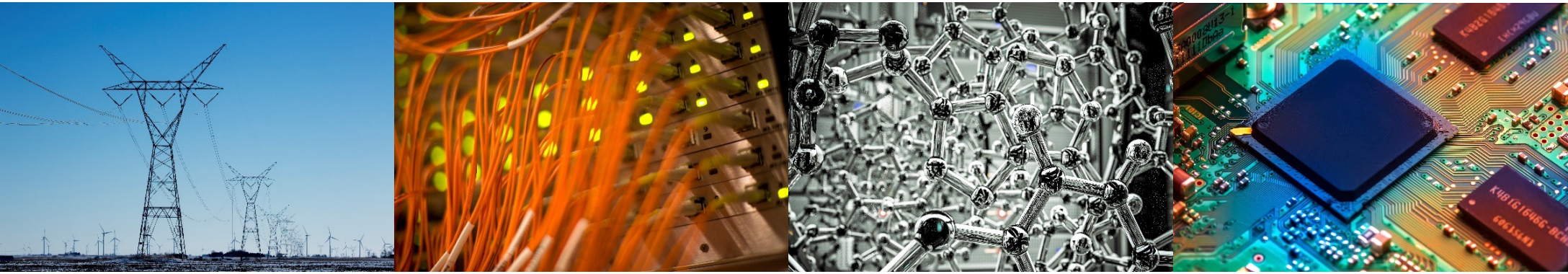
ECE 420- Mobile Application DSP Lab

Team Project Preview



ILLINOIS

Electrical & Computer Engineering

GRAINGER COLLEGE OF ENGINEERING

Final Project

Implementation

- ❑ Did you finish what you proposed?
- ❑ Was it stable/robust?
- ❑ Was it “real-time”?

Idea

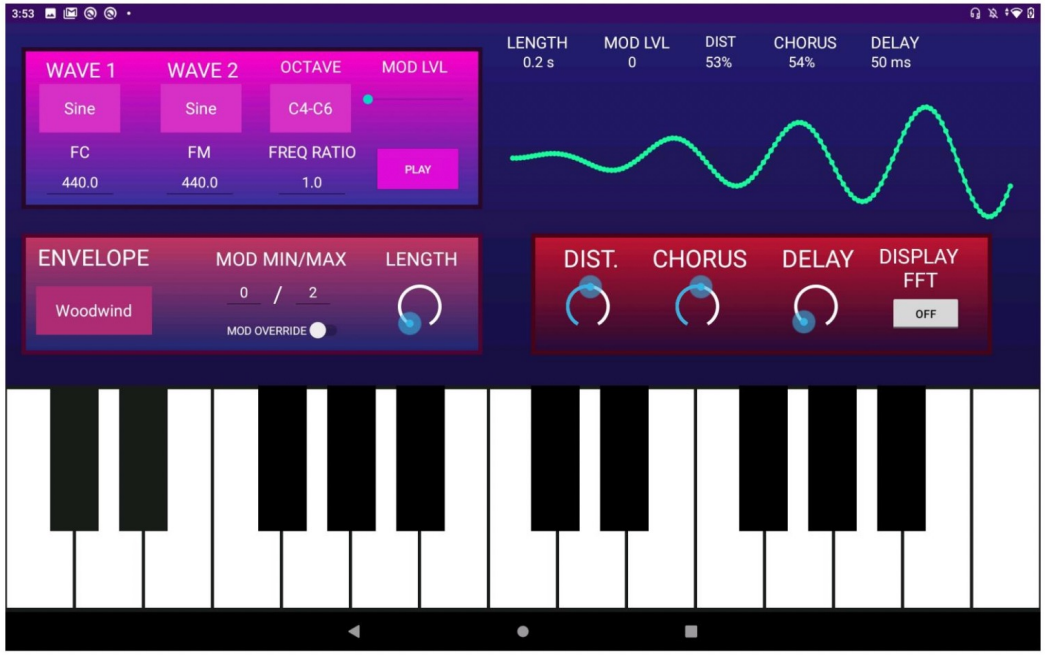
- ❑ Improve the algorithm
- ❑ Find application

Prototype Project

Goal is

- ❑ Validation: Is the algorithm feasible?
- ❑ Test: Is it still working in a non-ideal environment?

