Lab 01
Project Overview

Week 02

Friday, 0800-0950, Room 235, New Engineering Building

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Agenda

Week 02, Friday January 22, 2021

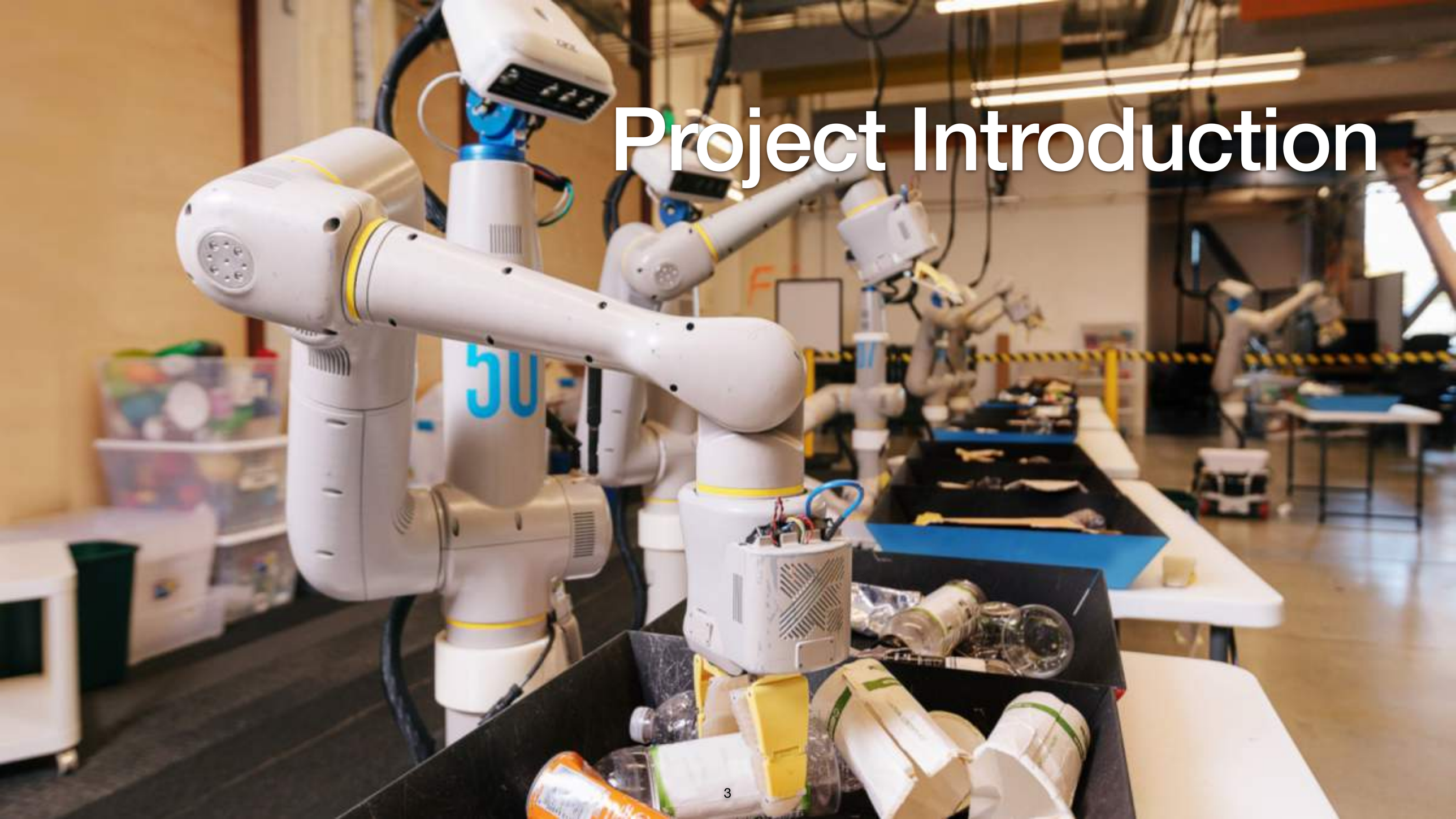
Project Introduction

Self-Introduction & Team Formulation

Robot Demonstration

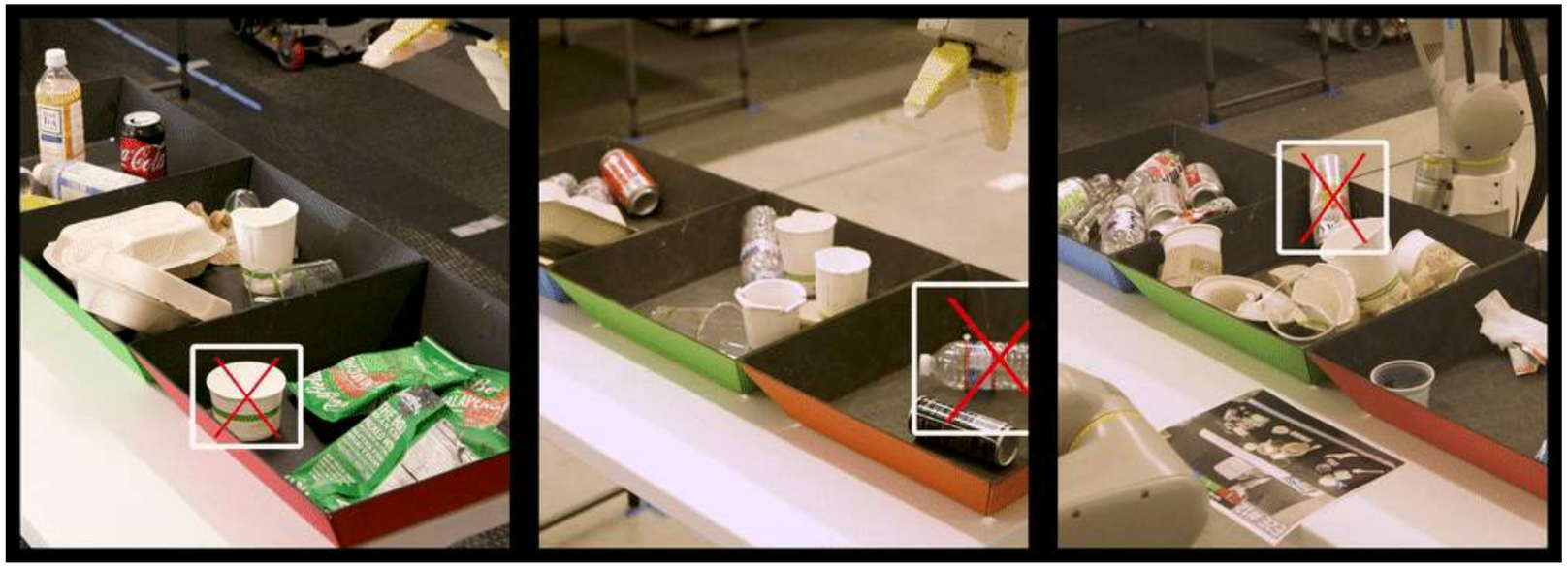
ME336参课同学调研

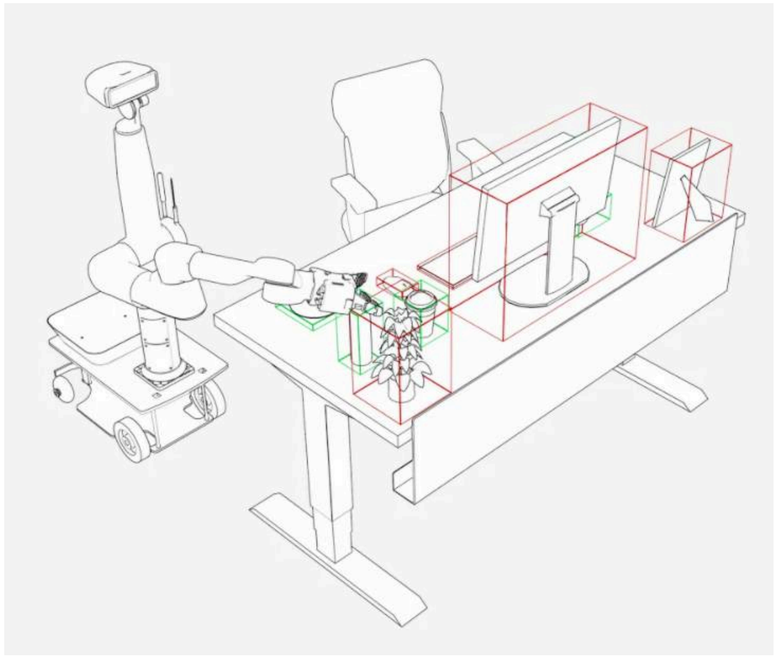
扫一扫

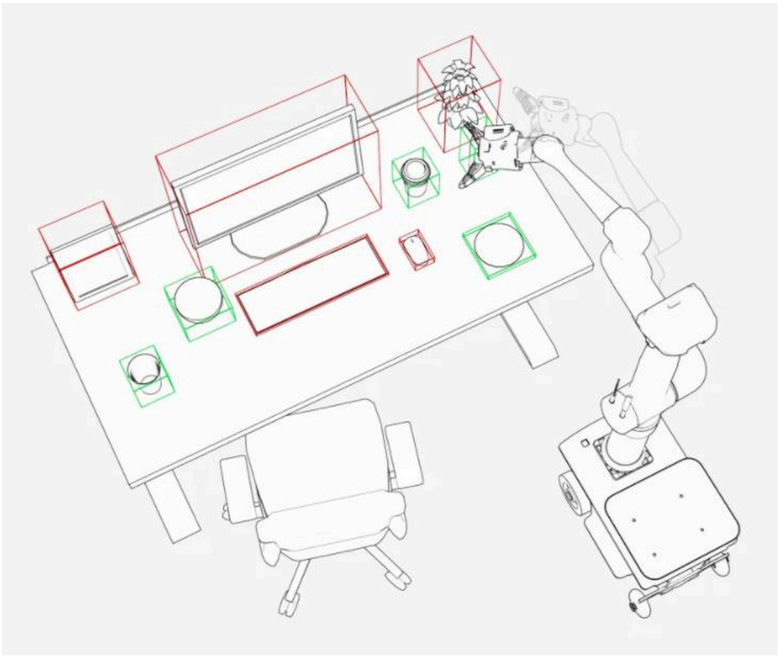


Project Introduction

Teaching robots to help with everyday life







Project Goal

Train a robotic manipulation to sort daily trash autonomously

- Try developing a wasteless production line that is capable of sorting all the office trash from SUSTech New Engineering Building autonomously, effectively, efficiently, and safely.

Grading Policy

Submission Deadline

- Assignment Project #1:
