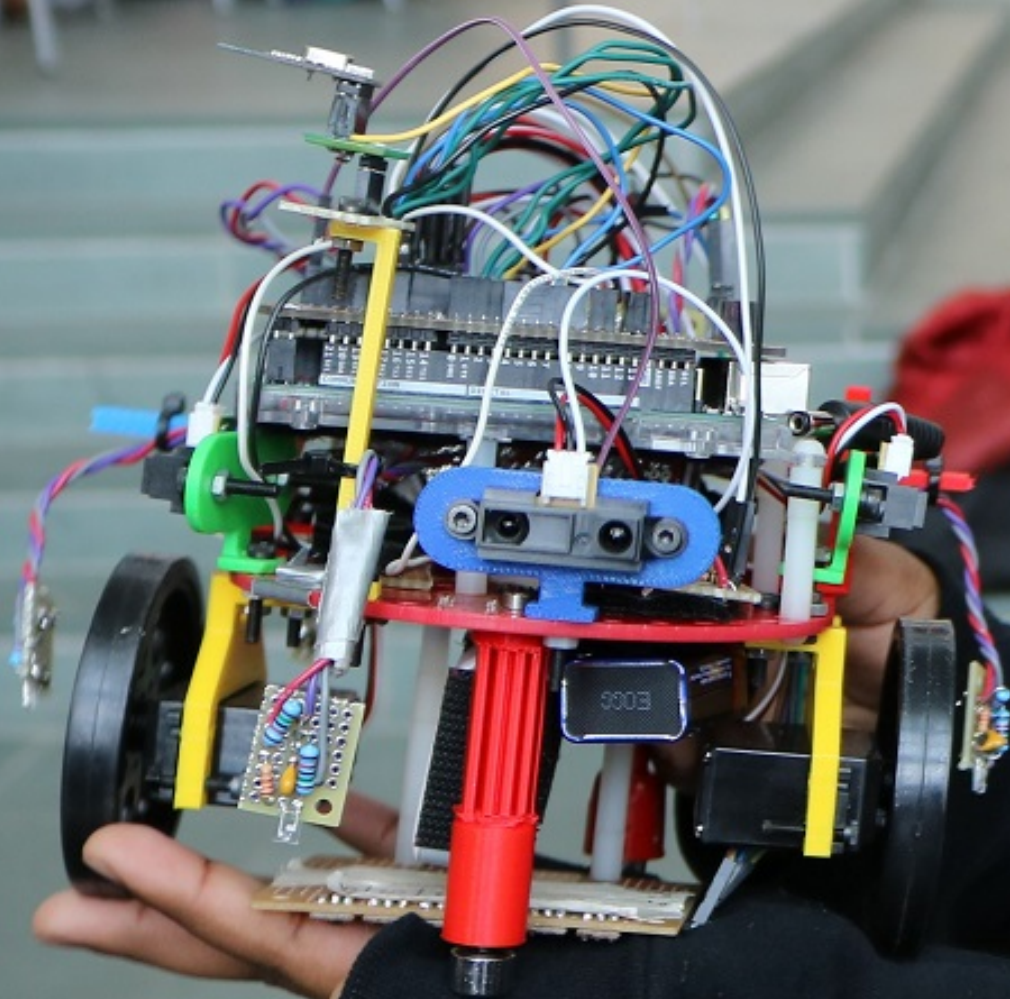


Class website: <https://cei-lab.github.io/ece3400-2018/>

Piazza: <https://piazza.com/cornell/fall2018/ece3400/home>

ECE 3400: Intelligent Physical Systems

*Assistant Professor
Kirstin Hagelskjær Petersen*



Class website: <https://cei-lab.github.io/ece3400-2018/>

Piazza: <https://piazza.com/cornell/fall2018/ece3400/home>

ECE 3400: Intelligent Physical Systems

IPS can perceive, reason about, and act upon their environment

Quadrotor



KUKA industrial arm



Google
humanoid

Dishwasher



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Piazza: <https://piazza.com/cornell/fall2018/ece3400/home>