SimpleSynth



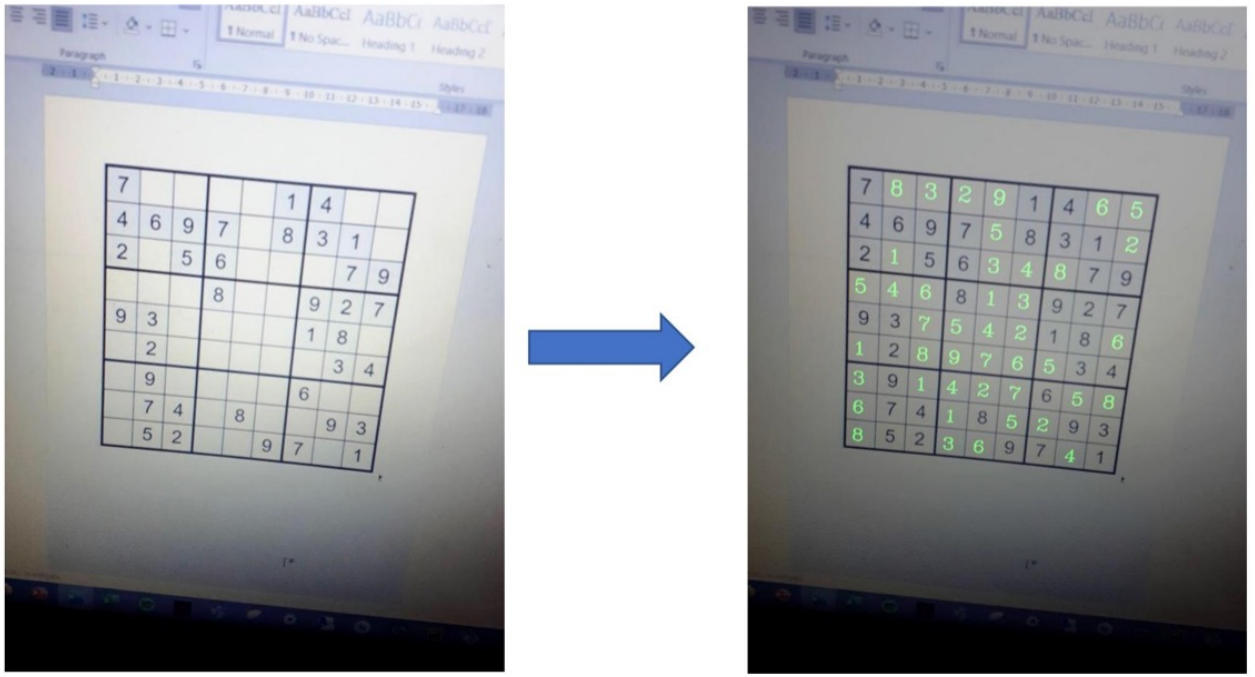
Idea

- ❑ Improve the algorithm
- ❑ Find application

- Seed paper: FM audio synthesis
- Implemented from scratch
- Improve latency by “alternative” waveform equations

Idea

Sudoku solver



- ❑ Improve the algorithm
- ❑ Find application

- Seed paper: Canny edge detection
- Used multiple libraries
- Perspective transformation, Digit recognition, back-tracking, etc…

FAQ

Q. Is the project group work or individual?

A. Group of 2-3.

Q. Can I form a group across different sections?

A. Yes.

Q. What is Assigned Project Lab?

A. APL is a **pre-lab** for the final project. You setup the topic/goal and run Python simulation.

FAQ

Q. What do we do for Assigned Project Lab?

A. 1) Submit a proposal

2) Implement the algorithm in Python

3) Presentation (**prepare slides**)