  - 30%
- Assignment Project #2:
  - 30%
- Course Project:
  - 30%
- Individual Marking:
  - 10%

Unless otherwise noted, all project items are due by 11:59 pm.

Week	Assignment Project #1	Assignment Project #2	Course Project
01~02			
03~06	Due Sunday, Mar 28		**Project Proposal:** Due Sunday, Mar 14
07~10		Due Sunday, Apr 25	**Project Milestone:** Due Sunday, Apr 18
11~15			**Final Report:** Due Wednesday, May 26 **Project Presentation:** Due Friday, May 28

Learning to Pick with 2D Images

Assignment Project #1: 30% | Due Sunday, Mar 28

- **[Basic Training]** Hand-eye Calibration
- **[Sample Project]** We will show you with an example on how to use 2D images to train a model so that useful information can be extracted to conduct simple picking tasks, including object location in (x, y) and object orientation in θ
- **[Assignment Project]** You will review the literature and reproduce a learning algorithm using 2D images to conduct a simple picking task by identifying the object location (x, y) at least
- **[Submission Material]** Github Repository in a Zip

Learning to Pick with 3D Point Cloud

Assignment Project #2: 30% | Due Sunday, Apr 25

- **[Basic Training]** Data Collection & Labeling (waste)
- **[Sample Project]** We will show you how to use 3D point cloud data to train a model so that detailed object pose in (x, y, z, r, p, y) can be extracted to conduct a dexterous picking task
- **[Assignment Project]** You will review the literature and reproduce a learning algorithm using point cloud data to conduct a picking task by estimating the object location in (x, y, z) at least.
- **[Submission Material]** Github Repository in a Zip