ECE 3400: Intelligent Physical Systems

IPS can perceive, reason about, and act upon their environment

Movie: Passengers



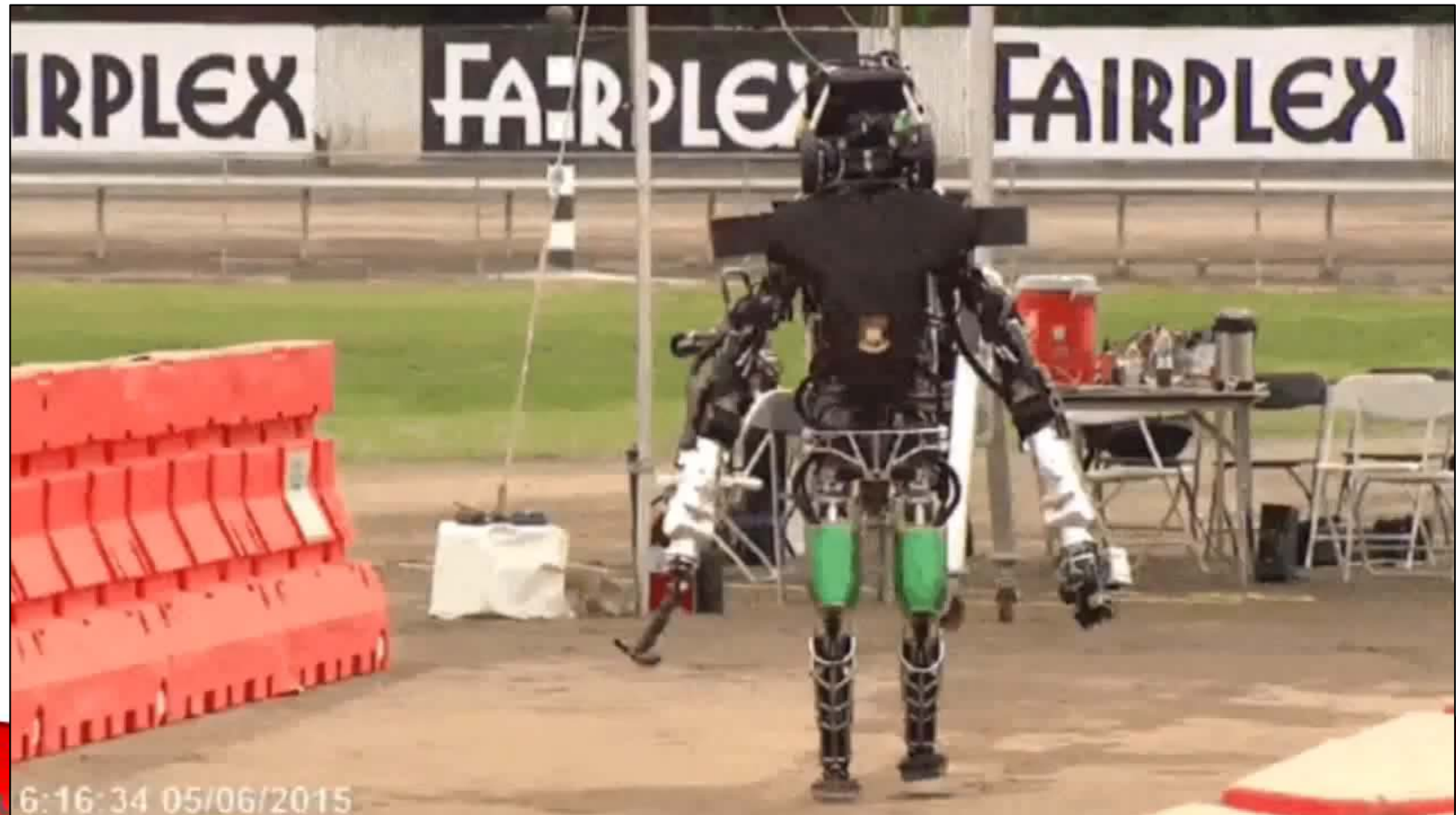
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ECE 3400: Intelligent Physical Systems

