CSCI 688-01

Network Location Theory

Course Syllabus—Spring 2023

10-10:50 MWF ISC 0248

INSTRUCTOR: Rex K. Kincaid
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Office Hours—2-3:30 p.m. WR or by appt.

PREREQUISITES: Csci 141, Csci 241, and Math 323 (high-level programming language, elementary data structures and rudimentary knowledge of optimization) or their equivalent (e.g. Csci 520 and Csci 628).

DESCRIPTION: Network location problems arise in many diverse applications. Examples include locating facilities, sensors, components, vehicles, people, services, and actuators. The course will include topics from classical location theory (covering, center and median problems) as well as more recent topics in the literature.

KEY DATES: The add/drop deadline is February 3 and the withdraw deadline is March 27. The midterm exam is slated for March 24 and the final project is due during our final exam time slot 2-5 p.m. Tuesday, May 16.

TOPIC OUTLINE:

1. Introduction (ch. 1 of Daskin) [1 week]
2. Covering Problems (ch. 4 of Daskin) [2 weeks]
3. Center Problems (ch. 5 of Daskin) [2 weeks]
4. Median Problems (ch. 6 of Daskin) [2 weeks]

- Midterm Exam (tentatively March 24)

5. Students present research articles [2 weeks]
6. Fixed Charge (ch. 7 of Daskin) [1 week]
7. Extensions of Location Models (ch. 8 of Daskin) [2 weeks]
8. Meet for individual/group projects [1 week]

Students will work on individual or group projects/papers during the last part of the semester. This can take the form of an application of an existing model, development of a new formulation, or implementation of a solution algorithm. On the course Bb site there is a folder containing copies of roughly 100 network location research articles. Here is a link to information about the textbook, https://daskin.engin.umich.edu/network-discrete-location/.

REFERENCES:

1. Daskin, M.S., Network and Discrete Location Models, Algorithms, and Applications, John Wiley & Sons, New York (2013).

2. Drezner, Z. and H.W. Hamacher (eds.), Facility Location: Applications and Theory, Springer-Verlag, Berlin, Germany (2001).
3. Chartrand, G., Introductory Graph Theory, Dover Publications Inc., NY, 1977.
4. Kincaid, R., "Exploiting Structure: Trees and Treelike Graphs," chapter 14 in Foundations of Location Analysis (edited by H.A. Eiselt and V. Marianov) Berlin: Springer-Verlag, 2011. ISBN: 9781441975713.
5. "Good Solutions to Discrete Noxious Location Problems via Metaheuristics," *Annals of Operations Research,* **40** (1992) pp. 265-281.
6. "The P-Dispersion-Sum Problem: Results on Trees and Graphs" (with L.G. Yellin) *Location Science,* **1** (1993) pp. 171-186.
7. "The Maxminsum Problem on Trees," (with R.T. Berger) *Location Science,* **2** (1994) pp. 1-10.
8 "Solving the Damper Placement Problem using Local Search Heuristics," special issue of *OR Spektrum* on Applied Local Search, **17** (1995) pp. 149-158.
9. "Quelling Cabin Noise in Turboprop Aircraft via Active Control," (with K. Laba and S. Padula) *J. of Combinatorial Optimization* **1**, Issue 3 (1997) pp. 1-22.
10. "Reactive Tabu Search and Sensor Selection in Active Structural Acoustic Control Problems," (with K. Laba) *J. of Heuristics*, **4** (1998) pp. 199-220.
11. "D-Optimal Designs for Sensor/Actuator Placement," (with S. Padula) *Computers and Operations Research* **29**, No. 6 (2001) pp. 701-713.
12. "Approximate Solutions of the Continuous Dispersion Problems," (with M. Trosset and A. Dimnaku) *Annals of Operations Research* Vol. 136, No. 1 (2005) pp. 65-80.
13. "Computational Experiments with Heurisitcs for two Nature Reserve Site Selection Problems," (with M. Jeske and C. Easterling) *Computers and Operations Research*, Volume 35, Issue 2 (2008) pp. 499-512.

HOMEWORK: Homework emphasizing and extending lecture material will be assigned and graded. Late homework is not accepted except in the case of an unanticipatable absence (serious illness, death in the family, loss of your favorite DVD, etc.).

GRADES: The midterm exam will be "almost closed book," i.e. students may use two 8.5 by 11 inch sheet of notes. Such notes may be on both sides of the paper, but they should be in orginal pen or pencil, **not photo-copies**. The course project will be due no later than the scheduled final exam time slot (May 16 at 5 p.m.). Homework assignments will be given periodically throughout the semester and together will count 30% of the final course grade. Some homework assignments will involve programming and the use of optimization software. Finally, class participation is important. 5% of the course grade will reflect your participation and insightfulness in class discussions.

Homework	33%
Midterm Exam	35%
Presentations	7%
Projects	25%