

Department of Computer Science
CSC 444
Fall 2022

Project Guidelines

2 pp abstract, with references, due by email to
schubert@cs.rochester.edu by Tue. Nov. 15
Project due Wed. December 14, 5pm

The project should be a small research undertaking, with “research” broadly understood; the emphasis could be more on researching and surveying the literature than in contributing your own ideas, or it could be on pursuing some ideas of your own, presenting some results of this effort, and proposing further research. You might also put the primary emphasis on developing an interesting program: AI is partly an engineering enterprise! The topic should tie in with the subject matter of CSC 444, i.e., it should have something to do with logical approaches to an AI problem class. By “logical” I generally mean quantified logic, though this stipulation might be relaxed for projects involving probabilistic reasoning or SAT-solving. (Even in these specialty areas, however, some approaches are more “logical” than others, such as Markov logic networks, or the use of SAT-solving to solve problems in planning, quantified reasoning, action logic, etc.)

But whether your project is focused on writing or system building, there should be evidence both of delving into the literature (with more breadth in the case of a project that is primarily a literature survey), and of *having given your topic some independent critical thought and having developed your own perspective on what the main achievements and important directions for further work are*. As some sort of guide about how much reading is expected, you should probably study about 3-5 articles carefully (explaining the gist of these in your own words, and highlighting strengths and shortcomings). Articles might be journal articles, book chapters or conference articles, though the latter are often too sketchy to enable a real technical grasp of the subject matter. *Make sure that your perspective is up to date, not limited to some “classical” readings* – it’s up to you to dig up the most recent relevant work..

If you’re interested in pursuing something related to the work being done here, you could look at the publications listed at

<https://www.cs.rochester.edu/u/schubert/>,

particularly ones that have the following words in the title: “inference”, “reasoning”, “knowledge”, “planning”, or “question answering”. When pursued seriously enough, such projects can lead to publications.

Good keywords for Google searches (along with occasional author names) might be *knowledge extraction/mining, Natural Logic, ontology building/discovery, from WordNet to logic, commonsense psychology, rule-based probabilistic reasoning, automated planning (of many kinds!), concept formation/discovery (Colton, Bundy, Walsh), induction (E. Shapiro D. McAllester), imagistic reasoning, self-awareness in machines (McCarthy), neural-net-based reasoning, analogical reasoning ...*

The project report should be around 3500-4500 words in length (though there’s no

penalty for overruns). The exposition of relevant literature should be as *specific* as possible. *Particular examples are usually more informative than high-level descriptions.* You should write your report as if you were using it as lecture notes for one or two lectures to a class like CSC 244/444 on your chosen topic, making sure that your listeners/readers would acquire sufficient knowledge about your topic to be able to answer some technical questions about it on an exam.

Be sure to make clear which of the ideas and opinions you present are your own, and which ones are taken from your sources (**which of course should be properly cited**). For any programs you develop, be sure to motivate and explain your approach (in relation to your readings), to document the code clearly, to show ample examples of what the program does, to discuss its capabilities and limitations and what has been learned.

In all cases, provide a concluding section that summarizes your perspective on the work studied and carried out, and on promising directions for further work.

In accord with the above guidelines, grading will be based on

- *effort* (breadth and depth of study and research demonstrated by the essay/project),
- *cogency* (quality of organization and writing, clarity and persuasiveness of the presentation, quality and performance of the programs, if any), and
- *originality* (independence of viewpoint, critical judgement, insight, ability to formulate and develop ideas).

Sources

Good sources for your readings are the following, though “KR&R”-related articles have become sparse in the journals and conferences, thanks to the overwhelming flood of DNN papers:

- The Brachman & Levesque text; browse the book to get an advance idea of what might interest you; look especially at further readings suggested at the end of chapters, and at material not scheduled to be covered in the course.
- The Russell and Norvig supplementary text; this covers quite a few topics not covered in B & L.
- The *AI Journal*; this is a high-quality journal with detailed technical papers in the full range of AI topics, but with past (but now diminished) emphasis on representation, reasoning, and planning. Tables of contents, abstracts, and many articles can be obtained on-line: see the web at URL <http://www.journals.elsevier.com/artificial-intelligence/>
- *JAIR* - the *Journal of AI Research*; this is a high-quality fully on-line journal – a new and helpful trend in journals! But again, reduced “KR&R” coverage. The URL for web access is <http://www.jair.org/>
- The Canadian journal *Computational Intelligence*, which is general in scope and generally of good quality. Web page at [http://onlinelibrary.wiley.com/journal/10.1111/\(ISSN\)1467-8640](http://onlinelibrary.wiley.com/journal/10.1111/(ISSN)1467-8640)