IPS can perceive, reason about, and act upon their environment

DARPA Grand Challenges Compilation



Outcomes

IPS Design

Analog

Digital logic

Filters Amplifiers

Audio

IR intensity

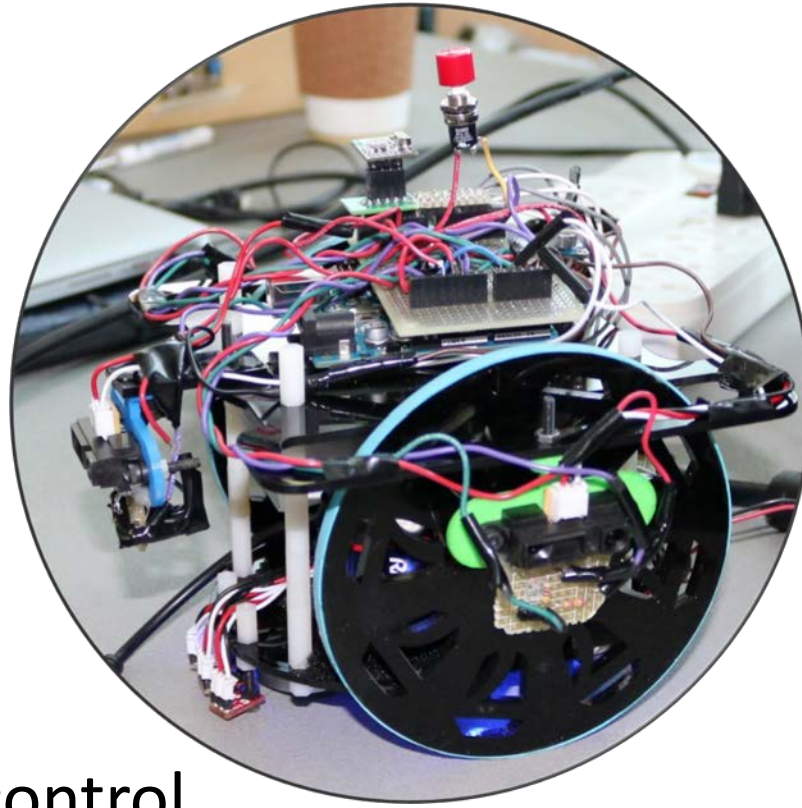
IR reflection

Vision Embedded control

Noise Prototyping Algorithms

Batteries Wireless

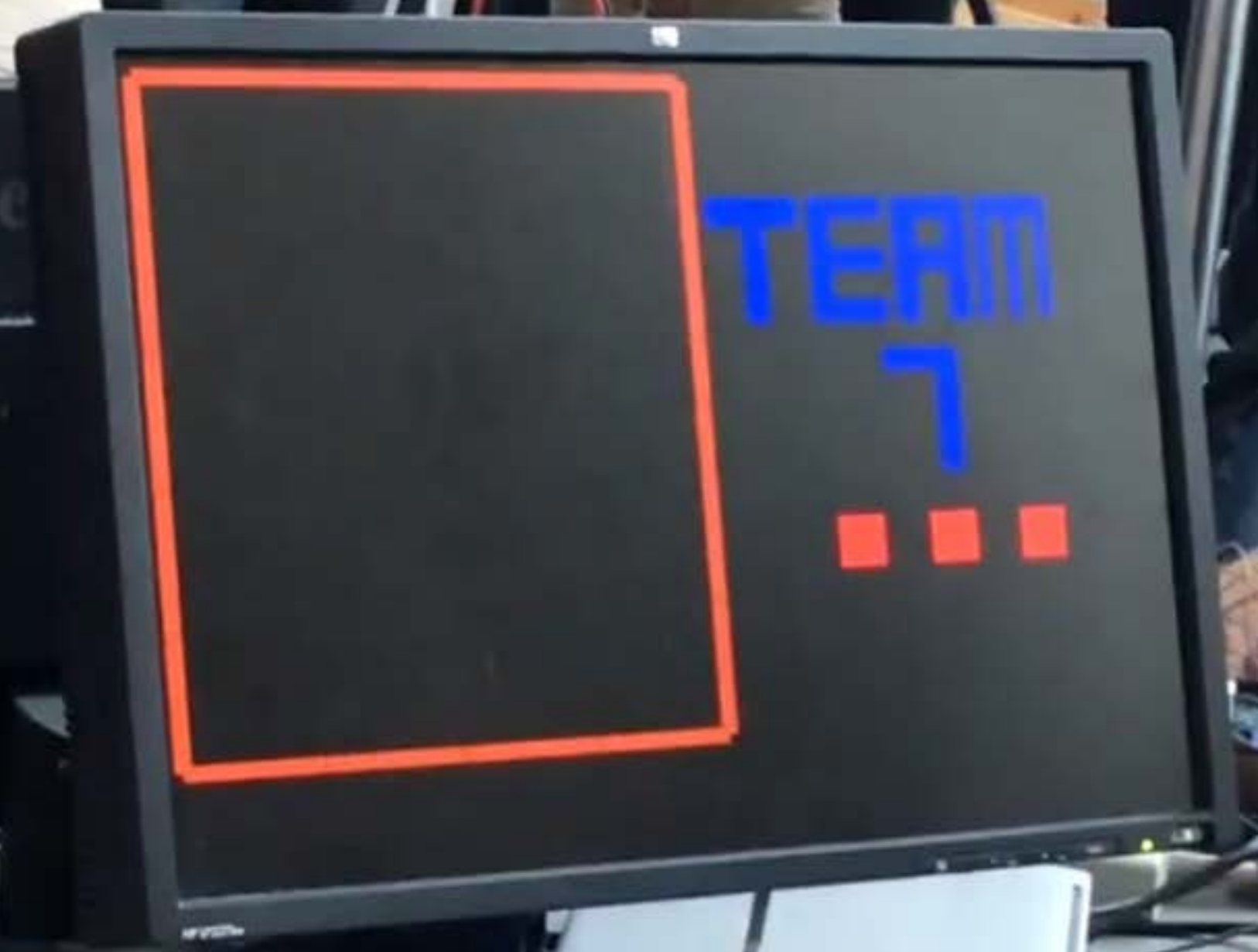
Wired



- *Team work*
- *Leadership skills*
- *Conflict resolution*
- *Time management*
- *Documentation*

*Learning to
learn online*

*Learning to
teach online*



Online Dissemination

ece3400-2018

 [View On GitHub](#)

This project is maintained by [CEI-lab](#)

Hosted on [GitHub Pages](#) using the Dinky theme

ECE 3400 Intelligent Physical Systems

Cornell University, Fall 2018

- **Instructor:** Assistant Professor Kirstin Petersen (khp37)
- **TA's**
- **Piazza**, sign up [here](#)
- Note that lab and milestone grades will be distributed over Blackboard!
- Class hours: Monday and Wednesday 11.15am-12.05pm, Upson Hall 142.
