Structure of Programming Languages  
Fall 2008 and Spring 2009

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Motivation
The motivation behind teaching this course is to prepare you for better programming and writing compilers, and to prepare you for tomorrow since languages keep changing while the basic principle and design philosophy does not alter. This course will provide basic understanding of general design issues and behavior of different class of programming languages. No specific programming language syntax will be discussed. Although, examples will use syntax of popular languages in a specific class of languages. In addition, the student will be taught latest concepts in multimedia languages such as synchronization issues, multimedia archival and retrieval issues, and multimedia formats.

Prerequisites
Intermediate programming, Data structures, Symbolic programming, Knowledge of at least couple of programming languages

Contents
Introduction and properties of a good programming language (75 minutes), control flow diagrams (20 minutes), syntax and Backus Naur form (120 minutes), introduction to semantics (45 minutes), parameter passing, side-effect, aliasing (200 minutes)

Pre-First Mid Term tutorial (45 minutes)

First Mid Term (1 lecture)
Implementation of Heap Based Languages and Garbage Collection (135 minutes lectures)  
Types as sets (100 minutes), use of types and abstract implementation (45 minutes), polymorphism (45 minutes), Data dependency, concurrency and synchronization (120 minutes),

Pre-Second Mid Term tutorial (45 minutes)

Second Mid Term (1 lecture)
Deterministic and non-deterministic programming and languages (80 minutes).  
Fundamentals of functional programming paradigm (90 minutes), Fundamentals of logic programming paradigm (135 minutes), Fundamentals of object oriented programming
paradigm (45 minutes), Implementation Models of object oriented languages <45 minutes>

Pre-Final tutorial (45 minutes)

Last three lectures (not covered in the examination) Agent Based Languages (45 minutes), Introduction to Multimedia Languages such as XML and SMIL (45 minutes) Introduction to theory of multimedia systems such as synchronization, multimedia archival and retrieval.

Assignments: Last assignment will be a bonus assignment, and will be counted to promote border line students to a higher grade

1. Control flow diagrams, Syntax, and semantics
2. Behavior of languages, parameter passing, and side effects
3. Type theory, concurrency, and non-deterministic programming
4. Heap and Garbage collection
5. Functional and logic programming paradigm, Object Oriented programming paradigm - 2 assignments

For each assignment you will be given exactly one week. Departmental policy will be followed regarding copying. Two very similar text (to be decided by the instructor) will be treated as case of copying. However, group discussion to understand the problem is encouraged. A student will lose 10% of grade for every working day of late submission. Without proper explanation, late assignment submission is discouraged.

Text Book and Reference Material
1. Concepts of Programming Languages by Robert Sebesta, Eighth Edition, Publisher: Addision Wesley,
2. Arvind Bansal, transparencies from the class

Other Reference Books
1. Material for garbage collection and functional programming will be augmented during the semester.

Grading Policy
There will be three examinations: first midterm (20 %), second midterm (20 %), and third midterm (30%), and six assignments. First Five assignments will be counted. Last assignment will be a bonus assignment to help students who are at the border of two grades. Each assignment carries 6% of the grade. A student must attend 85% of the classes.

A > 85%, B > 75%, C > 65%, D > 50%
University Plagiarism Policy

Administrative Policy and Procedures Regarding Student Cheating and Plagiarism
Condensed Version
For complete policy and procedure go to www.kent.edu/policyregister 3342-3-01.8.
Cheating and plagiarism constitute fraudulent misrepresentation for which no credit can be given and for which appropriate sanctions are warranted and will be applied. The university affirms that acts of cheating and plagiarism by students constitute a subversion of the goals of the institution, have no place in the university and are serious offenses to academic goals and objectives, as well as to the rights of fellow students. “Cheat” means to intentionally misrepresent the source, nature, or other conditions of academic work so as to accrue undeserved credit, or to cooperate with someone else in such misrepresentation.

