Class Time: 3:05 – 4:20pm, W. F.  
Class website on SAKAI
Instructor : Xiaobai Sun  
Office/Lab.: D109 LSRC  
Email : xiaobai[at]cs.duke.edu
Recitation Hour : TBA

Prerequisite: calculus, linear algebra, basic programming experience

Reference books:
- Network Science by A. Barabasi
- Networks by M. Newman

Additional references : to be recommended in classes and homework assignments

Work load and evaluation: 20% in weighting for each of the following
- 3 homework/project assignments
  - each has two components : analysis and experiments
    analysis by individual work, experiments by team work (two persons)
  - the first homework serves as a warmup
- 2 project presentations (midterm and final)
  - with key components
  - peer reviews

Homework tools:
- LaTex for text preparation, revision, presentation and submission
- MATLAB for algorithm prototypes and investigative experiments

Homework grading:
- individual points on analysis; team-shared points on experiments
- penalty on inadequate citation or acknowledgments; zero tolerance on plagiarism
- reward on creative ideas and approaches
- reward on correction within a week from the return of reviewed homework, up to 50% of the lost points

Class attendance: self-reporting in class at the course site; informing the teaching team of absence ahead of time

both available on line.
Basic and integral topics & components

There are many types of networks in natural sciences, social sciences, engineering and medicine. Graph-matrix theory is the mathematics of networks. Graph-matrix computation is instrumental to investigating and analyzing large and complex network data from real world and in multiple aspects or spaces.

The students will learn, via class lectures, literature study, discussion and homework, basic concepts and components about network analysis:

- modeling data relationships/interactions with graphs/networks
- data query and analysis via graph-matrix representation and computation
- important graph problems: classical and contemporary
- combinatorial graph invariants
- algebraic graph invariants
- statistical robustness
- fast and sparse graph-matrix computation methods
- iterative solutions to graph-based optimization problems