- Team meetings: Friday 11.15am-12.05pm, location TBD by teams.
- Labs: Monday 1.25-4.25pm, Monday 7.30-10.30pm, Wednesday 7.30-10.30pm, Thursday 7.30-10.30pm, Friday 1.25-4.25pm in Phillips Hall 427.

Welcome to ECE 3400; a class where students learn to tie the fundamental principles of Electrical and Computer Engineering (ECE) across virtual and physical boundaries to create autonomous robots able to perceive, reason about, and act upon their environment. Specifically, in teams of 4-5, students will design and fabricate a robot able to navigate and map out a maze with treasures in the shortest possible time.

Robot

Maze

What's new??

- New lectures
 - New rooms
 - No discussion section – questions *always* welcome

Class website: <https://cei-lab.github.io/ece3400-2018/>
Piazza: <https://piazza.com/cornell/fall2018/ece3400/home>



What's new??

- New lectures
- New course material

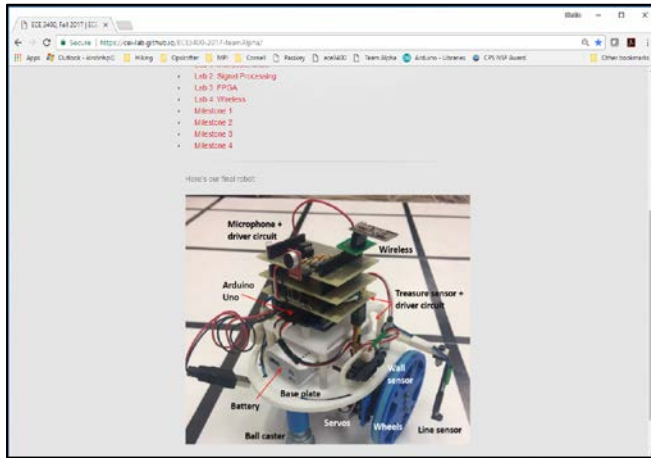
Class website: <https://cei-lab.github.io/ece3400-2018/>
Piazza: <https://piazza.com/cornell/fall2018/ece3400/home>