A Good Example for Assignment Project Files

https://github.com/andyzeng/visual-pushing-grasping

- A GitHub repository with runnable codes
- A README.md with all information necessary and explanation
- Videos or Gifs demonstrating the result of your codes
- Clear file and folder structure and clean format

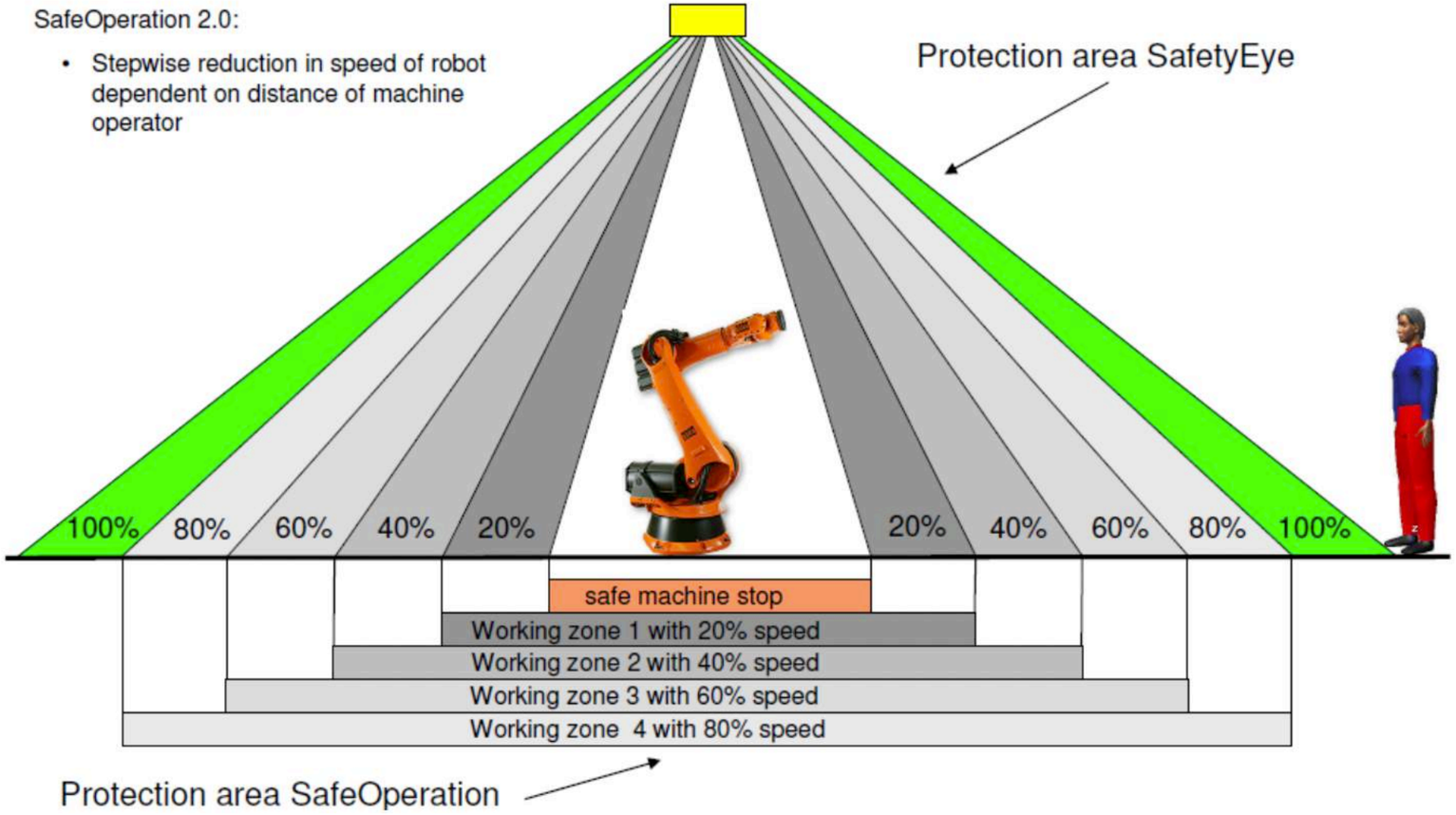
Towards an Autonomous Waste Sorting Robot

