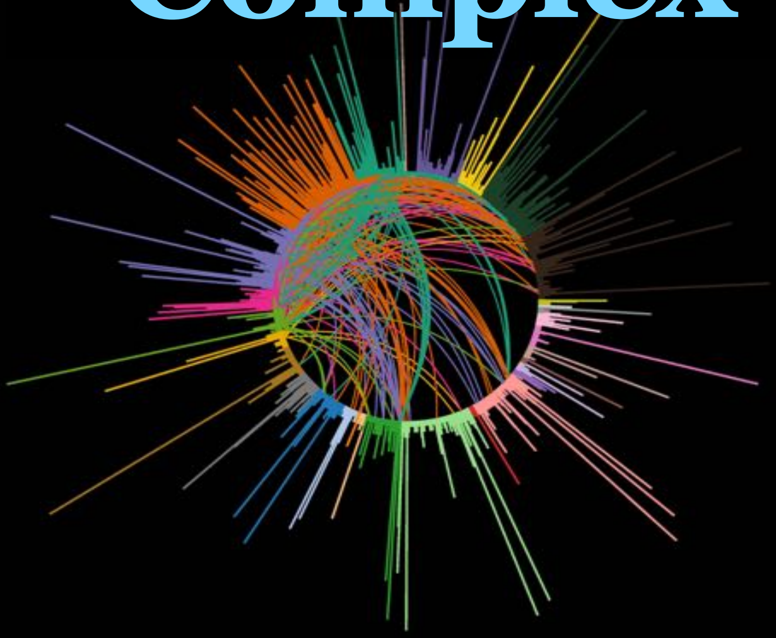
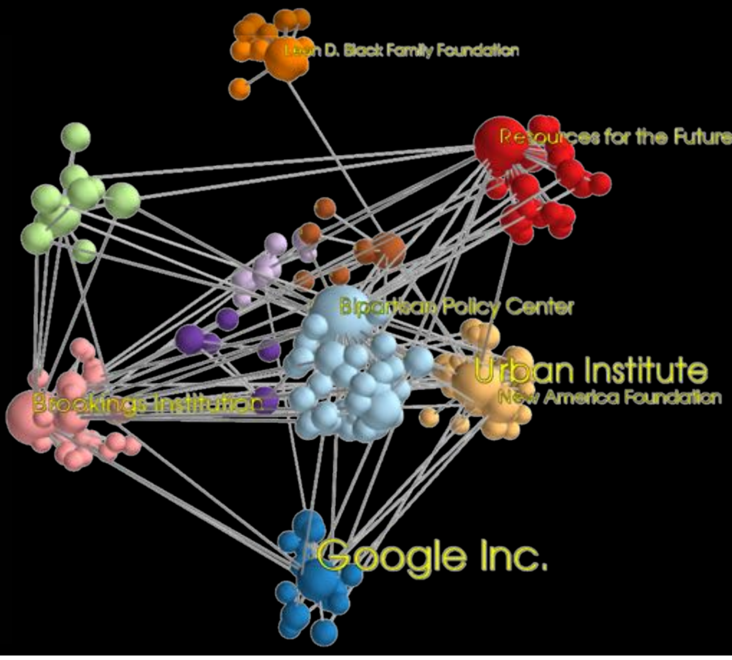
Winter'17

MATH 17

An Introduction to Math Beyond Calculus

Complex Networks





Networks are ubiquitous structures in nature and society. A few examples of networks include the animal brain, electrical power grids, the internet, online social networks such as Facebook and Twitter, the relationship between genes and diseases, collaboration and citation among scientists, trade among countries, as well as interactions between financial markets. Most of these networks have non-trivial structural properties and hence the name complex networks. Mathematical analysis of complex networks has led to many successes. For instance, in developing new vaccination strategies to stop the spreading of diseases.

In recent years, inexpensive mobile computing and sensory devices have become more accessible. These devices have made it easy to collect massive amounts of data on many complex phenomena. Traditional data processing and analysis methods have proven inadequate in dealing with this data. Tools from complex network theory have shown promise in analyzing such data sets.

This course will expose students to the methods and applications of complex networks. The following topics will be covered during the course. (i) Networks in the real world. (ii) Mathematical techniques for classification of networks. (iii) Models of network growth. (iv) Measures for quantifying local and global structures in networks. (v) Data analysis using tools from the theory of complex networks. We will also learn Python-based software packages including visualization techniques used in the analysis of networks.

Course overview

Math 17 gives first-year students an early opportunity to explore topics outside the calculus series. The target audience for this course is students who have completed the calculus sequence. However, senior students are also welcome to register for the course.

Minimum Prerequisites: Math 8, or placement into Math 11. Please contact the instructor for further information.

Instructor

Nishant Malik
Department of Mathematics, Dartmouth College
Nishant.Malik@dartmouth.edu