& Demo the code

FAQ

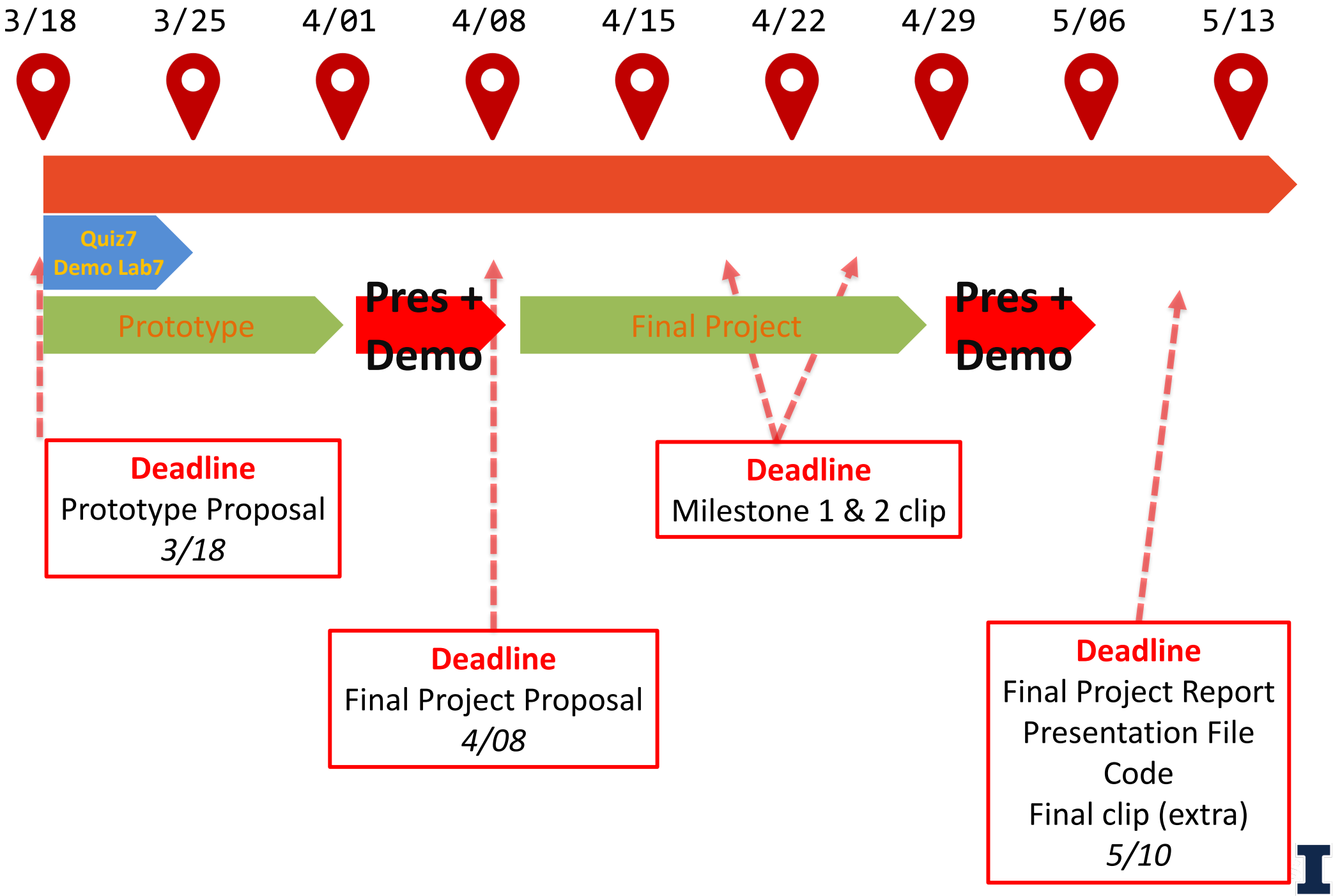
Q. Can I use a built-in function from package/library?

