CSCE 625: Artificial Intelligence

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CSCE 625: Artificial Intelligence

- Course Homepage
  
  http://robotics.cs.tamu.edu/dshell/cs625/

- Textbook
  
  *Artificial Intelligence: A Modern Approach*, 3rd Edition
  
  by Stuart Russell and Peter Norvig, 2009

- Other Reading Material: See the course homepage
Objectives

- Understand and enumerate the basic techniques for creating intelligent programs.
- Create a successful program illustrating the operation of one of these methods.
- Apply the right programming language or technique to the right problem and be able to evaluate a proposed AI application for likelihood of success.
- Be able to discern sensationalism from science on the possible impact of AI on society.
Different definitions of the discipline A.I

- “New” problems? Things on the fringe?

- Is it just algorithms for difficult problems?

- Is it just heuristic control theory, but light on theory?
Paraphrasing H. S. Wall:

Uppermost in the minds of the professors is the desire to help the student develop the ability to set up and solve problems, and to make free use of computing. I believe progress can be made in that direction. Perhaps the fault lies in the prevalent idea that the subject is a kit of tools all arranged in little packages. Over the years this has come to be reflected in our textbooks, which in trying to meet the demand for more and more tools in the kit, have reached the point where one can question whether we are teaching science at all.
Real Objectives

- Give some indication of the intellectual activity of scientists.
  - Characteristics of scientific procedures.
  - Goals for which the scientist strives.
- The new outlooks which the work gives for the great mysteries of human existence.
- I want to get you to think critically and inquisitively.
What I cannot create, I do not understand.

Know how to solve every problem that has been solved.

Why const * sort Po

To learn:

Bethe Ansatz Prob.
Kondo 2-D Hall
accel. Temp
Non linear Chemical Hydro

\[ \begin{align*}
\mathcal{A} f &= U(Y, a) \\
\mathcal{B} f &= 2|k.a|(u.a)
\end{align*} \]
"It has often been said that a person does not really understand something until he teaches it to someone else.

Actually a person does not really understand something until he can teach it to a computer."

-- Donald E. Knuth.
Bloom’s Taxonomy

Higher Order Skills

Creating
- designing, constructing, inventing, devising…

Evaluating
- hypothesizing, judging, checking, critiquing…

Analyzing
- organizing, structuring, outlining, integrating…

Applying
- using, implementing…

Understanding
- summarizing, inferring, interpreting, comparing…

Remembering
- recognizing, listing, naming, identifying…
Our roles and respective responsibilities

"I see my role as that of someone who opens a door to the riches of the world of mathematics and encourages the students to take responsibility for their own education. ...the standard pattern of the teacher as the sole source of initiative, and of the teacher-and-textbook combination as the sole source of wisdom, induces a condition of intellectual bondage; an umbilical cord is indispensable at the fetal stage of growth, but it must be cut if the next stage of growth is to take place."

--- Abe Shenitzer
The Texas Method

R.L. Moore, F.B Jones, H. J. Ettlinger, and H.S. Wall

- Much attention is given to matters of language and logic.
- To develop clear thinking, it is necessary to develop the ability to make statements that say exactly what is intended.
- Also, it is necessary to learn to deny statements.
The Texas Method

“Examination systems, in spite of all efforts to the contrary, seem to influence our teaching in the direction of formalism rather than insight; because it is easy to test a student’s manipulative skill and extremely difficult to test their ability to think.”

-- W. B. Carver
The Texas Method

“The Great contribution of mathematics, pure or applied, is not rigor. It is ideas. Those are what our teaching should explain, and our own research should look for, and our writing should express”

-- G. Strang
Pay attention to this:

https://www.youtube.com/watch?v=vJG698U2Mvo
Charles Sanders Peirce:

"Looking out my window this lovely spring morning, I see an azalea in full bloom. No, no! I don't see that; though that is the only way I can describe what I see. That is a proposition, a sentence, a fact; but what I perceive is not proposition, sentence, fact, but only an image, which I make intelligible in part by means of a statement of fact. This statement is abstract; but what I see is concrete. I perform an abduction when I so much as express in a sentence anything I see. The truth is that the whole fabric of our knowledge is one matted felt of pure hypothesis confirmed and refined by induction. Not the smallest advance can be made in knowledge beyond the stage of vacant staring, without making an abduction at every step."
Das lesende und rechnende Pferd mit seinem Lehrer HERRN von OSTEN (Berlin.)
The Arch of Aristotelian Logic

The "Problem of Induction": how many individuals of a kind justify a generalization?

The "Problem of Deduction": why do First Principles not need to be proven?

The intuitive grasp of self-evident First Principles

Inductive Generalizations uncertain

Posterior Analytics

Inductive Logic counting and generalization of individual kinds and events experience individual objects

"Mind"

Posterior Analytics

First Principles or Axioms of Demonstration certain

Prior Analytics reasons beliefs

Deductive Logic conclusions or theorems of the deductive system

An infinite regress of reasons is avoided if there are reasons which do not need to be proven, i.e. First Principles
Programming Assignment 0

Assignments are the most important part of this class.

http://robotics.cs.tamu.edu/dshell/cs625/a0.html
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“It is to your advantage not to read proofs in books or even to look into mathematical texts indiscriminately. Some good problem eventually stated in class may thereby be forever spoiled, and originality may be impaired.”

-- H. S. Wall
Sources:


Hawthorne [https://hbr.org/2008/07/a-field-is-born](https://hbr.org/2008/07/a-field-is-born)


Arch of Aristotelian Logic: My drawing is based on this: [http://www.unique-design.net/library/word/logic.html](http://www.unique-design.net/library/word/logic.html)