

Intelligent Systems (AI-2)

Computer Science cpsc422, Lecture 34

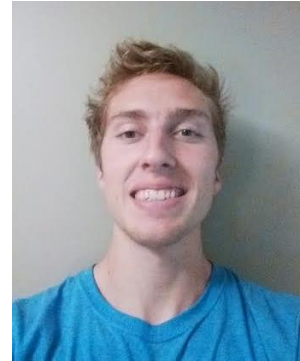
Dec, 4, 2015

Lecture Overview

- TA Evaluations / Teaching Evaluations
- IBM Watson.....
- After 422.....
- (422) Highlights from IUI conference
- Final Exam: how to prepare.....

TA evaluations

Ted Grover



Enamul Hoque Prince



Also if you have not done it yet, fill out the teaching evaluations

<https://eval.olt.ubc.ca/science>.

login to the site using your CWL

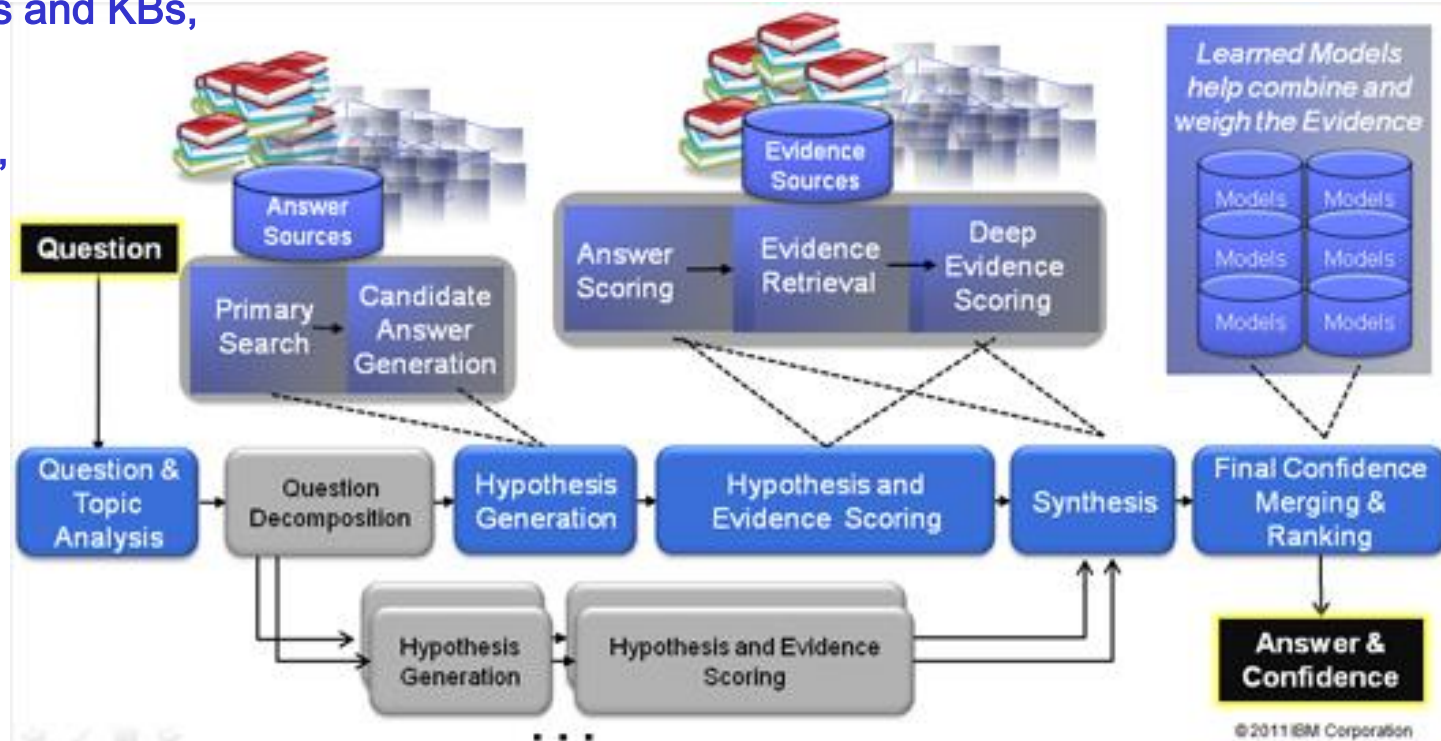
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Watson : analyzes natural language questions and content well enough and fast enough to compete and win against champion players at Jeopardy!

"This Drug has been shown to relieve the symptoms of ADD with relatively few side effects." • 3 secs

- 1000s of algorithms and KBs,
- Massive parallelism,



Source:
IBM

AI techniques in 422 / Watson

- Parsing (**PCFGs**)
- Shallow parsing (NP segmentation with **CRFs**)
- Entity and relation Detection (NER with **CRFs**)
- Logical Form Generation and Matching
- Logical Temporal and Spatial Reasoning
- Leveraging many databases, taxonomies, and **ontologies**
- Confidence.... **Probabilities** (**Bnets** to rank)
- Strategy for playing *Jeopardy*...statistical models of players and games, game-theoretic analyses and application of **reinforcement-learning**

From silly project to \$1 billion investment

2005-6 “IT’S a silly project to work on, it’s too gimmicky, it’s not a real computer-science test, and we probably can’t do it anyway.” These were reportedly the first reactions of the team of IBM researchers challenged to build a computer system capable of winning “Jeopardy!”