- The *KR'91-KR'14* Proceedings; the full title is the *Proc. of the 1st - 9th Int. Conf. on Principles of Knowledge Representation and Reasoning*; this is the premier conference in the KR&R field, and the papers are generally detailed enough to be useful. See the web at <http://www.kr.org/> for information on upcoming and past conferences, including calls for papers and the list of talks at past conferences. The proceedings from 1989-2021 are accessible at <https://kr.org/proclist.html>
- The *AAAI* Conference Proceedings; currently “AAAI” stands for the Association for the Advancement of AI. Proceedings from early years are archived as *Proc. of the Nat. Conf. on Artificial Intelligence*, sponsored by the Am. Assoc. for AI). This is the main US conference on AI, held annually, and covering the full AI spectrum. This gives you a very good overview of what’s happening on the research frontiers; the articles are sometimes too concise to give you adequate technical depth. The AAAI home page is at <http://www.aaai.org> and you can find past conference proceedings for both AAAI conferences and other major conferences at <http://www.aaai.org/Library/conferences-library.php> .
- The *IJCAI* Proceedings; full name: the *Proc. of the Int. Joint Conf. on Artificial Intelligence*. This is the main international AI conference, held in odd-numbered years since 1969. It’s the oldest regular conference in AI, and is comparable in quality and scope to AAAI conferences. The IJCAI home page is at <http://www.ijcai.org/> . As of 2021 year, all the proceedings are accessible online (click on Proceedings, then 2022 or past proceedings)).
- NeurIPS Proceedings (Advances in Neural Information Processing (<https://papers.nips.cc/>) – look for the (occasional!) papers on reasoning.
- The *CSCSI* and *CAIAC* Proceedings; full name: *Canadian Society for Computational Studies of Intelligence*, renamed *Canadian Artificial Intelligence Association*. The conference is usually held at 2-year intervals. Web page: <https://www.caiac.ca/> . The Canadian AI Magazine and conference proceedings are accessible at <https://www.caiac.ca/en/canadian-ai-magazine> , together with <https://www.caiac.ca/en/canadian-ai-conference> . The Canadian AI conferences are smaller than AAAI or IJCAI, but generally of good quality.
- Look at <http://www.aiinternational.org/societies.html> for some further AI-oriented organizations (and hence further publications), such as the Eur. Coordinating Comm. on AI, which sponsors the European AI Conferences (ECAI), where further high quality papers may be found; the IEEE Computer Society and their AI-oriented journals; and others.
- The Special Interest Group in AI, SIGAI (until 2007, SIGART) (Special Interest Group in AI) has a web page at <http://sigai.acm.org/> . The Newsletter name was changed from SIGART Newsletter to “AI Matters”:
<http://sigai.acm.org/aimatters/> .
- Some “classic” papers are to be found in various “Readings” collections: Brachman & Levesque, *Readings in Knowledge Representation* (Morgan Kaufmann, 1985); Webber & Nilsson, *Readings in Artificial Intelligence* (Tioga, 1981); Collins & Smith, *Readings in Cognitive Science* (Morgan Kaufmann, 1988); Allen, Hendler & Tate, *Readings in Planning* (Morgan Kaufmann, 1990); Ginsberg, *Readings in*

Nonmonotonic Reasoning (Morgan Kaufmann, 1981). For some more recent books, some of which are relevant, see the Morgan & Claypool *Synthesis Lectures on Artificial Intelligence and Machine Learning*,

<http://www.morganclaypool.com/toc/aim/1>

- Google has of course become a nearly universal tool for finding information on any topic, and often leads you to references you might easily have missed. (In a Google literature search you may come across citeseer (<http://citeseerx.ist.psu.edu/index.jsp>), which is a very good, broad-coverage index of the scientific literature.) *But beware:* Google will often lead you to personal and course pages of variable quality. While these can be very useful, your references should primarily be from the *refereed* literature, which is much more reliable. Also, keep in mind that you cannot lift passages from references or sites you locate and insert them in your essay as if they were your own words. This would be *plagiarism*, a serious violation of U of R's academic honesty policy. Express everything you want to say in your own words – even if you feel one of the references says it better (though of course explicit quotation from a book, journal, conference paper, or even website, with a citation, is perfectly ok).