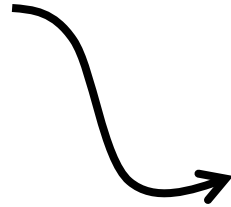
Course material

Class website: <https://cei-lab.github.io/ece3400-2018/>

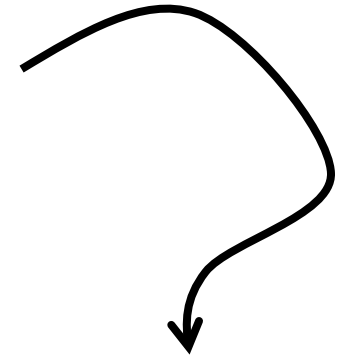
Piazza: <https://piazza.com/cornell/fall2018/ece3400/home>



ECE 3400 2016



ECE 3400 2017



- Robotics is a field in rapid flux
- Starting from scratch is not realistic
*always cite your source!
- Critical reading, inspiration and innovation



ECE 3400 2018

What's new??

- New lectures
- New course material
- New competition

Class website: <https://cei-lab.github.io/ece3400-2018/>
Piazza: <https://piazza.com/cornell/fall2018/ece3400/home>

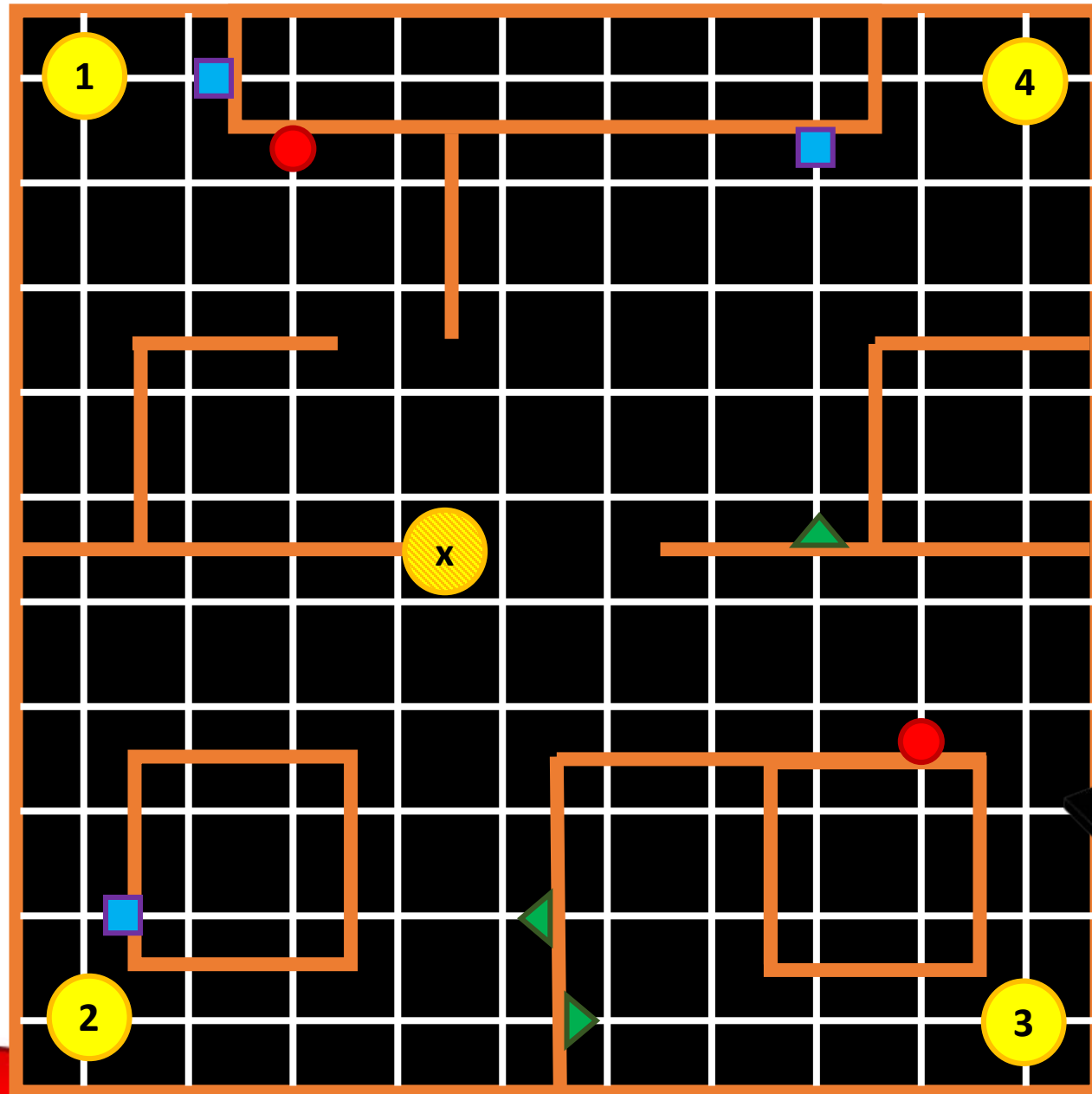


Semester Project

5 minutes, 2 rounds + finale

- Coverage: 15 pts
- Offense: -5 pts
- Treasures: [-1:3] pts/treasure
- Per round:
max 20 pts, min 0 pts
- Top 3:
Up to 5 pts
And T-shirts! 😊

...from 5-6 people to 4-5 people



What's new??

- New lectures
- New course material
- New competition
- New labs

Class website: <https://cei-lab.github.io/ece3400-2018/>
Piazza: <https://piazza.com/cornell/fall2018/ece3400/home>



Semester Schedule

- Lectures (UH142)
- Labs (PH427)
- Skunkworks (PH414)
