

CSI4106 -- AI Project
Fall 2018

Goal

The goal of the AI project is to allow you to explore in more depth a topic of interest to you which we don't have the chance to study in our introduction course.

Teams

You can do the project alone, or in groups of 2 or three people.

Project Coordinator

Yazan Otoum (yotou096@uottawa.ca) will be coordinating the projects as well as marking them.

Evaluation / Expected effort

The project is worth 24% of your overall grade. It is spread over 6 weeks (Oct. 28th to Dec. 5th) and should correspond to an effort of about 25 hours per person.

Organisation and deadlines

	Step	Date	Description	%
	Presentation of possible project types and topics	10 octobre 2018	You will have to decide on a project type and topic. Think about what you want to do, perform some research to decide.	
Step 1	Decision about your team and its members	1 novembre 2018	SEND to Yazan: Team members: Name + Student numbers	
Step 2	Project Definition due	5 novembre 2018	Two pages max: project type, project domain, goal, distribution of work, etc	5%
	Project Presentation Date Assignment	9 novembre 2018	Each team will be assigned to a presentation day (P1 or P2)	
Step 3	Presentation submitted	26 november 2018	For P1 group, PDF of presentation provided to Yazan	
	Presentation Day 1	28 novembre 2018	P1 - Project oral presentations	10%
		1 december 2018	For P2 group, PDF of presentation provided to Yazan	
	Presentation Day 2	3 decembre 018	P2 - Project oral presentations	
Step 4	Project reports due	5 december 2018	Content varies based on chosen project type.	85%

Outline of your project definition

(1 to 2 pages)

1. Project title
2. Project type (survey, comparative study, tutorial, etc)
3. Chosen topic and its link to Artificial Intelligence (why is it pertinent in an AI class?)
4. Members of the team and their role
5. Planned tasks and estimated time for each

Outline of project oral presentations

- To be determined, according to the number of teams

List of project types

1. Survey about an application or a technology
2. Comparative analysis of 2 (or 3) approaches of problem solving
3. Development of a tutorial for a specific open-source software
4. Comparative evaluation of 2 (or 3) open-source software used for the same purpose
5. In-depth study of a particular AI research topic
6. Participation in an international evaluation
7. Investigation project
8. Critical analysis of a technology-related contentious topic in AI
9. Exploration of your own approach for an application

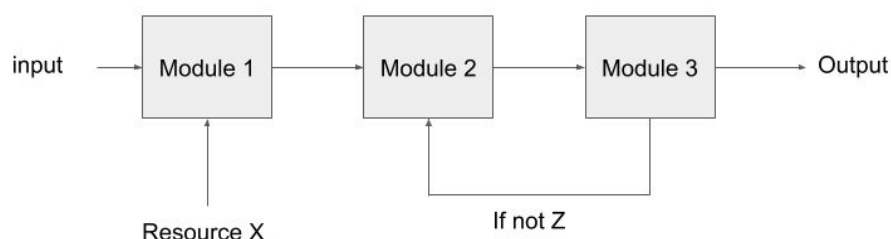
Guideline for report writing

The content of your report will vary depending on the chosen project type. Below, each project type, and its corresponding report style, are described.

The number of pages indicated should be considered a minimum. I assume a font size of 10pt and single line spacing. When a range is provided (e.g. 4-6 pages) it would be 4 pages for 2 people and 6 pages for 3 people. I also assumed that non-coding projects would be chosen for personal projects and therefore gave the report guidelines accordingly. If it is not the case, the scope of your study should reflect the fact that you are a team.

Projects which include an implementation should contain well documented code, which is functional, as well as instructions to run the code. The code could be available in a public directory (like github) or simply attached as a zip file (containing all the necessary files to properly run the code) with the report submission.

A few report styles should contain a block diagram, by which I mean a high-level representation of processes involved in an application or technology, as shown below.



1. Survey about an application or a technology

A survey should include (1) the reading of a multiple articles and (2) the development of an analytical grid. For example, let's take a survey on machine translation. You would have to think of the angles under which this technology can be evaluated (e.g. performance, languages, underlying technologies, etc) and analyse a few approaches (e.g. Rule-based MT, Statistical MT, Neural MT). The survey can be diachronic, and show the evolution of a technology over time.

This type of project would be appropriate if you like working alone, and also like reading to understand globally a field of study.

No coding.

Outline of the report (12 pages)

1. Title + Names + Date
2. Context (link to AI)
3. Problem studied and type of analysis (current time or diachronic)
4. List of the studied articles
5. Details of the articles
 - a. Short summary of each
 - b. Appropriateness of the article for the current study
 - c. Your opinion on the value of the article
6. Development of an analytical grid
7. Technology analysis according the the criteria in the grid
8. Conclusion
9. References (all the links toward information that you retrieved from the internet)

2. Comparative analysis of 2 (or 3) approaches of problem solving

Contrarily to the survey type (above) which stays at a descriptive level, this comparative analysis type of project studies in depth 2 (or 3 if you are 3 in the team) approaches and implements these approaches to test them. For example, you can explore various population-based algorithms, such as genetic algorithm, ant-colonies, memetic algorithms.

