Analysis Research Rotation	
NETS 6108	Complex Network Analysis Capstone	
NETS 6990	Thesis	

Optional Co-op

Code	Title	Hours
NETS 6000	Professional Development for Co-op	1
NETS 6964	Co-op Work Experience	0

Program Credit/GPA Requirements

36–37 total semester hours required

Minimum 3.000 GPA required

COMPLEX SOCIAL SYSTEMS CONCENTRATION

Code	Title	Hours
A total of 12 semester hours is required to complete this concentration.		
Complete 6–8 semester hours from the following:		6-8
INSH 5304	Social Network Analysis	
INSH 6304	Modeling and Analyzing Social Networks	
NETS 5311	Physical and Digital Human Traces	
NETS 5314	Complexity in Social Systems	
NETS 5360	Research Design for Social Networks	
PPUA 5262	Big Data for Cities	
Complete 4–6 semester hours from the following:		4-6
NETS 6061	Analyzing Higher-Order Networks	
NETS 6063	Probabilistic Mathematics of Networks	
NETS 6099	Special Topics in Complex Networks	

ECONOMIC AND TECHNOLOGICAL NETWORKS

Code	Title	Hours
A total of 12 semester hours is required to complete this concentration.		
Complete 6–8 semester hours from the following:		6-8
CS 7150	Deep Learning	
DS 5220	Supervised Machine Learning and Learning Theory	
DS 5230	Unsupervised Machine Learning and Data Mining	
MISM 6212	Data Mining and Machine Learning for Business	
NETS 5411	Financial and Economic Networks	
Complete 4–6 semester hours from the following:		4-6
NETS 6061	Analyzing Higher-Order Networks	
NETS 6063	Probabilistic Mathematics of Networks	
NETS 6099	Special Topics in Complex Networks	

POPULATION HEALTH DYNAMICS CONCENTRATION

Code	Title	Hours
A total of 12 semester hours is required to complete this concentration.		
Complete 6–8 semester hours from the following:		6-8
BINF 6308	Bioinformatics Computational Methods 1	
NETS 5126	Spreading on Networks: From Epidemics to Memes	
NETS 5515	Complex Network Analysis for Biological Systems	
PHTH 5210	Biostatistics in Public Health	
PHTH 6440	Advanced Methods in Biostatistics	
Complete 4–6 semester hours from the following:		4-6
NETS 6061	Analyzing Higher-Order Networks	
NETS 6063	Probabilistic Mathematics of Networks	
NETS 6099	Special Topics in Complex Networks	