Artificial Intelligence & Science Fiction: A post-graduate course

Rebecca Bates, PhD
LIAMF Seminar, DCC, IME, USP, 17 June 2010

The working hypothesis

There is an interaction between art and technical development, bonded by creativity.

Summary

- Course History & Goals
- Technical Topics
- Connections to fictional works
- Examples
- Student project samples

Course History

- Undergraduate, writing intensive class
  - Move from composition towards more technical writing
  - Ethics
  - Literature
  - Introduction to AI concepts
  - Approved as a general education course for all students
- Graduate, project-based class
  - Ethics, literature and writing
  - More technical content
  - Options for technical, educational, or fictional projects
    - All must be creative!
    - Must make connections between state-of-the-art AI and work of the project

Course Goals

- Present students with a fun opportunity to improve their English writing, reading, speaking and understanding.
- Explore the social impact of the field of AI.
- Prepare students to deal with ethical questions that will arise in their professional careers.
  - They may not need to deal with space ships full of aliens but they will have clients!
- Connect students to the culture of the community.
- Explore the connections between creativity in arts and in computer science.
- Develop advocates for the field.
- And increase knowledge of technical content.

6 Areas of AI (Russell & Norvig)

Framework for projects and early group discussions.

- Natural language processing to enable a system to communicate successfully in a human language like Portuguese or English
- Knowledge representation to store what the system knows or hears
- Automated reasoning to use the stored information to answer questions and draw new conclusions
- Machine learning to adapt to new circumstances and to detect and extrapolate patterns
- Computer vision to perceive objects
- Robotics to manipulate objects and move about

Technical Topics

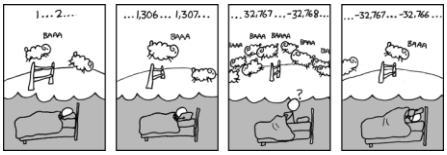
- Definitions: intelligence & sentience
- Turing Tests
- Agents & Environments
- Problem Solving through Search (uninformed, informed & adversarial)
- Machine Learning & Games
- Data, Learning from Examples, Bayesian Decision Making
- Decision Trees
- Neural Networks
- Support Vector Machines
- "lab" assignment using the Orange DataMining Toolkit

Focus on *how* to make a decision rather than a particular problem environment.

Course Materials

- Russell & Norvig
- Technical papers
  - Lois McMaster Bujold, "Allegories of Change: The 'New' Biotech in the Eye of Science Fiction"
  - John R. Searle, "Minds, Brains and Programs"
- Ethical Readings:
  - Daniel Dennet, "Did HAL Commit Murder?"
  - ACM Code of Ethics
  - P.W. Singer, "Robots at War: The New Battlefield"
- Current news articles about AI
- Short stories (Asimov)
- Films
- Novels (1-2 from a suggested set)
- XKCD (www.xkcd.com)

XKCD Example



Alt-text: If androids someday DO dream of electric sheep, don't forget to declare sheepCount as a long int.
http://www.xkcd.com/571/

Films

- 2001: A Space Odyssey (1968) [2001 - Uma Odisséia no Espaço]
- The Computer Wore Tennis Shoes (1969)
- THX 1138 (1971)
- Star Wars (1977) [Guerra nas Estrelas]
- Blade Runner (1982) [Blade Runner – O Caçador de Andróides]
- TRON (1982) [Tron – Uma Odisséia Eletrônica]
- WarGames (1983) [Jogos de Guerra]
- Star Trek: Generations (1994) [Jornada nas Estrelas: A Nova Geração]
- Johnny Mnemonic (1995)
- I, Robot (2004) [Eu, Robô]
- Hitchhiker's Guide to the Galaxy (2005) [O Guia do Mochileiro das Galáxias]

Stories and Novels

- Terry Bisson, "They're Made Out of Meat"
- Orson Scott Card: *Ender's Game*
- Isaac Asimov: *I, Robot*
  - Liar!
  - Runaround
- Isaac Asimov: *Caves of Steel*
- Neal Stephenson: *The Diamond Age* and *Snow Crash*
- Mary Doria Russell: *The Sparrow*
- William Gibson: *Neuromancer*
- Douglas Adams: *The Hitchhiker's Guide to the Galaxy*

Discussion Questions

- What is intelligence?
  - Gardner's 9 types: Naturalist, musical, logical-mathematical, existential, interpersonal, bodily-kinesthetic, linguistic, intra-personal, spatial
- What is sentience? (having self-awareness)
- What is the relationship between intelligence and sentience?
- What are the boundaries of sentience? Who is sentient and who isn't?
  - Am I sentient? Certainly.
  - Other people? Yes… but what about our enemies?
  - Animals?
  - Pernilongos? Bacteria? Aliens???
- How do we measure intelligence? For humans? For machines?

Examples

- Blade Runner: Sentience, measuring of intelligence
  - http://www.youtube.com/watch?v=-DyetSFQAB4
- I, Robot: machine learning and emotions
  - http://www.youtube.com/watch?v=9pnLtsdSqU4
- "Let the wookie win": collaborative machine learning
  - http://www.youtube.com/watch?v=HMXhqe1Rozk
- Asimov's Stories: Runaround, Liar!: What happens when bad decisions are made?
- Data from Star Trek: The Next Generation, "Measure of a Man": Sentience and autonomy

Examples of Ethical Questions

- How are robots treated in Star Wars? Is it different? How? Why?
- Are the replicants in Blade Runner sentient? Do the human characters think so or not?
- When HAL, the computer in 2001: A Space Odyssey, kills members of the crew, who is guilty? The computer or the creator?

Student Project Examples

- Educational/Outreach
  - Belief revision
  - Music recommendation systems (machine learning)
- Technical
  - Harmonic analysis of music using SVMs
  - Human vs. bot detection for advertising clicking
- Fiction/Creative work
  - Turing Tests and an examination of intelligence, cognition and consciousness
  - The limits of knowledge and logic– How much can we know?
  - Belief revision: What happens when robots react to changes in human world views? How should the robot deal with inconsistencies?
  - Computational analysis of humor, especially puns

Student Feedback

- Most mentioned the technical content and the balance between literature and technical content.
- "In this system where the demand is for results, this class had the important mission to made us think about what we do."
- "That is a nice class. Besides the lessons, we watch movies. But, it's not easy."

Future Offerings?

- Show movies outside of class to have more time for group discussions. Perhaps consider movie time as lab time?
- Balance lectures with discussions.
- Require revision of some essays to encourage rewriting.
- So many options for fiction! Could be rotated.
- Formalize peer review of work.
- Guest speakers from faculty (perhaps even outside of IME?)

Muito obrigada!

- Students of MAC 5737
- Prof. Fabio Kon
- DCC
- Fulbright Commission
- Minnesota State University, Mankato

becky.bates@gmail.com