- [Lab schedule](#)

...be on time!

Week	Topic	Week	Topic
1	Intro	9	Prototyping <i>LAB 4</i>
2	Embedded programming, team work/time management, <i>LAB 1</i>	10	Conflict resolution and algorithms
3	Online communication	11	Algorithms, <i>Milestone 3</i>
4	Sensors and filters <i>Milestone 1</i>	12	Evaluating and debugging IPS
5	Actuators and control, <i>LAB 2</i>	13	(EE-)Power and Careers, <i>Milestone 4</i>
6	Wired/wireless communication	14	Alternative approaches to IPS
7	FPGA/Vision, <i>LAB 3</i>	15	IPS Ethics
8	Prototyping, <i>Milestone 2</i>	16	Final Competition

What's new??

- New lectures
- New course material
- New competition
- New labs
- New TAs

Class website: <https://cei-lab.github.io/ece3400-2018/>
Piazza: <https://piazza.com/cornell/fall2018/ece3400/home>



Teaching Assistants

Class website: <https://cei-lab.github.io/ece3400-2018/>
Piazza: <https://piazza.com/cornell/fall2018/ece3400/home>

Mon 1.25-4.25pm



Mon 7.30-10.30pm



Wed 7.30-10.30pm



Thur 7.30-10.30pm



Fri 1.25-4.25pm



What's new??

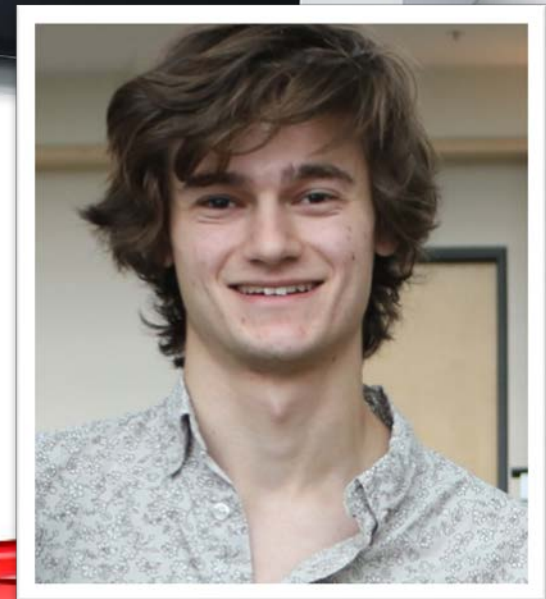
- New lectures
- New course material
- New competition
- New labs
- New TAs
- New equipment