Final Project: 30%

- Pick any of the four problems to design an Autonomous Waste Sorting Robot
  - Ambient Intelligence for Safe Robot Sorting
  - Agile Waste Sorting with Tossing
  - Waste Classification by Vision & Touch
  - Learning by Demonstration for Waste Sorting
- **[Submission Material]** Paper with Code

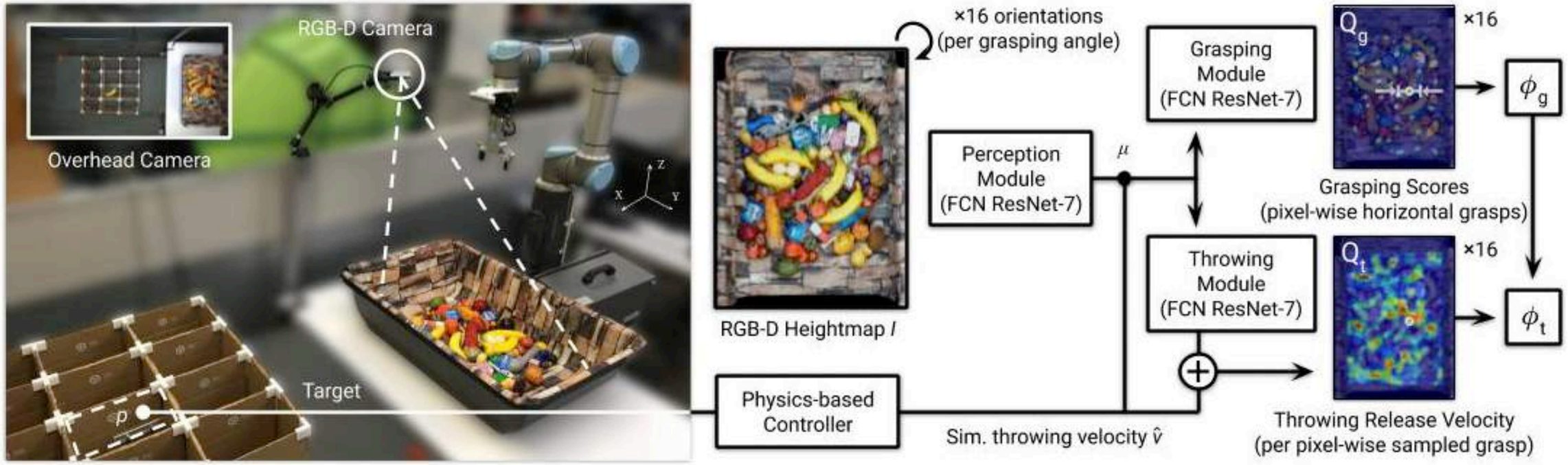
Ambient Intelligence for Safe Robot Sorting

How safe is your waste sorting robot when working with human?



Agile Waste Sorting with Tossing

How fast is your robot when sorting waste?



