CARNEGIE MELLON UNIVERSITY 07-380
PROJECT SPECIFICATION

DUE: **Groups**: Nov. 13 **Proposal, Data/Demo**: Nov 24, **Final**: Dec. 10, **Q&A (zoom)**: Dec 12-14

https://www.cs.cmu.edu/~07380

The 07-380 project gives you the opportunity to dive deeper into the topics we covered this semester. You and your group may choose any topics that are of interest to you, as long as they meet the requirements and guidelines outlined in more detail below.

1 Deadlines and Deliverables

See Piazza posts for details on submitting each deliverable. All deadlines are at 11:59 pm.

Description	**Due Date**	**Deliverable**
Project Groups Selected	Fri., Nov. 13	Submit names and Andrew ID's of all three group members
Project Proposal with Data/Demo	Tue., Nov. 24	Describe your project as specified in the proposal section below, which includes either a link to the
Final Project Submission	Thu., Dec. 10	Submit a single Colab notebook containing both the write-up and code for the project

2 High-level Requirements

- Completed in groups of exactly three students
- Use two different techniques from 07-380 for two different components of your project. One technique from **pre-fall break topics** and one technique from **post-fall break topics**.
- Either:
  - Train at least one of the two techniques on a dataset that includes data that you have collected/created yourself (fine-tuning is acceptable).
  - Use at least one of the two techniques on an embodied agent (a physical agent in the real world), e.g., a robot.
- Pose an **experimental question** about at least one of your techniques, run that experiment, and analyze the results. The experiment must be non-trivial (e.g., beyond just tuning a learning rate), but it doesn't need to be overly complex. *Tip:* To help avoid the risky, "will this work or not," phrase your question as "what is the effect on A when we change B?"

- Appropriate techniques must be used to train/run your project as compute time permits, e.g., selecting appropriate learning rate, training long enough to compare results
- The project write-up and all code are included in a single Google Colab notebook, and the staff is able to run all code to produce the included results (e.g., without needing to create accounts or paying for API/data services).
  - The exception to this is additional code used for an embodied agent. The additional code should be included via a link within the notebook.
  - In the case of embodied agents, appropriate photos/video should be included in/linked from the notebook.
- The project is something that you are excited to work on!

This project is intended to be completed along with other coursework within the last few weeks of the course, so we are definitely not expecting state-of-the-art results or novel approaches. Simply meet the stated requirements and have fun exploring and experimenting.

3 Finding Teammates

You must form a group of **three (3) students** to work on this project. Exceptions will only be made to this in the case that we do not have a number of students working on the project that is divisible by three. If you need any help in the process of forming teams, the course staff is always here to help.

4 Project Proposal

The purpose of this proposal is three-fold:

- Writing down your ideas forces you to organize your thoughts about your project before it gets too close to the final deadline.
- Confirms that your chosen dataset can be feasibly loaded into a Colab notebook when the course staff runs the notebook and/or you can get the basics running for your embodied agent
- It gives the course staff the ability to verify that your project has the correct scope or offer suggestions to set you up for success.

5 Use of AI Tools and Teamwork

One way to think about AI tools in a course project... You're on a project team with some eager, wizard-level PhD student who has all the ideas, does all the work, and doesn't talk much with the group. You may have a cool project, but you're not going to learn much and you earning credit for that project certainly lacks academic integrity. But... what if that awesome student actually worked together with the group? You could learn a ton!

The purpose of this project is for you to learn even more about AI & ML, and learning to use AI tools is part of this purpose. You are allowed to use AI tools for any part of your project, BUT... everyone in your

group is **required to understand** the contents of your submitted project, not just the techniques and results, but also what you learned, why you made various decisions along the way, and what challenges you faced.

As you use AI tools on the project, we strongly suggest:

- You, as humans, write the report. This helps to ensure you actually know what is in the report and why you are including each piece. Tip: Write first, then have AI check it for quality, clarity, grammar, and spelling.
- You, as humans, have the ideas and drive the project, including what to try next when an attempt doesn't work very well.
- Ask AI to explain things. This is especially important if AI is doing any work for you.
- Begin any AI sessions by including in the prompt that you are a student trying to learn via this course project. AI will help then help you do this!

Teamwork: Again, **everyone in your group** is required to understand the contents of your submitted project. Dividing up tasks is a smart thing to do, but you need to talk to each other before and after. You are responsible for helping your group members understand the work that you (or you and AI) did.

The Q&A sessions after project submission will help the course staff assess whether or not you are meeting these teamwork and AI tool use expectations.

6 AI and Compute Resources

We don't expect group members to invest in AI or compute resources beyond the university-provided ChatGPT Edu Plus and the free GPUs on Kaggle or Colab, potentially with something like $9.99 for a month of Colab Pro.

It won't be feasible to train huge models long enough with these expectations, so make sure you run early feasibility tests to scope your project to something that fits with small compute resources and our relatively small course project timeline.

7 Report Structure

Your Colab notebook should include the following sections

- Title and Group Members
- `LONG_RUN` flag
- Model Card (see Mitchell, et al. 2019: Include model card sections for 1) Task Input and Output, 2) Training Data and/or Physical Components, 3) Intended Use, 4) Risks. *Note:* These should be related to how the end user will use what you are building.
- Introduction: What is your project about? What problem are you trying to solve? Describe your dataset and/or your embodied agent and the inputs/outputs of the problem.
- Methods: Provide background information for the methods you used during your project. Clearly state your experimental question and techniques. Reminder that your project must include at least two techniques: one from each half of the course.

- Results and Discussion (separate sections or combined): Present figures (plots, tables, etc.) showing the performance of the multiple techniques that you implemented. Present figures (plots, tables, etc.) showing the results of your experiment. Include an analysis and discussion of your experimental results. Is this what you expected? Explain why you think you saw the results that you did. Highlight the limitations of the approaches you chose. Comment on whether you think there are other methods that may have better results than those you saw.
- References and citations: Clean and formatted citations of any sources that you referenced throughout this project. This includes citing previous work by others that AI tools put into the project.

8 Additional Information

- **Code**: Include your code directly in your notebook (preferred) or include a cell that pulls your code into the Colab runtime file structure. Implementations do not need to be made from scratch. You may use frameworks such as PyTorch, TensorFlow, HuggingFace models, etc.
- **API Keys**: If you would like to use any API that requires a personal API key in your application, you will need confirmation that we have pre-approved that API before submitting your work. *Note:* We won't approve all requests. For example, we won't approve any APIs that require payment or even free access if that requires a credit card. We'll post more details about this process on Piazza.
- **`LONG_RUN` flag**: Within the first few cells of your notebook, you should have a `LONG_RUN` flag set (initially set to False) that allows us to run your notebook without waiting for training or long seach processes to complete. However, the course staff should be able to set the `LONG_RUN` flag to True and run your full training and experiments. With the flag set to False, your code should run in less than 10 minutes on Google Colab.
- **Embodied Agents**:For embodied agents, include images and links to videos that demonstrate your setup and results.
- **Piazza**: Keep an eye on pinned Piazza post(s) with additional information and FAQs.
- **Help and feedback**: You can get feedback on your project at any time. Come talk to the course staff for feedback and help scoping your project or to make sure your are hitting the project requirements.