This type of project would be appropriate for teams.

With coding.

Outline of the report (4-6 pages + implementation)

1. Title + Names + Date
2. Context (link to AI) - area in which the algorithms will be tested
3. Summary of the chosen approaches and their appropriateness in the context
4. Dataset chosen for the comparative study + criteria for comparison
5. Details of the approaches
 - a. Short summary of each one
 - b. Implementation (pseudocode + link to code + running instructions)
 - c. Evaluation
6. Result analysis
7. Conclusion
8. References (all the links toward information that you retrieved from the internet)

3. *Development of a tutorial for a specific open-source software*

This type of project would allow you to push your understanding of an AI open-source software and to allow other people to benefit from your time investment. This could be a good project type for solo work which includes in-depth understanding of code, as well as a pedagogical aspect.

This project fits better to solo work. Please, validate your choice of software with the professor. It must be a somewhat complex software to justify the tutorial.

With software testing and development of testing examples.

Outline of the report (2 pages + implementation + tutoring material)

1. Title + Names + Date
2. Context (link to AI)
3. Choice of open-source software (which one, and why)
4. Reason to develop a new tutorial
 - a. Is there a tutorial available already online, and if so, why is it not sufficient?
 - b. Targeted audience
 - c. Type of support used (video, notebook, etc)
5. Link to tutorial (video, or notebook, etc).
 - a. Installation and running instruction
6. Conclusion
7. References (all the links toward information that you retrieved from the internet)

4. *Comparative evaluation of 2 (or 3) open-source software used for the same purpose*

For this type of project, you should find 2 or (3 if you are 3 people in the team) open-source software having the same purpose (e.g. TensorFlow and PyTorch for deep learning). You should find a problem on which you will test the two or three software, so that you can present some conclusions as to their ease of use, performance, etc.

With software testing and development of testing examples.

Outline of the report (6-8 pages + implementation)

1. Title + Names + Date
2. Context (link to AI)
 - a. The tested software would be used in which context?
3. Summary of chosen approaches, and the reason to choose them
4. Comparison grid
 - a. Define the criteria on which the approaches will be compared
 - b. Tests the software will be submitted to
5. Details of the open-source software
 - a. Short summary of each one
 - b. Tests performed (link to code + running instructions)
 - c. Observations
6. Comparative Result analysis
7. Conclusion
8. References (all the links toward information that you retrieved from the internet)

5. In-depth study of a particular AI research topic

Contrarily to the survey type (1) which stays high-level, the in-depth study would take a single approach (e.g. Neural MT) or a single application (e.g. IBM Watson for Jeopardy playing) and would demystify this approach, understanding its foundations, its challenges, etc. This study does not include an implementation, but nevertheless assume enough reading to understand/analyse the approach or application.

No coding.

Outline of the report (12 pages)

1. Title + Names + Date
2. Context (link to AI)
3. Studied technology or application
4. List of the studied articles
5. Details of the articles
 - a. Short summary of each
 - b. Appropriateness of the article for the current study
 - c. Your opinion on the value of the article
6. Block diagram showing your high-level understanding of the problem
 - a. Detail of each module within the diagram
7. Conclusion
8. References (all the links toward information that you retrieved from the internet)

6. Participation in an international evaluation

The site Kaggle (<https://www.kaggle.com/competitions>) contains multiple knowledge type (no money associated with) competitions to which you can participate. Be careful about participation rules, licences to sign for data access, etc. Another site, called SemEval (for Semantic Evaluation), is fully academic, and offers competitions within the field of Natural Language Processing. Each years new tasks are defined. For example, in 2015, there was a sentiment analysis task on Twitter (<http://alt.qcri.org/semeval2015/task10/>). You can look at the different tasks over the last few years. This type of project allows you to work in a very constrained environment, but you must push the software development part.

With coding.

Outline of the report (3-5 pages + implementation)

1. Title + Names + Date
2. Context (link to AI)
3. Experimental set-up: task description, dataset, evaluation method, etc.
4. Proposed algorithm
 - a. Is this your algorithm? Or are you testing (possibly with variations) of a “winning” algorithm?
 - b. Pseudo-code
5. Implementation (link to code + running instructions)
6. Result analysis
7. Conclusion
8. References (all the links toward information that you retrieved from the internet)

7. Investigation project

For this project type, you would choose a technology (e.g. targeted publicity as offered by company X, or information retrieval as performed by company Y, etc) and you would attempt at discovering what is “under-the-hood”. This project could be tricky but intriguing. Companies do not say much about their technologies (except sometimes in whitepapers). You will have to find an investigation method (some reverse engineering) to understand the technology (at least make hypothesis about it) and write about what you found.