Learning to Throw Arbitrary Objects with Residual Physics

Andy Zeng, Shuran Song, Johnny Lee, Alberto Rodriguez, Thomas Funkhouser

Princeton
Vision & Robotics

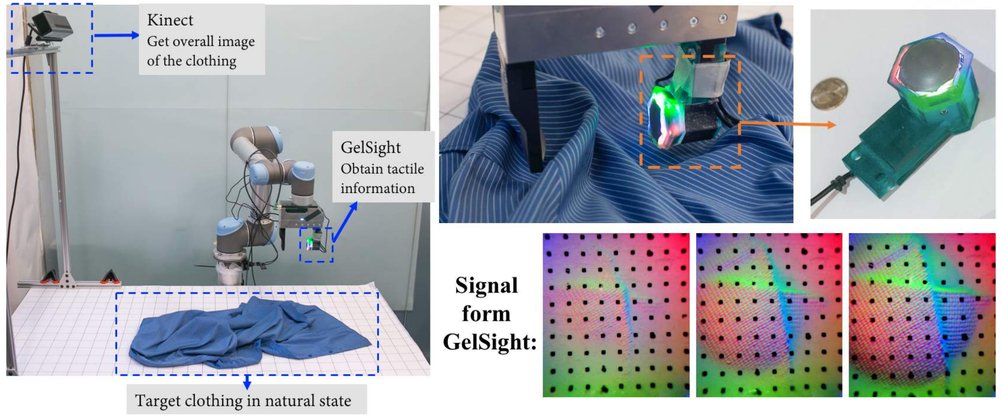
Google
Research

Columbia
University

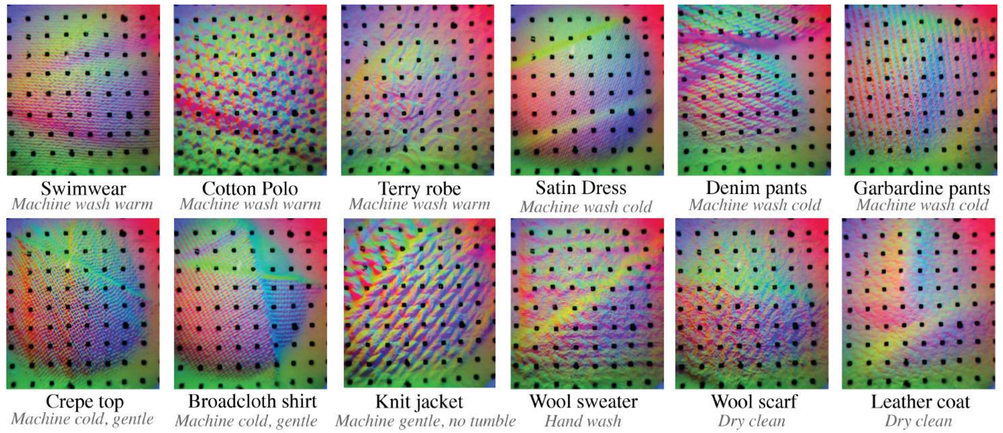
MIT
MCube Lab

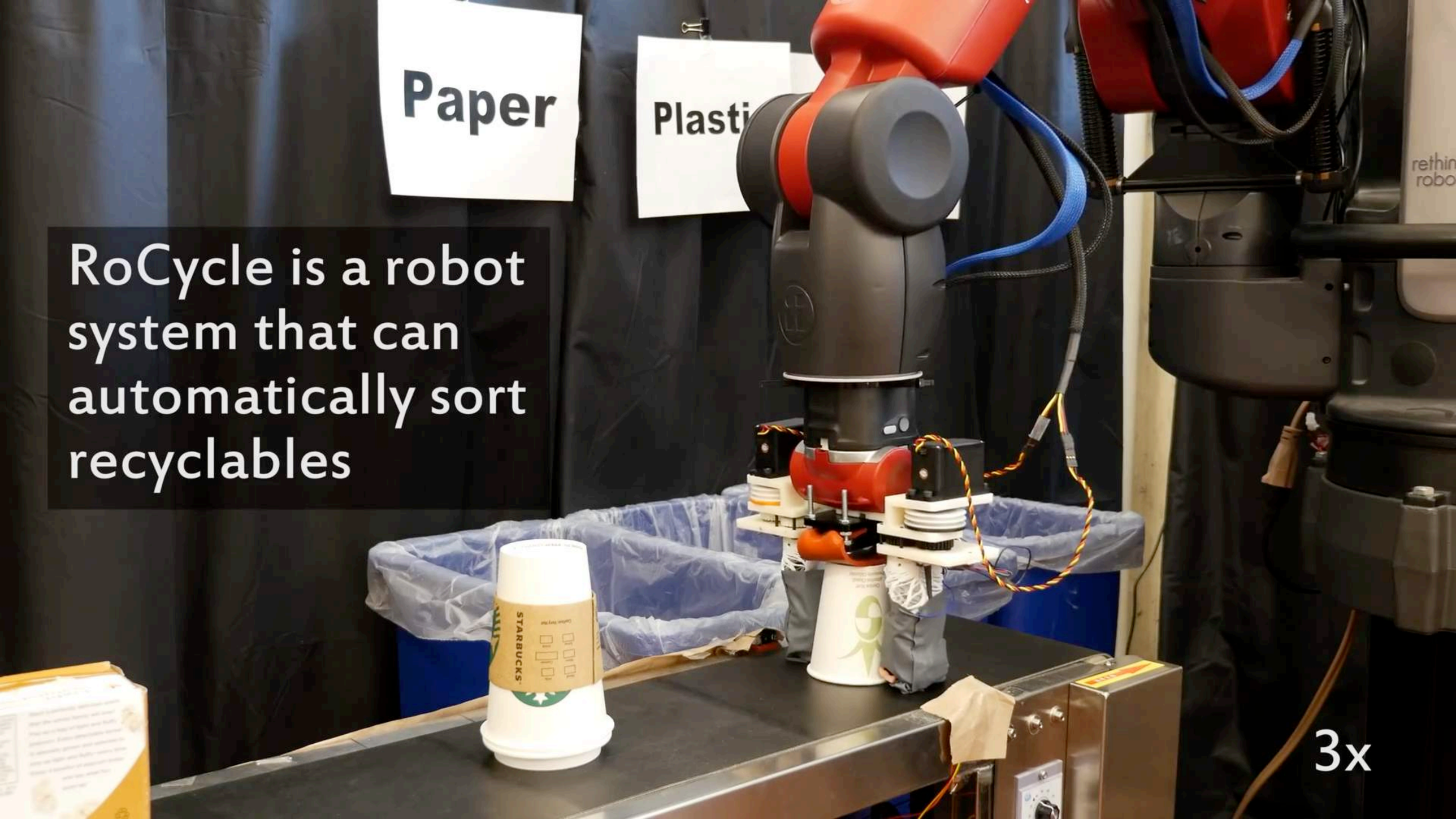
Waste Classification by Vision & Touch

How accurate is your robot when sorting waste?



Signal form GelSight:





RoCycle is a robot system that can automatically sort recyclables

Learning by Demonstration for Waste Sorting

How dexterous is your robot when dealing with waste sorting?


Blue is human safe

A Good Example for Final Project Files

https://vpg.cs.princeton.edu/

- A GitHub repository with runnable codes
- A README.md with all information necessary and explanation
- Videos or Gifs demonstrating the result of your codes
- Clear file and folder structure and clean format

Project Proposal: Due Sunday, Mar 14

The project proposal should be one paragraph (200-400 words)

- Your project proposal should describe:
  - What is the problem that you will be investigating? Why is it interesting?
  - What reading will you examine to provide context and background?
  - What data will you use? If you are collecting new data, how will you do it?
  - What method or algorithm are you proposing? If there are existing implementations, will you use them and how? How do you plan to improve or modify such implementations? You don't have to have an exact answer at this point, but you should have a general sense of how you will approach the problem you are working on.
  - How will you evaluate your results? Qualitatively, what kind of results do you expect (e.g. plots or figures)? Quantitatively, what kind of analysis will you use to evaluate and/or compare your results (e.g. what performance metrics or statistical tests)?

Project Milestone: Due Sunday, Apr 18