Class website: <https://cei-lab.github.io/ece3400-2018/>
Piazza: <https://piazza.com/cornell/fall2018/ece3400/home>



SkunkWorks

Class website: <https://cei-lab.github.io/ece3400-2018/>
Piazza: <https://piazza.com/cornell/fall2018/ece3400/home>



What's new??

- New lectures
- New course material
- New competition
- New labs
- New TAs
- New equipment
- Team meetings every Friday
- Please give feedback

Class website: <https://cei-lab.github.io/ece3400-2018/>
Piazza: <https://piazza.com/cornell/fall2018/ece3400/home>



Grading

Class website: <https://cei-lab.github.io/ece3400-2018/>

Piazza: <https://piazza.com/cornell/fall2018/ece3400/home>

- Each of the 4 labs + write-ups count up to 20 points
- Each of the 4 milestones + write-ups count up to 10 points
- The final competition gives up to 25 points
- The final robot design gives up to 25 points
- The final webpage gives up to 15 points
- Team work assessments give up to 15 points
- Make tutorials for extra credits

Score	200-155	154-110	109-65	64-20	19-0
Grade	A	B	C	D	F

**Subject to rescaling without warning!*

Google Form

- Deadline:
Saturday
@midnight

The screenshot shows a web browser window with a single tab titled 'ECE 3400 Info for Team C...'. The address bar shows a secure connection to a Google Forms URL. The browser's bookmark bar includes 'Apps', 'MPI', 'Cornell', 'Passkey', 'ECE 3400-2017', 'Team Alpha', 'Piazza', 'CPS NSF Award', and 'Other bookmarks'. The form itself has a purple header and a white content area. The title is 'ECE 3400 Info for Team Composition'. Below the title is a paragraph of text: 'To match up good teams with diverse qualities and skill sets we need to know more about you. Please answer honestly, these answers will not be shown to your class mates and will in NO WAY affect your grades.' There are two required questions: 'Name *' and 'Cornell netID *'. Each question has a text input field with the placeholder 'Your answer'. A small purple edit icon is in the top right corner of the form area.

ECE 3400 Info for Team Composition

To match up good teams with diverse qualities and skill sets we need to know more about you. Please answer honestly, these answers will not be shown to your class mates and will in NO WAY affect your grades.

