CS 151 Artificial Intelligence
Harvey Mudd - Spring 2014 - Final Project

Overview

For the CS 151 final project, you will perform an in depth investigate an AI topic of your own choosing. You will work in groups of 2-3 people. The project will involve:

- Independent background reading. You should find and read at least three relevant papers on the topic of your project. The textbook has an excellent bibliography, and for more recent papers you can use Google Scholar or one of the resources provided below.
- Implementation and evaluation of a key AI technique that extend beyond current class assignments.
- Presentations to (and evaluation of) peers.
- A good write-up that details the problem, your approach, background / related work, the results of your approach, ideas for future work, and a bibliography.

Deliverables

- Proposal Presentations (20 points, Presentation: Feb 24 – March 5, Write-up: March 5)
    - A short 5-minute presentation to the class for peer feedback. A portion of these points will be assigned based on your feedback to (and from) other teams. A good presentation will address the following four questions:
        1. What problem are you solving?
        2. Why is this AI?
        3. How will you know that you've successfully solved the problem?
        4. Why will you be successful (e.g., give evidence that points towards the feasibility of this project)?
    - An up to 2-page write up on your proposed project (note the formatting guidelines below). This is intended to give me an opportunity to provide you important feedback on the trajectory and scope of your project.
    - Your report should address the above four questions and thus describe the problem you will be solving as well your preliminary ideas for solving. The report should contain evidence that points towards the feasibility of this project (that the scope is reasonable). This could be an example of a similar project, an academic paper that you are building on, etc.
- Progress Report and Literature Review (45 points; April 4)
    - Groups will provide a 4-6-page update on their work. This is intended to be a project check point to (1) encourage you to be making sufficient progress and (2) give me an opportunity to provide you important feedback on the trajectory and scope of your project. This report should contain much of the same content as the final report (e.g., I recommend including a complete draft of the first 3-4 bullet points), albeit in much less detail. If well written, this should provide a solid basis for your final report.
    - Included in this write-up should be a bibliography containing the three sources that you plan on using for your work. The report should include a summary of these related works and a description of how they relate to your problem.

- Final Project Presentations (35 points; April 28, 30)
    - Groups will present a summary of their project findings. Groups will have 12-15 minutes (depending on number of groups). Presentations should motivate the problem, describe the approach, and provide a summary of interesting results, which could include empirical evaluations, project demos, or other theoretically interesting findings.
    - Once again, a portion of these points will be assigned based on your feedback to (and from) other teams.
- Final Project Reports (50 Points; May 9)
    - Groups will produce a 6-12 page report that motivates the problem you solved, detail and justify the approach, and clearly present the outcomes and findings of the project. See below for specifics on project evaluation.
    - Groups will also submit an archive file containing any and all project code.

All write-ups should use the AAAI Word template or LaTeX style sheet (http://www.aaai.org/Publications/Templates/AuthorKit.zip)

Project Evaluation

A good project will:
- Clearly describe the problem that is being solved.
- Summarize relevant work in the field and describe how it relates to the problem.
- Choose a reasonable method to attempt to solve the problem, and in the write-up justify the chosen approach.
- Make a serious attempt to implement the method and solve the problem.
- Take care in evaluating how well you solved (or failed to solve) problem. For example, if your method includes an element of chance, you should do enough experiments to be sure your results are statistically meaningful. If your method takes input parameters (for example, the parameters of a local search method), your experiments should try a range of different parameters values.
- Present the results and a thoughtful discussion of the results in the write-up. Use graphs and charts effectively to display numeric results.
- Include a conclusion section in the write-up that describes what you discovered and what other problems the project suggested would be interesting to investigate.
- Include citations in your write-up as necessary to papers and books (physical or online) that you used in creating your project. This should include at least three sources in addition to the textbook.

Note that is possible to get 100% on your project even if the approach you try does not work, as long as you made a solid effort and tried to understand why the approach was not a good one for the problem. However, if your system does not work because of programming bugs, or because you left it until the last minute and never finished, then you will, of course, be penalized.

The final project is worth 15% of your final grade and is in lieu of an AI final.
(Metrics adapted from http://pages.cs.wisc.edu/~dyer/cs540/demos.html)

Resources

- Google Scholar
- AAAI Topics (aitopics.net)
- Citeseerx (http://citeseerx.ist.psu.edu/index)
- Artificial Intelligence Magazine
  (http://www.aaai.org/ojs/index.php/aimagazine/issue/archive)
- Journal of Artificial Intelligence Research (jair.org)
- Proc. of any AAAI sponsored conferences (aaai.org)
- Proc. of the Int'l Joint Conf. of A.I. (ijcai.org)
- Proc. of the Autonomous Agents and Multiagent Systems Conf. (aamas-conference.org)
- Proc. of Neural Inform. Processing Systems (NIPS.cc)
- Proc. of the Int'l Conf. on Machine Learning (ICML.cc)
- Proc. of Int'l Conf. on Robotics and Autmoation (icra2013.org)
- Robotics Science and Systems (roboticsconference.org)
- http://pages.cs.wisc.edu/~dyer/cs540/demos.html

Project Ideas

- Implement an interesting extension to your clinic project.
- Identify an interesting research paper, attempt to replicate the results, and evaluate a novel extension.
- Propose, implement, and evaluate a novel extension to the Berkeley Pac-man project code-base. E.g., write a Pac-man agent that learns to play through learning by demonstration by a human user.
- Examples from previous semesters:
    - http://www.cs.hmc.edu/courses/2012/fall/cs152/ (Neural Net projects)
    - http://www.cs.hmc.edu/~jagajanian/cs151/
    - http://www.cs.hmc.edu/~mmann/CS151/
    - http://www.youtube.com/watch?v=-k9DITDE6Jg
- See http://courses.cs.washington.edu/courses/cse473/06sp/projects.html for more ideas!