Logic Programming

Semantic Worksheets

Michael Genesereth
Computer Science Department
Stanford University
DEPARTMENT OF COMPUTER SCIENCE
MSCS Program Sheet (2010-11)

Artificial Intelligence : Primary Specialization

Name: Charles Parnell Naut
Student ID #: 
Email: cmnau@stanford.edu
Proposed date for degree conferral: 
Date: 10/8/2010

GENERAL INSTRUCTIONS
Before the end of your first quarter, you should complete the following steps. Detailed instructions are included in the Guide to the MSCS Program Sheet in your orientation packet (an online version is available at es.stanford.edu/degrees/mscs/programsheets/):

- Complete this program sheet by filling in the number, name and units of each course you intend to use for your degree.
- Create a course schedule showing the year and quarter in which you intend to take each course in your program sheet.
- Meet with your adviser and secure the necessary signatures on the program sheet.

FOUNDATIONS REQUIREMENT
You must satisfy the requirements listed in each of the following areas; all courses taken elsewhere must be approved by your adviser on a foundation course waiver form. Required documents for waiving a course include course descriptions, syllabi, and textbook lists. These documents can be organized here: es.stanford.edu/degrees/mscs/waivers/. Do not enter anything in the "Units" column for courses taken elsewhere.

Note: If you are amending an old program sheet, enter "on file" in the approval column for courses that have already been approved.

<table>
<thead>
<tr>
<th>Required</th>
<th>Equivalent elsewhere (course number/title/institution)</th>
<th>Approval</th>
<th>Grade</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Logic, Automata and Complexity (✓ CS 103)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Probability (✓ CS 109, STATS 116, CMB 106, or MS&amp;E 220)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Algorithmic Analysis (✓ CS 161)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Computer Organization and Systems (✓ CS 107)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Principles of Computer Systems (✓ CS 110)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

TOTAL UNITS USED TO SATISFY FOUNDATIONS REQUIREMENT: 10

Note: This total may not exceed 10 units.

77 Requirements Left | Total Units: 10 | Status: Draft
Heterogeneous Worksheets
Collaborative Heterogeneous Worksheets
Architectural Alternatives
Syntactic vs Semantic Worksheets

Syntactic Worksheets

*Widget state* (e.g. value of selector) stored
User gestures (e.g. clicking a button) change *widget state*
Visible Features (e.g. color of text) views of *widget state*

Semantic Worksheets

*Application state* (e.g. courses student has taken) stored
User gestures translated to *application actions*
Visible Features computed as *views of application state*
Heterogeneous Data
<table>
<thead>
<tr>
<th>Course 1</th>
<th>Course 2</th>
<th>Course 3</th>
<th>Course 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Autumn</td>
<td>Autumn</td>
<td>Autumn</td>
<td>Autumn</td>
</tr>
<tr>
<td>Winter</td>
<td>Winter</td>
<td>Winter</td>
<td>Winter</td>
</tr>
<tr>
<td>Spring</td>
<td>Spring</td>
<td>Spring</td>
<td>Spring</td>
</tr>
<tr>
<td>Summer</td>
<td>Summer</td>
<td>Summer</td>
<td>Summer</td>
</tr>
</tbody>
</table>

- **Autumn**
  - Course 1
  - Course 2
  - Course 3
  - Course 4

- **Winter**
  - Course 1
  - Course 2
  - Course 3
  - Course 4

- **Spring**
  - Course 1
  - Course 2
  - Course 3
  - Course 4

- **Summer**
  - Course 1
  - Course 2
  - Course 3
  - Course 4
**Operation Definitions:**

- select(Course, Quarter) :: holds(Course, Quarter)
- deselect(Course, Quarter) :: ~holds(Course, Quarter)

**Widget Data:**

- holds(course1, autumn)
- holds(course2, autumn)
Schedule 2

Operation Definitions:

\[
\text{select}(\text{Quarter},\text{Course}) :: \text{holds}(\text{Quarter},\text{Course}) \\
\text{deselect}(\text{Quarter},\text{Course}) :: \neg \text{holds}(\text{Quarter},\text{Course})
\]

Widget Data:

\[
\text{holds}($\text{autumn}$,$\text{course1}$) \\
\text{holds}($\text{autumn}$,$\text{course2}$)
\]
Mapping Rules for Schedule 1 to Schedule 2:

select(Quarter,Course) :: holds(Course,Quarter)
deselect(Quarter,Course) :: ~holds(Course,Quarter)

Mapping Rules for Schedule 2 to Schedule 1:

select(Course,Quarter) :: holds(Quarter,Course)
deselect(Course,Quarter) :: ~holds(Quarter,Course)