A. Yes, but we value your own implementation + idea

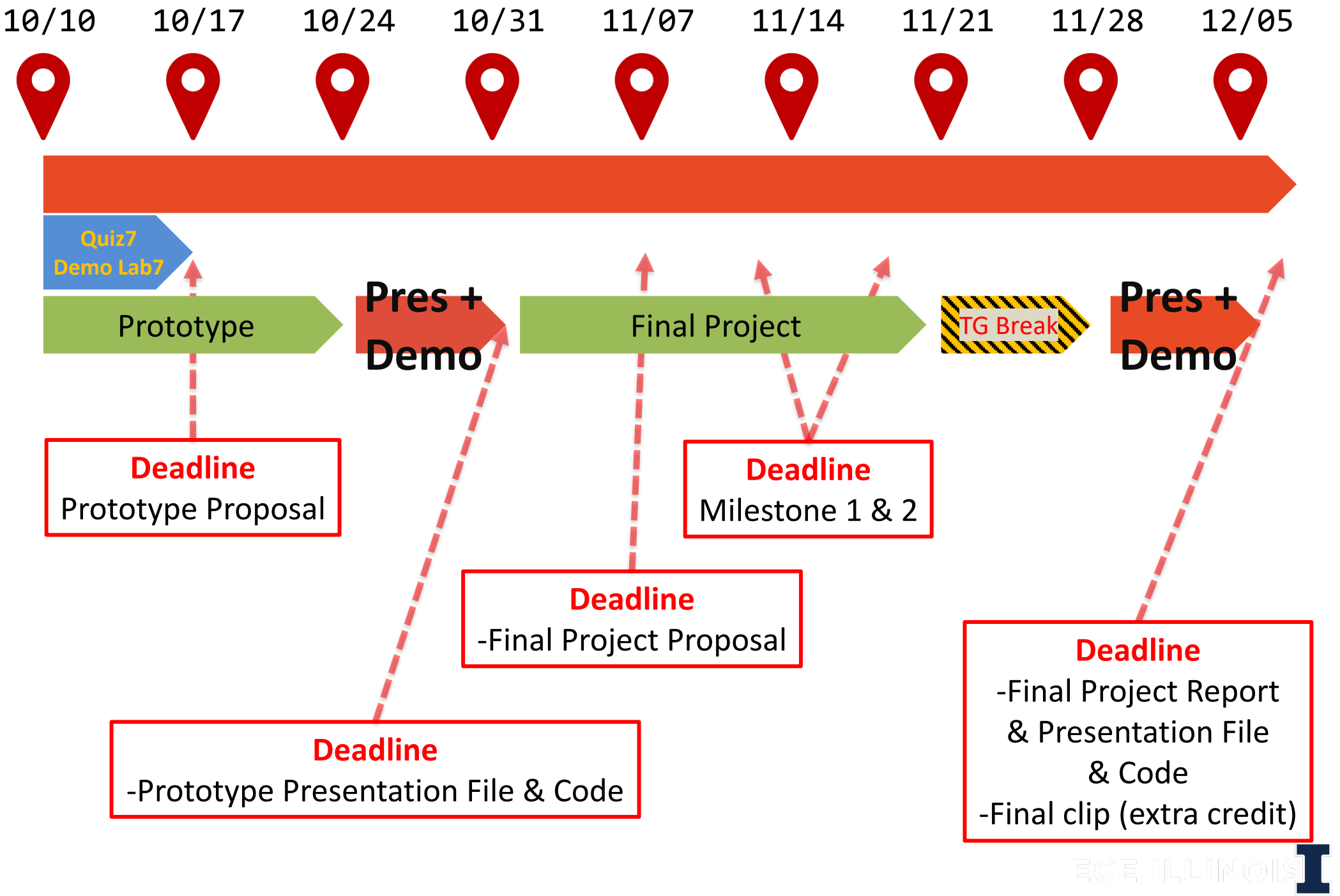
For example, Hough Transform Project

a. from scratch + detect a circle → ok (simple goal)
b. library + detect a circle → bad (simple goal with library)
c. library + image scanner application (correct angle, scale, detect multiple sheets, etc) → great
d. from scratch + image scanner application (correct angle, scale, detect multiple sheets, etc) → excellent!

