

# CS 787 Decision Guidance Systems

## Spring 2014

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**Prof. Alex Brodsky** (<http://cs.gmu.edu/~brodsky/>)

Meeting Times: Tuesday 7:20-10 PM

Meeting place: AB L008

Instructor's Contact Info:

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Office hours: Thursdays 4:00-5:30 or by appointment

### **Purpose of the course:**

Increasing number of applications require predicting behavior of a complex system and making decisions to move the system towards desirable outcomes. Examples include finding the best course of action in emergency, deciding on business transactions within a supply chain, making a patient treatment plan for the best prognosis, and deciding on public policies guided by most positive outcomes.

In these applications, predictions and decisions are to be made in the presence of large amounts of dynamically collected data and learned uncertainty models. In many cases, it is also necessary to acquire additional data in order to reduce uncertainty and make better decisions. We call such a system, which supports a closed-loop data acquisition, learning, prediction and decision optimization, a *decision-guidance application*.

The focus of this class is on studying models, languages, and algorithms toward building a *decision-guidance management system* (DGMS), which is a productivity tool for fast development of *decision-guidance applications* in a seamlessly integrated environment.

Significant advances have been made in the areas of operations research, mathematical and constraint programming, machine learning and data mining, and database systems. These advances can all contribute to a DGMS. However, there are no cohesive frameworks, algorithms and systems that unify the models and computational paradigms of all the components. A unified framework in the form of a DGMS, which is the focus of this class, is necessary for decision guidance in complex systems. In addition, the integration of multiple components from different areas in a unified DGMS brings new computational challenges and new optimization opportunities.

**Pre-requisites:** CS 550 or INFS 614 (Database Management) or permission by instructor. Background in Operations Research and Statistical Learning is helpful, but not required.

**Textbooks:** None required, but a lot of reading materials will be assigned by the instructor.

**Course work & Grading Policy:**

Students are required to attend all the lectures. The planned structure of the class:

- 2/3 Exam: 40 %
- Research term paper or project: 50%.
- Participation in class: 10%
- There is no final exam

**Tentative Class Schedule (TBD)**

#	Date	Topic	Lecture
1	Jan 28	Introduction: Decisions and challenges	
2	Feb 4	Constraint Optimization and Decision-guidance management	
3	Feb 11	Optimization Programming Language (OPL)	
4	Feb 18	OPL – cont.	
5	Feb 25	Decision Guidance Query Language (DGQL)	
6	Mar 4	CoJava language and Service-Composition	
7	Mar 11	No Class - Spring break	
8	Mar 18	Recommender systems with composite alternatives	
9	Mar 25	No Class	
10	Mar 29 – Friday 5:30 – 8pm	Catch-up and review for exam	
11	Apr 1	Exam	
12	Apr 8	No Class – working on projects	
11	Apr 15	DG Applications	
12	Apr 22	students' presentations	
13	Apr 29	students' presentations	
16	May 6	students' presentations	
17	May 13	students' presentations	