.....after 8-9 years...

On January 9th 2014, with much fanfare, the computing giant announced plans to invest \$1 billion in a new division, IBM Watson Group. By the end of the year, the division expects to have a staff of 2,000 plus an army of external app developersMike Rhodin, who will run the new division, calls it “one of the most significant innovations in the history of our company.” Ginni Rometty, IBM’s boss since early 2012, has reportedly predicted that it will be a \$10 billion a year business within a decade.

More complex questions in the future...



Or something like: “Should Europe reduce its energy dependency from Russia and what would it take?”

And interactive, collaborative question-answering / problem solving

AI applications.....

- DeepQA
 - Robotics
 - Search Engines
 - Games
 - Tutoring Systems
 - Medicine / Finance /
 -
- Most companies are investing in AI and/or developing/adopting AI technologies

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422 big picture: What is missing?

StarAI (statistical relational AI)

Hybrid: Det +Sto

Prob CFG

Prob Relational Models

Markov Logics

Deterministic

Stochastic

<p><i>Logics</i> <i>First Order Logics</i></p> <p><i>Ontologies</i></p> <ul style="list-style-type: none"> • Full Resolution • SAT 	<p><i>Belief Nets</i></p> <p>Approx. : Gibbs</p> <p><i>Markov Chains and HMMs</i></p> <p>Forward, Viterbi....</p> <p>Approx. : Particle Filtering</p> <p><i>Undirected Graphical Models</i> <i>Markov Networks</i> <i>Conditional Random Fields</i></p>
<p>Planning</p>	<p><i>Markov Decision Processes and Partially Observable MDP</i></p> <ul style="list-style-type: none"> • Value Iteration • Approx. Inference <p><i>Reinforcement Learning</i></p>

Applications of AI

Representation

Reasoning
Technique

StarAI (statistical relational AI)

Hybrid: Det +Sto

Prob CFG
Prob Relational Models
Markov Logics

After 422.....

Machine Learning
Knowledge Acquisition
Preference Elicitation

Deterministic

Stochastic

Query	<i>Logics</i> <i>First Order Logics</i> <i>Ontologies</i>	<i>Belief Nets</i> <i>Markov Chains and HMMs</i>	<i>Where are the components of our representations coming from?</i>
		<i>Undirected Graphical Models</i> <i>Markov Networks</i> <i>Conditional Random Fields</i>	
Planning		<i>Markov Decision Processes and Partially Observable MDP</i> <i>Reinforcement Learning</i>	<i>From people and from data!</i>

Some of our Grad Courses

522: Artificial Intelligence II : Reasoning and Acting Under Uncertainty

Sample Advanced Topics.....

Relational Reinforcement Learning for Agents in Worlds with Objects, relational learning.

- Probabilistic Relational Learning and Inductive Logic Programming at a Global Scale,

Some of our Grad Courses

503: Computational Linguistics I / Natural Language Processing

Sample Advanced Topics.....

- Topic Modeling (LDA) – Large Scale Graphical Models
- Discourse Parsing by Deep Learning (Neural Nets)
- Abstractive Summarization

Other AI Grad Courses: check them out

532: Topics in Artificial Intelligence (different courses)

- User-Adaptive Systems and Intelligent Learning Environments
- Foundations of Multiagent Systems

540: Machine Learning

505: Image Understanding I: Image Analysis

525: Image Understanding II: Scene Analysis

515: Computational Robotics

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AI and HCI meet

Keynote Speaker:

Prof. Dan Weld, University of Washington

Intelligent Control of Crowdsourcing

Crowd-sourcing labor markets (e.g., Amazon Mechanical Turk) are booming, use of **partially-observable Markov decision Processes (POMDPs)** to control voting on binary-choice questions and iterative improvement workflows.

Some papers from IUI

Unsupervised Modeling of Users' Interests from their Facebook Profiles and Activities

Preeti Bhargava (*University of Maryland*)

Oliver Brdiczka (*Vectra Networks, Inc.*)

Michael Roberts (*Palo Alto Research Center*)

named entity recognition, document categorization, sentiment analysis, semantic relatedness and social tagging

Semantic Textual Similarity (STS) system [13] for computing the SR scores. STS is based on LSA along with WordNet knowledge and is trained on LDC Gigawords and Stanford Webbase corpora

Some papers from IUI

BayesHeart: A Probabilistic Approach for Robust, Low-Latency Heart Rate Monitoring on Camera Phones

Xiangmin Fan (*University of Pittsburgh*)

Jingtao Wang (*University of Pittsburgh*)

BayesHeart is based on an **adaptive hidden Markov model**, requires minimal training data and is user-independent.

Two models, one with 2 states and one with 4 states, work in combination....

Applications: gaming, learning, and fitness training)

Last Clicker Question

I would like to learn more about AI.....

- A. Yes
- B. Maybe
- C. No



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Final Exam, Thur, Dec 10,
we will start at 8:30AM Location: DMP 110

How to prepare....

- Learning Goals (posted on Connect)
- Revise all the clicker questions, practice exercises, assignments and midterm
- Will post more practice material today
- Student Led Review Seminar, ICICS 146, TODAY, 13:00 - 16:00 (TA attending)
- Office Hours – **Me** Mon 10-11 / Post Questions on Piazza

Can bring letter sized sheet of paper with anything written on it (double sided)