MATH 8500 Algorithmic Graph Theory, Spring 2017, OSU
Syllabus
Instructor: Anastasios Sidiropoulos

Website. http://web.cse.ohio-state.edu/∼tasos/courses/2017_spring_math8500_graphalg/

Grading policy. The course will include homework assignments and a final project. The project will be completed in teams of either one or two students and will consist of either a paper presentation or the implementation and experimental evaluation of an algorithm. Each student will also be responsible for scribing for at least one lecture. The resulting notes should be formatted in latex and sent to the instructor at most one week after the lecture. All resulting lecture notes will be posted on the course website. The assignment of students to lectures will be posted on the course website. The final grade will be computed using the following formula: $0.3 \cdot (\text{scribe notes}) + 0.3 \cdot (\text{homework}) + 0.4 \cdot (\text{project})$.

Description. The course discusses fundamental problems and techniques in the rapidly evolving field of algorithmic graph theory. The topics that will be covered include:

- Graph clustering: Algorithms for partitioning a graph into well-connected pieces (e.g. spectral partitioning, sparsest-cuts, multi-way cuts, and so on).
- Distances in graphs: Algorithmic methods for geometric problems in graphs, such as the Traveling Salesperson Problem, Minimum Spanning Trees, shortest paths, and so on.
- Flows in graphs: Min-cut/max-flow duality, and its extensions to multi-commodity flows. Applications to divide & conquer.
- Graph compression: Methods for representing succinctly large graphs (e.g. spectral sparsifiers, vertex sparsifiers, graph spanners, and so on).
- Algorithmic graph-minor theory: Dynamic programming on graphs via tree decompositions. Algorithms for graphs on surfaces.

Relevant textbooks.

- R. Ahuja, L. Magnanti, and J. Orlin, Network Flows: Theory, Algorithms, and Applications.
- B. Mohar and C. Thomassen, Graphs on Surfaces.

Description of the intended student audience: The course will be accessible to students with some knowledge of algorithms, graph theory, discrete mathematics, and probability theory. Programming experience is not necessary.

Academic Misconduct Statement. It is the responsibility of the Committee on Academic Misconduct to investigate or establish procedures for the investigation of all reported cases of student academic misconduct. The term "academic misconduct" includes all forms of student academic misconduct wherever committed; illustrated by, but not limited to, cases of plagiarism and dishonest practices in connection with examinations. Instructors shall report all instances of alleged academic misconduct to the committee (Faculty Rule 3335-5-48.7). For additional information, see the Code of Student Conduct at http://studentlife.osu.edu/csc/.

Disability Services Statement. Students with disabilities that have been certified by Student Life Disabilities Services (SLDS) will be appropriately accommodated and should inform the instructor as soon as possible of their needs. SLDS contact information: slds@osu.edu; 614-292-3307; 098 Baker Hall, 113 W. 12th Avenue.