CS 370/570: Group Project Pitch Presentation & Report

Computer Imaging in the Real World

Learning Objectives & Outcomes

The objectives of this project are as follows:

"To provide students an exposure to –"
- Real-world use-cases of application of computer imaging;
- Opportunity to use state-of-art tools in a team-based setting to develop a prototype;
- (For Master's students) A venue to hone project management, leadership, and mentoring skills that will serve them in the workplace; and
- Opportunity to create a visual (video) artifact that can be helpful in employment and networking activities.

Deliverables for Pitch Presentation (Week 3)

Provide a report and a presentation, that serve as a project proposal for your team. Your report should be in ACM SIGGRAPH format (found here: https://www.siggraph.org/preparing-your-content/author-instructions/). Your report should be minimum 4 pages, and not exceed 8 pages (excluding any citations).

The paper should describe the overall idea and design of the project that your team is going to implement over the next few weeks. You should try to cover the following questions:

(a) What is the problem that you are trying to solve?

(b) What are the current approaches to solve this problem?

(c) Describe the steps in the image processing pipeline for the project *in detail* (provide appropriate equations/formulae and figures to support your argument.)

(d) Describe each stage of your pipeline – its purpose, the input data, the expected output, and why this stage is important.

(e) Provide a schedule of the implementation timeline (what is being done when?) You should plan to demo at least one prototype (in weeks 9 or 10) before the final presentation (week 14)

If you are referring to any website/paper/software manual as a reference point for the stacking methods, you must cite them in your paper. You are encouraged to search for as many methods as possible.

In this particular report, you are allowed to use the results of existing software – images, screenshots, photographs, tables – however, they MUST be appropriately cited to show what the expected resulting output may look like. In future reports, the output images MUST be from your implementation/prototype.

You are permitted to use third-party libraries to read and write image & files from/to the disk. However, any image processing stage in your pipeline must be implemented by your team.

Your representation of the design should be presented in standard UML format (use Visio, or similar, to create these figures).

Sample Topics

You can use the list of topics below to start your research process for the group project:

- Edge AI / Real-time Processing: Prioritizing on-device, low-latency analysis for applications like autonomous vehicles and surveillance.
- Vision Transformers (ViTs) & Self-supervised Learning: Transforming model performance via attention-based architectures and unlabeled data.
- Generative AI & Synthetic Data: Accelerating training with GANs and diffusion models that create realistic data while preserving privacy.
- 3D Vision / Depth Estimation & Hyperspectral / Multispectral Imaging: Enabling spatial context and spectral analysis for sectors like AR/VR, agriculture, and medical diagnostics.
- Multimodal Learning & Video Stream Analysis: Combining image data with audio, text, or sensor info to improve perception systems.
- Explainable (XAI), Federated Learning, Ethical AI: Ensuring transparency, privacy, and fairness under emerging regulations.

- Deepfake Detection & Low-light Enhancement: Tackling adversarial and challenging environmental tasks to improve reliability.
- Event Cameras, Quantum Image Processing, Biomedical Imaging, Energy-efficient AI: Cutting-edge techniques gaining traction in specialized research.

Grading Criteria

Outcome	Rubric
Exemplary (A)	The report discusses all the points thoroughly as noted above, and goes beyond by presenting novel content not explicitly specified in this document.
Satisfactory (B)	The report discusses all the points as noted in this requirement specification.
Developing (C)	The report does not cover all the points specified in this document.
Unsatisfactory (D)	The report covers only the most barebones discussion of the topics specified, does not provide appropriate citations, or does not present the content in ACM SIGGRAPH format.
Failure (F)	No report submitted