CS 6630: SPATIAL AND MULTIDIMENSIONAL DATABASES

Semester Hours:	3.0	*Contact Hours:* 3
Coordinator	Ray Kresman	
Text	Spatial databases- a tour	
Authors:	Shekhar and Chawla	
Year	2003	

SPECIFIC COURSE INFORMATION

Catalog Description:

Introduction to advanced database structures and large datasets. Efficient data structures and related algorithms for spatial, streaming and multi-dimensional and semi-structured datasets. Employs concepts from databases, algorithms, computer graphics and computational geometry. Prerequisites: CS 5620 or permission of instructor.

Course type: **ELECTIVE**

SPECIFIC COURSE GOALS

- I am able to store, retrieve and manipulate multidimensional data using advanced data structures such as MX-quad tree, BBD-tree, R-tree, and others.
- I am able to formulate spatial queries that permit efficient data.
- I am able to distinguish between various spatial distance metrics.
- I am able to explain the mechanics of certain algorithms for similarity searching.
- I am able to use advanced SQL operations to query data warehouses.
- I am able to explain the nature of streaming data and algorithms for certain problems.
- I am able to critically evaluate a research literature in the realm of multidimensional, spatial or streaming data.

LIST OF TOPICS COVERED

1. Introduction
    - Large datasets
    - Spatial data & GIS

- Streaming data

2. Graph Theory
    - Elementary graphs
    - Computational geometry

3. Multidimensional Datasets
    - Transactional data and relational schemas
    - Dimensional models
    - Snowflake schemas
    - Data warehousing & SQL

4. Spatial Datasets
    - Representation
    - Access methods
    - Trees: R-tree, Kd-tree, quad-tree, etc.
    - Performance tradeoffs

5. Data Storage and Manipulation
    - Spatial Object types
    - Spatial queries & operations
    - Similarity search/methods
    - Spatial algebra

6. Streaming Data
    - Sample problem: sampling, cardinality/moments estimation
    - Clustering & space filling cures
    - Approximation algorithms

7. Performance
    - Spatial indices
    - Clustering & space filling curves
    - Data quality and metrics

8. Mining
    - Association rules
    - Continuous space and spatial co-location
    - Spatial autocorrelation