

## AAI521-Final Project

For this project, you will use Python in Google Colab, write a technical report, and prepare a recorded video presentation, including visuals based on your report.

a good format for answering interview questions: (STAR)

- Situation: We need to track number of occupants in a room
- Task: Design an IoT system that can use a pre-trained ML model like YOLO8 to use a camera to detect and place a person in the room
- Action: Design an Edge IoT with multiple sensors that can detect, count, and place a person in a room
- Results: An Edge IoT device powered by low voltage, that with multiple sensors can use an ML model that can detect, count, and place people in a room

Final projects and datasets from prior courses cannot be used. It is **REQUIRED** that you and your team use GitHub as a code hosting platform to manage version control and collaboration during this project. It is also necessary to create and add a [README](#) [Download README](#) file to your GitHub repository. Building web applications (using [Streamlit](#) [Links to an external site.](#) or [Python's Dash](#) [Links to an external site.](#) or similar) is a *big advantage* and *valuable practice* but not a requirement. It is recommended that you follow the [PEP 8](#) [Links to an external site.](#) – Style Guide for your Python code in the final project.

### Problem Definition:

- Include a clear statement describing the initial state of a problem by answering the following questions:
  - What is the problem you are going to solve?
  - Why does the problem need to be solved?
  - What aspect of the problem will a computer vision algorithm solve?
- Ensure your problem is interesting and understandable.

### EDA and Pre-Processing:

- Include a clear discussion that ensures all steps are clearly explained and addresses the following:
  - How did you make sure that you are ready to apply deep learning models?
  - What type of pre-processing is required on your data?
  - How can you define and refine various feature variables that you may potentially use for the modeling?
  - Have additional features added to demonstrate necessary image processing, image preparation, or image access for later AI computation?

### Modeling Methods, Validation, and Performance Metrics:

- Perform modeling using the training dataset.
- Evaluate the model(s) using the test dataset and validate as well.
- Ensure all modeling methods are well-motivated, correctly implemented, and, to the extent appropriate, span the range of methods discussed in this course.
- Cross-validation and/or held-out test sets are used in accordance with best practices to assess model performance.
- Performance metrics are carefully tailored to the project objectives.

### Modeling Results and Findings:

- Discuss the results comparing different models and explain the differences and the challenges.
- Ensure all project objectives are fully met, findings are clearly presented, and question(s) are technically addressed in the report.
- Include tables/graphs comparing the different models, including their characteristics, performance, and accuracy.

### Project Timeline:

- Module 2 (by the end of Week 2): The course instructor will group students into teams of two to three members. Each team should select and introduce a dataset of their choice. Blackboard, USD Email, or Slack can be used to find your team members.
- Module 4 (by the end of week 4): Your team will submit a status report of the project. One team representative will need to submit the "Team Project Status Update Form." This form includes describing the dataset(s) your team has chosen.
- Module 7 (by the end of Week 7): One team representative should submit deliverables for the course project in the final week:

1.

1. **Report:** One PDF document containing a final report explanation for analyses, interpretations (7-10 pages without appendix), and appendix (see below).
2. **Appendix:** Include PDF documents for submission with code, comments, and results. Attach these documents to your final report for submission.
3. **Video Recording:** One video recording of the technical project presentation with all team members' contributions. Visuals are required in the video recording presentation. This presentation should include one slide to showcase your collaborative efforts; you will create a presentation slide highlighting each team member's

individual **names** and **their contributions** to the final project work and deliverables.

### Project Deliverables and Submission Format:

- Write and submit your final project report in APA 7 style ([sample professional paper](#) [Download sample professional paper](#)). The final report (without Appendices), including text and selected tables/graphs, should be 7-10 pages.
- Appendix: Attach the PDF documents for submission with code, comments, and results to the report.
- Prepare a recorded video presentation of your project using a screencasting tool, or you can use your USD licenses to Zoom to record your screen and provide a voice narration. Ensure that the sound quality of your video is good and that each member presents an equal portion of the presentation. Export the video file to an **mp4** format. Visuals are required in your presentation.
- You may use any recording software you wish. View [Recording Video Presentation and Submission Guidelines for AAI Students](#) [Download Recording Video Presentation and Submission Guidelines for AAI Students](#).
- Submit the final PDF documents and video file on the final project submission page of Blackboard. You will use the naming convention Final Project-Team Number.pdf (e.g., **Final Project-Team 1.pdf**).
- Only one member of your team will need to submit these deliverables.
- Submit the peer evaluation form *individually*.