No coding

Outline of the report (12 pages)

1. Title + Names + Date
2. Context (link to AI)
3. Technology or application studied: which company?
4. Information found: white papers, competitor’s information
5. Formulated hypotheses (of reverse-engineering)
 - a. Block diagram showing an organization of your hypotheses
 - b. Detail of each module
6. Validation of your hypotheses
 - a. Are you able to? Are there proxys (other ways to evaluate) ?
7. Conclusion
8. References (all the links toward information that you retrieved from the internet)

8. Critical analysis of a technology-related contentious topic in AI

In this type of project, you would take a technology-related contentious topic (not ethic-related) and perform a critical analysis of the subject, so as to develop your own opinion and justify it. For example, the reproducibility of experiments in machine learning is a topic discussed quite a lot these days, as it is very hard to reproduce other researchers experiments. You would express your opinion as to whether that is problematic (or not) and why. If you are two people in the team, you should take opposite opinions on the matter and write a debate-style report.

No coding

Outline of the report (12 pages)

1. Title + Names + Date
2. Description of the contentious subject (link to AI)
3. List of the studied articles
4. Details of the articles
 - a. Short summary of each
 - b. Appropriateness of the article for the current study
 - c. Your opinion on the value of the article
5. Your position
 - a. Your analytical grid to justify your position
6. Conclusion
7. References (all the links toward information that you retrieved from the internet)

9. Exploration of your own approach for an application

In this type of project, you will choose an application (a game that you like for example) and make an attempt at programming a portion of the application (or game) in your own way, using knowledge seen in class, enriched by further explorations.

With coding.

Outline of the report (4-6 pages + implementation)

1. Title + Names + Date
2. Context (link to AI)
3. Description of the application
 - a. Block diagram of your understanding of the application
 - b. Subset of modules which you will code
 - c. How is each module link to knowledge seen in class?
4. Suggested algorithms
 - a. Pseudo-code of the suggested algorithms for the different modules
 - b. Implementation (link to code + running instructions)
5. Qualitative analysis of your results
 - a. As there are no "dataset", you can perform a qualitative analysis
6. Conclusion
7. References (all the links toward information that you retrieved from the internet)

Possible topics for projects

If you need to be inspired for finding your topic, you can look at the different topics suggested in various upcoming AI conferences which will happen in 2019.

Canadian AI Conference

28-31 mai, Kingston, Ontario

<https://www.caiac.ca/en/conferences/canadianai-2019/home>

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| <ul style="list-style-type: none">• Agent Systems• AI Applications• Automated Reasoning• Bioinformatics and BioNLP• Case-based Reasoning• Cognitive Models• Constraint Satisfaction• Data Mining• E-Commerce• Evolutionary Computation• Games• Information Retrieval and Search | <ul style="list-style-type: none">• Information and Knowledge Management• Knowledge Representation• Machine Learning• Multimedia Processing• Natural Language Processing• Neural Nets and Deep Learning• Planning• Privacy-preserving• Robotics• Uncertainty• User Modeling• Web Mining and Applications |
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AAAI - Association for the Advancement of AI

27 janvier - 1er février, Honolulu

<https://aaai.org/Conferences/AAAI-19/>

Topics

AAAI-19 welcomes submissions reporting research that advances artificial intelligence, broadly conceived. The conference scope includes all subareas of AI and machine learning. These include (but are not limited to) traditional topics such as search, planning, knowledge representation, reasoning, natural language processing, robotics and perception, multiagent systems, statistical learning, and deep learning. We expressly encourage work that cuts across technical areas, or develops AI techniques in the context of important application domains, such as healthcare, sustainability, transportation, and commerce.

International Joint conference on AI

10-16 juin, Macao, China

<http://www.ijcai19.org/>

(appel pas encore disponible... peut-être bientôt).

International Conference on Advanced ML technologies and Applications

28-30 mars, Cairo, Egypt

<http://egyptscience.net/AMLT19/>

Topics of interest for each track include (but are not limited to):

Advanced Machine Learning Technologies in Natural Language Processing
Advanced Machine Learning Technologies for multimedia processing.
Advanced Machine Learning Technologies for Network Security.
Advanced Machine Learning Technologies for Bio-Science and Bio-technology
Advanced Machine Learning Technologies for Education Systems
Advanced Machine Learning Technologies for Wireless, Mobile Technologies.
Advanced Machine Learning Technologies for Ambient Intelligence
Advanced Machine Learning Technologies for Web Mining
Advanced Machine Learning Technologies for Cloud Computing
Advanced Machine Learning Technologies for Intelligent Environment
Advanced Machine Learning Technologies for Disabled and Non-Disabled People
Advanced Machine Learning Technologies for control and automation systems
Advanced Machine Learning Technologies for Robotic systems
Advanced Machine Learning Technologies for Biomedical applications
Advanced Machine learning in animal behavior studies
Advanced Machine learning on big data processing
Advanced Machine learning for sports
Advanced Machine learning for multimedia processing
Advanced Machine learning in Internet of things and cloud computing
Advanced Natural language processing
Advanced Machine learning for educational systems
Deep Learning Techniques for smart agriculture
Deep Learning Techniques for Self-driving cars
Deep Learning Techniques for medical image processing
Deep Learning Techniques for automatic Machine Translation
Deep Learning Techniques for Voice Search & Voice-Activated Assistants
Deep Learning Techniques for Healthcare Applications