Cheating includes, but is not limited to:
1. Obtaining or retaining partial or whole copies of examinations, tests or quizzes before these are distributed for student use;
2. Using notes, textbooks or other information in examinations, tests and quizzes except as expressly permitted;
3. Obtaining confidential information about examinations, tests or quizzes other than that released by the instructor;
4. Securing, giving or exchanging information during examinations;
5. Presenting data or other material gathered by another person or group as one’s own;
6. Falsifying experimental data or information;
7. Having another person take one’s place for any academic performance without the specific knowledge and permission of the instructor;
8. Cooperating with another to do one or more of the above;
9. Using a substantial portion of a piece of work previously submitted for another course or program to meet the requirements of the present course or program without notifying the instructor to whom the work is presented; and
10. Presenting falsified information in order to postpone or avoid examinations, tests, quizzes or other academic work.

“Plagiarize” means to take and present as one’s own a material portion of the ideas or words of another person or to present as one’s own an idea or work derived from an existing source without full and proper credit to the source of the ideas, words, or works. As defined, plagiarize includes, but is not limited to:
a. The copying of words, sentences and paragraphs directly from the work of another without proper credit;
b. The copying of illustrations, figures, photographs, drawings, models, or other visual and nonverbal materials, including recordings of another without proper credit; and
c. The presentation of work prepared by another in final or draft form as one’s own without citing the source, such as the use of purchased research papers.

Student Cheating and Plagiarism
Academic Sanctions
The following academic sanctions are provided by this rule for offenses of cheating or plagiarism. Kent campus instructors shall notify the department chairperson and the student conduct office each time a sanction is imposed. Regional campus instructors shall notify the regional campus dean and the student conduct officer each time a sanction is imposed. Regional campus student conduct officer shall notify the Kent student conduct office each time a sanction is imposed by a regional campus instructor. The following academic sanctions are provided by this rule for offenses of cheating or plagiarism. In those cases the instructor may:
1. Refuse to accept the work for credit; or
2. Assign a grade of “F” or zero for the project, test, paper, examination or other work in which the cheating or plagiarism takes place; or
3. Assign a grade of “F” for the course in which the cheating or plagiarism took place; and/or;
4. Recommend to the department chair or regional campus dean that further action specified in the rule be taken. The department chairperson or regional campus dean shall determine whether or not to forward to the academic dean or to the vice president for the extended university a recommendation for further sanction under this rule.

For information regarding the academic appeals procedure, please refer to page 107 of the 2008-2009 FlashGuide
What is AI?
Artificial Intelligence (AI), also referred as computational intelligence, is mimicking human intelligence and reasoning using computational techniques. In early 1970s, the scope of artificial intelligence was limited to mimicking the knowledge based reasoning of a specialist and intelligent guessing (heuristics) for smart game playing. However, as the area of computational intelligence has matured, it has diverged to many areas such as expert systems, decision support systems, shape and object recognition, pattern recognition and data mining, knowledge based systems, content based retrieval, case based reasoning, symbolic systems, neural networks, intelligent agent based system, common sense reasoning, decision support systems, constrained based reasoning, speech recognition, robotics, motion planning, collaborative reasoning, inductive learning, deductive reasoning, and their integration.

Application
AI has been extensively used in diagnostics systems, simulating what-if scenarios, game playing, decision support systems with human in loop to assist humans in decision making, automated control of machines, automobiles, aircrafts, spacecrafts, intelligent industrial machines for specific functions, learning new trends from stock market and traffic and sales understanding systems for multimedia objects, more recently in phone based automated voice interactions, intelligent routing of the messages in the computer networks, human like human-computer interaction, and development of humanoids to assist aging population as in Japan.

Motivation
The motivation of this course is to help you learn various AI techniques and concepts as explained above. The course will teach you above concepts and programming in popular AI languages such as Lisp, Scheme, Prolog, and the implementation of the above concepts using these languages.

Course Outline
Introduction (1 lecture), Lisp programming (2 lectures), Prolog programming (2 lectures), Programming practice (3 lectures)

** First Mid term – Take Home Exam**
Heuristics and State space problems and Searching (3 lectures), Constraint satisfaction and propagation (2 lectures), Forward Chaining and Backward Chaining Systems (1 lecture), Bayesian network and pattern matching (1 lecture), Tutorial (1 lecture)

** Second Mid Term **

Neural Networks (1 lectures), Semantic Networks, Knowledge Bases and Ontology (2 lectures), Belief and Plans (1 lecture), Hidden Markov Model (1 lecture) Learning (1 lectures), Perception (1 lecture), Tutorial (1 lecture)