Your project milestone report should be between 2 - 3 pages using provided template.

- The following is a suggested structure for your report:
  - **Title, Author(s)**
  - **Introduction**: this section introduces your problem, and the overall plan for approaching your problem
  - **Problem statement**: Describe your problem precisely specifying the dataset to be used, expected results and evaluation
  - **Technical Approach**: Describe the methods you intend to apply to solve the given problem
  - **Intermediate/Preliminary Results**: State and evaluate your results upto the milestone

Final Report: Due Wednesday, May 26

- Your final write-up is required to be between 6 - 8 pages using the provided template, structured like a paper from a robot learning conference (CoRL, ICRA, IROS, etc.).
- Please use this template so we can fairly judge all student projects without worrying about altered font sizes, margins, etc.
- After the class, we will post all the final reports online so that you can read about each others' work.
- If you do not want your writeup to be posted online, then please let us know via the project registration form.

Suggested Structure for Your Report

You don't necessarily have to organize your report using these sections in this order.

- **Title, Author(s)**
- **Abstract**: Briefly describe your problem, approach, and key results. Should be no more than 300 words.
- **Introduction (10%)**: Describe the problem you are working on, why it's important, and an overview of your results
- **Related Work (10%)**: Discuss published work that relates to your project. How is your approach similar or different from others?
- **Data (10%)**: Describe the data you are working with for your project. What type of data is it? Where did it come from? How much data are you working with? Did you have to do any preprocessing, filtering, or other special treatment to use this data in your project?