Widget Data:

holds(course1,autumn)
holds(course2,autumn)
holds(autumn,course1)
holds(autumn,course2)
Data:

offered(course1, autumn)
offered(course2, autumn)

Operations:

select(Course, Quarter) :: offered(Course, Quarter)
deselect(Course, Quarter) :: ~offered(Course, Quarter)

select(Quarter, Course) :: offered(Course, Quarter)
deselect(Quarter, Course) :: ~offered(Course, Quarter)

Views:

holds(Course, Quarter) :- offered(Course, Quarter)
holds(Quarter, Course) :- offered(Course, Quarter)
### AI Program Requirements

- **Take at least 6 courses**
- **Take at most 3 courses per quarter**

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
<th>Total:</th>
<th>Professor Courses</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS 157</td>
<td>☐</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>CS 227B</td>
<td>☐</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>CS 228</td>
<td>☐</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>CS 331B</td>
<td>☐</td>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>

**Focus on AI Topics**

- 25% Computational Biology
- 25% Computer Vision
- 25% Information Retrieval
- 25% Logic
- 25% Machine Learning
- 25% Natural Language Processing
- 25% Robotics
Academic Program Management

Stanford University + School of Engineering
Computer Science
Artificial Intelligence Track
2019-20 Program Sheet

Final version of program sheet due to the department no later than one month prior to the last quarter of senior year.
*Follow all requirements as stated for the year of the program sheet used.*

Name: ___________________________  SU ID#: ___________________________
Phone: __________________________  Email: ___________________________
Today's Date: _____________________  B.S. Expected: Quarter: _____ Year: _____

Mathematics

Select MATH 19, 20, 21 OR MATH 41, 42 OR AP Calculus (minimum 10 units):
☐ MATH 19  ☐ MATH 20  ☐ MATH 21  ☐ MATH 41  ☐ MATH 42  ☐ AP or IB Calculus

Select all of the following (5 units each):
☐ CS 103  ☐ CS 109

Add two courses from the following:
☐ CME 100  ☐ CME 102  ☐ CME 103  ☐ CME 104  ☐ CS 157  ☐ CS 206L
☐ EE 103  ☐ MATH 51  ☐ MATH 52  ☐ MATH 53  ☐ MATH 104  ☐ MATH 107
☐ MATH 108  ☐ MATH 109  ☐ MATH 110  ☐ MATH 113  ☐ PHIL 151

Add electives if necessary:
☐ Elective  ☐ Elective  ☐ Elective  ☐ Elective

* Changes to the Math requirements must be petitioned to the School of Engineering.
* If you have taken both Math 51 and Math 52, you may not count CME 100 as an elective.
* You may count at most one course from CS 157 and PHIL 151 and one from CME 103 and EE 103.

<table>
<thead>
<tr>
<th>Dept</th>
<th>Course</th>
<th>Title</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Year</th>
<th>Autumn</th>
<th>Winter</th>
<th>Spring</th>
<th>Summer</th>
</tr>
</thead>
<tbody>
<tr>
<td>2021</td>
<td></td>
<td></td>
<td></td>
<td>26 units minimum</td>
</tr>
<tr>
<td>2022</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2023</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2024</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Collaborative Worksheets
Collaborative Nineboard
Heterogeneous Worksheets
Tic Tac Toe

```
 X O X
```

Trifecta

Deck
1,2
1,3
2,1
2,2
2,3
3,3

White
1,1
3,1

Black
3,2
Tic Tac Toe - Trifecta
Logistics
Architectural Choices

**Dataset Sharing**
Easy to implement and debug
May move lots of data
Allows all users to see and modify all data

**Message Passing** *(Communication Channels)*
Difficult to implement and debug
Moves minimal data
Privacy and security assured

**Backend Server** *(MySQL, PHP, etc.)*
Moderate effort to implement and debug
Development and maintenance of backend infrastructure
Moves minimal data
Privacy and security assured
Worksheets

Create dynamic, interactive web pages. Publish online for personal or public use. Interlink to support collaborative work.

Public
Click here to access public worksheets.

Private
Click here to manage your own worksheets.

Cloud-based. No need to install hardware or software. Do It Yourself. No traditional programming required. Easy to manage. Dashboards and drop down lists.

Learn More
Start Building on AWS Today

Whether you're looking for compute power, database storage, content delivery, or other functionality, AWS has the services to help you build sophisticated applications with increased flexibility, scalability and reliability.

Create a Free Account

View AWS Free Tier Details »

GET STARTED TODAY

Amazon Lightsail
Everything you need to get started on AWS—for a low, predictable price

Sign up for free »