** Final **

Text

Grading
There will be five mini-projects and a team project. There will be three midterms. The total of mini-projects/assignments would be 20%, the total of team project would be 20%, First midterm will be 20%, second midterm will be 20%, and the finals would be 20%. The project would be an implementation of a small group project using Prolog or Lisp to write a game or a reasoning system using blackboard architecture or an expert system or simulating a neural network or developing a Hidden Markov Model or developing semantic network and pulling out information using semantic network or using semantic network to identify an object. The projects would involve whole lot of self study and discussion with the professor.
A > 85%, B > 75%, C > 65%, D > 50%

Copying Policy
Professor will treat the students as mature adults who are seriously interested in learning the course material. Copying is not conducive to learning. If you feel that you are unable to meet your grade obligations, talk to the professor to help you out instead of copying. Please read the university policy and the department policy regarding plagiarism given along with the syllabus very carefully. Taking any material from the web site is also plagiarism, and should be avoided.

You are allowed to discuss the projects and assignments in study groups to understand the involved concepts. However, the homework problems must be attempted and programmed only by you and not by others.
Kent State University  
CS 4/59995: ST: Introduction to Data Mining  
Fall 2009

**Professor: Yuri Breitbart, MSB 251**

Mondays and Wednesdays 9:15-10:30 am; Rm. MSB 228  
Office Hours: Mondays and Wednesdays 11:00-12:00pm and by appointment

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**Prerequisites**

CS 33001 Data Structures  
Or Consent of the Instructor

**Course Overview**

The course presents the concepts and techniques of data mining. Data Mining is a process of discovering information from a set of large data sets. Many commercial and government organizations have huge databases and files with a lot of information in them. Data Mining has developed a set of techniques to unlock information from these data. Among data mining successes are: discovering patterns of traveler behaviour, discovery of market associations of the "beer and diaper" type, and comparisons of the genotype of people with and without certain medical problems related to presence of specific genes in their genetic structure. Data Mining is an interdisciplinary field that combines methods from statistic, databases, machine learning and neural networks. All necessary information from these fields will be given in class. The major difference between data mining and previous artificial intelligence and statistical methods is in designing scalable methods that applicable to large data that cannot be stored entirely in computer memory. Such methods led to very impotant applications in bioinformatics, medical informatics, market analysis, financial engineering, web searching, and e-commerce e-science among others. In this course we first focus on issues of data extraction and data preparation for data mining. We then analyse basic data mining techniques: association rules, classification, clustering, and mining complex data types. Finally, we apply the learned techniques to specific applications in medicine and market analysis.

**Learning Outcome**

It is expected that at the end of the course students will learn basic data mining techniques and examples of application of these techniques to specific application data. The students will also learn the ways to collect data from data warehouses and design data models amenable to scalable data mining techniques.

**Textbook**

*Margaret Duhnam*
Data Mining: Introductory and Advanced Topics

Additional Text

Data Mining: Concepts and Techniques by Jiawei Han and Michele Kamber

Weekly Course Outline

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<td>Topics Related to Data Mining</td>
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Exams

Students will be asked to do some homeworks. Each homework contains examples of application of data mining algorithms as well as questions about the alternative algorithms for some data mining algorithms. There will be a midterm on October 14, 2009. Project due date is December 7, 2009. This a firm date and no extension will be granted. There will be final exam on December 15th, 2009 at 10:15. Each project will be either implementation of comparisons between two data mining algorithms discussed in class. or analysis of additional literature assigned by instructor.

Requirements & Grading Policy

University Policies

A student's grade is determined as a weighted average of homeworks (20%), project (20%), midterm (25%), and final exam (35%).

Check This place for New Class Materials

Homeworks

Projects

Viewgraphs

The official registration deadline for this course is 09/13/2009. University policy requires all students to be officially registered for each class they are attending. Students who are not officially registered for a course by published deadlines should not be attending classes and will not receive credit or a grade for
the course. Each student must confirm enrollment by checking her/his class schedule (using Student Tools in FlashFast) prior to the deadline indicated. Registration errors must be corrected prior to the deadline. The last day to withdraw is 11/08/2009.