Suggested Structure for Your Report

You don't necessarily have to organize your report using these sections in this order.

- **Methods (30%)**: Discuss your approach for solving the problems that you set up in the introduction. Why is your approach the right thing to do? Did you consider alternative approaches? You should demonstrate that you have applied ideas and skills built up during the quarter to tackling your problem of choice. It may be helpful to include figures, diagrams, or tables to describe your method or compare it with other methods.

- **Experiments (30%)**: Discuss the experiments that you performed to demonstrate that your approach solves the problem. The exact experiments will vary depending on the project, but you might compare with previously published methods, perform an ablation study to determine the impact of various components of your system, experiment with different hyperparameters or architectural choices, use visualization techniques to gain insight into how your model works, discuss common failure modes of your model, etc. You should include graphs, tables, or other figures to illustrate your experimental results.

- **Conclusion (5%)** Summarize your key results - what have you learned? Suggest ideas for future extensions or new applications of your ideas.

Suggested Structure for Your Report

You don't necessarily have to organize your report using these sections in this order.

- **Writing / Formatting (5%)** Is your paper clearly written and nicely formatted?
- **Supplementary Material,** not counted toward your 6-8 page limit and submitted as a separate file. Your supplementary material might include:
  - Source code (if your project proposed an algorithm, or code that is relevant and important for your project.).
  - Cool videos, interactive visualizations, demos, etc.
- Examples of things to not put in your supplementary material:
  - The entire PyTorch/TensorFlow Github source code.
  - Any code that is larger than 10 MB.
  - Model checkpoints.
  - A computer virus.

Project Presentation (video recording)

May add a poster session depending on department call

- Each group is required to submit a 5-minute presentation video for their final project.
- Students can be as creative as they like for their video presentations.
- The easiest option is to create a slide deck together as a team and record yourselves presenting the slide deck as a group using Feishu.
- Each student member should speaker during the presentation.

Project Presentation (video recording)

May add a poster session depending on department call

- The following is a suggested structure for the video presentation. The specific rubric will be updated later in the quarter. You don't necessarily have to organize your presentation using these sections in this order, but that would likely be a good starting point for most projects.
  - **Problem Statement**: Briefly describe the problem your group is tackling. Describe the overall motivation, as well as the input / output of the problem.
  - **Technical Challenges**: Briefly describe why the problem is technically challenging.
  - **Related Works**: Briefly in what ways previous works have tackled the technical challenges.
  - **Your Approach and Results**: Describe your detailed technical approach and innovations. Describe evaluation results (dataset and metric).
  - **Broader Impact**: How do you expect the impact of your work to be? What can others learn from it or how can they apply it to solve their problems? What are the limitations of your work? What are areas for future improvements?

Team Roles Marked by Monthly Peer Review

Individual Marking: 10%

- 7~8 students form a team
  - Red/Green/Blue/Yellow
- 5 roles per team
- 1~2 students per role

- Design Engineer
- Algorithm Engineer
- System Engineer
- Software Engineer
- Data Engineer

Role Description

1~2 student per role

- **Design Engineer**: design & handle the mechanical hardware, build & make
- **Algorithm Engineer**: design and develop algorithms for task execution
- **System Engineer**: engineering management of the team and process
- **Software Engineer**: dealing with various software issues for integration
- **Data Engineer**: focus on the data preparation and presentation of the results

Self-Introduction & Team Formulation

Introduce Yourself & Pick Your Role

1~2 students per role, 7~8 students per team

- **Team Red**
  - System
  - Algorithm
  - Software
  - Data
  - Design
- **Team Green**
  - System
  - Algorithm
  - Software
  - Data
  - Design
- **Team Blue**
  - System
  - Algorithm
  - Software
  - Data
  - Design
- **Team Yellow**
  - System
  - Algorithm
  - Software
  - Data
  - Design

ME336组队申请

打开飞书「扫一扫」

Robot Demonstration

Thank you

For more information, please visit mainDL.ancoraSIR.com

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