CMPT 815 - G100 Algorithms of Optimization

Instructor(s): Igor Shinkar

Calendar Objective/Description:
This course will cover a variety of optimization models, that naturally arise in the area of management science and operations research, which can be formulated as mathematical programming problems.

Instructor’s Objectives:
Most interesting optimization problems are NP-hard. For an NP-hard problem, it is impossible to have an algorithm which gives an optimal solution efficiently (in polynomial time) for any input instance of the problem unless P=NP. Approximation are powerful and widely used approaches for tackling hard optimization problems. An approximation algorithm finds a near-optimal solution with guaranteed accuracy efficiently for any input instance. Randomized algorithms are another powerful and widely used approach to tackle problems for which efficient deterministic algorithms are not known.

The course will cover the fundamentals on the design and analysis of approximation and randomized algorithms for discrete optimization problems. By completing this course, students are expected to be able to design approximation and randomized algorithms for their own problems, prove and analyze the correctness and efficiency of their algorithms, and apply theoretical analysis to the study of heuristics.

Prerequisites:
None

Topics:
- Basic probability: linearity of expectation, concentration inequalities
- Approximation algorithms for discrete optimization problems
- Randomized algorithms
- Linear programming
- Semidefinite programming
- Sublinear time algorithms
- PCP theorem and hardness of approximation

Grading:
To be discussed in class.

Academic Honesty Statement:
Academic honesty plays a key role in our efforts to maintain a high standard of academic excellence and integrity. Students are advised that ALL acts of intellectual dishonesty will be handled in accordance with the SFU Academic Honesty and Student Conduct Policies (http://www.sfu.ca/policies/gazette/student.html).