Project Schedule - Spring



Project Schedule - Fall



Prototype

Final Project

- Lab operates like office hour
  (TA will be in zoom meeting)
- Not required to attend
- You can still demo Extra-lab (lab8)

Pres + Demo

- To Instructor & TA
- **@ECEB 5072**
- **20 min**
  - Presentation(Proposal)
    + Result(Demo)
- ALL group members should attend
- Prepare slides
- May not be your lab section

Milestone 1&2

- Meet the TA who you met
  in Prototype demo
- Report your progress
  and show your intermediate results

Assigned Project Lab Proposals

- Expectations for proposal:
  - Intorduction to the project. What is the final goal of the project? Rough idea(s) for Final Project applications of the algorithm.
  - Overview of the algorithm to be implemented, including citation of sources.
  - Plan for testing and validation of the algorithm's implementation.
  - Contribution
- If you choose a paper not listed in the webpage, please contact us.
- Length: 2-4 pages (use many figures/diagrams/tables/Equations)
- Template (Latex) is provided
  (*strongly recommended* to use the Latex template).

Feedback Examples…

1. First we acquire an adequate data set that we will use to train and test our Facial Recognition System.
2. We compute the mean of this image and subtract the mean face from all the Training Samples
3. We then use PCA, or Principal Component Analysis, in order to compute the "Eigenfaces" for each of the training samples. This ends the initialization of our facial recognition system.
4. We then accept the input of a new recognition image that had not been included in our data set. This is the image that we would like to "recognize."
5. We again use the PCA approach in order to compute this image's eigenface.
6. We can then compute the euclidean distance between the eigenface of the recognition image and each of the eigenfaces of the sample. The image that is closest in euclidean

→ *Looking for a more in depth* technical review *of the paper*

Feedback Examples…

If a matching cluster is found (for cluster C_k):

Update cluster weights: $w_k \leftarrow w_k + \frac{1}{L}\left(\frac{1}{P} - w_k\right)$

Adjust the centroid of the matching cluster based on the incoming pixel: $c_k \leftarrow c_k + \frac{1}{L}(x_t - c_k)$

→ *Equations without complete definitions/explanation*

Feedback Examples…

→ Be specific on how you plan testing&validation

Bad example:
Validating the algorithm's correctness will consist of running the algorithm on pre-recorded audio segments.

Great example:
We plan to test the algorithms using speech uttered by different genders and age groups. We will try our best to collect speech utterances from child, adult female, adult male, senior female, and senior male. If we are not able to cover all age groups, we will at least test on our own speech utterances, which include both adult female and adult male voices. For each person, we plan to record 8 speech utterances including both voiced and unvoiced syllables as described in Section III.B in [1]. We will use Praat [6], a professional phonetic analysis software, to record all of the speech utterances under the same condition, mono sound with sampling frequency 12000Hz.

Feedback Examples…

- *Looks a little simple on the image processing end. I see that you want to use a NN, but I think you should put more work into the image processing or put more thought into the NN design. I would rework this.*

→ Choose the right difficulty (justify in Plan section)

APL Proposal Rubric- 50 Points

- (10pt) Introduction
  - introducing the project, stating the goal, rough idea to the final project
- (10pt) Overview of the algorithm
  - elaborating the technical details using equations/figures/diagrams
- (10pt) Plan for testing and validation
  - stating detail plans by examples/numbers/stats
- (10pt) Format
  - Latex template
- (10pt) Overall quality

Communicate!
with the teaching staff

- Come to lecture/office hour/lab
- Get consult/tech help from us