* Required

Name *

Your answer

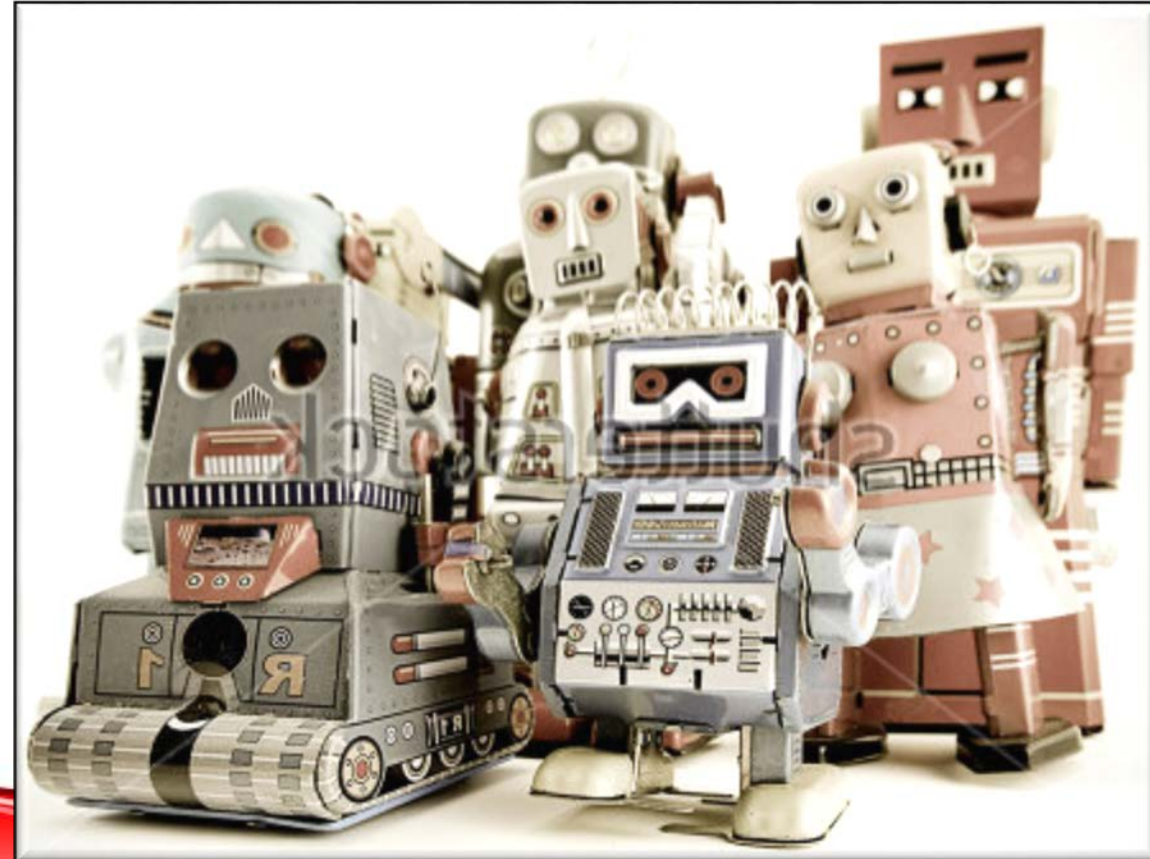
Cornell netID *

Your answer

Team Work

- High-performing teams include members with a balance of skills.
- Optimally designed tasks and processes
- Norms
 - Discourage destructive behavior
 - Promote positive dynamics

...we pick the teams...



Good Team Work

Raymond Meredith Belbin (born 1927): **Belbin Team Inventory**



maximillion.co.uk



Plant

Good Team Work

- Plant
- Monitor-Evaluator
- Specialist

- Coordinator
- Team Worker
- Resource Investigator

- Shaper
- Implementer
- Completer/Finisher

Good Team Work

- Plant
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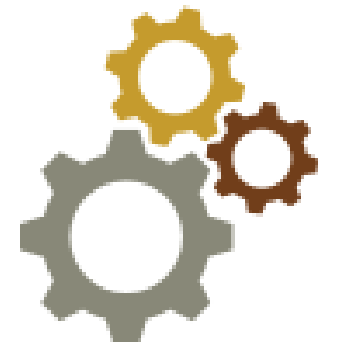
Monitor-Evaluator

Good Team Work

- Plant
- Monitor-Evaluator
- Specialist

- Coordinator
- Team Worker
- Resource Investigator

- Shaper
- Implementer
- Completer/Finisher



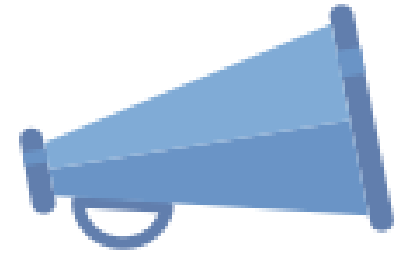
Specialist

Good Team Work

- Plant
- Monitor-Evaluator
- Specialist

- **Coordinator**
- Team Worker
- Resource Investigator

- Shaper
- Implementer
- Completer/Finisher



Coordinator

Good Team Work

- Plant
- Monitor-Evaluator
- Specialist

- Coordinator
- **Team Worker**
- Resource Investigator

- Shaper
- Implementer
- Completer/Finisher



Team Worker

Good Team Work

- Plant
- Monitor-Evaluator
- Specialist

- Coordinator
- Team Worker
- Resource Investigator

- Shaper
- Implementer
- Completer/Finisher



**Resource
Investigator**

Good Team Work

- Plant
- Monitor-Evaluator
- Specialist

- Coordinator
- Team Worker
- Resource Investigator

- **Shaper**
- Implementer
- Completer/Finisher

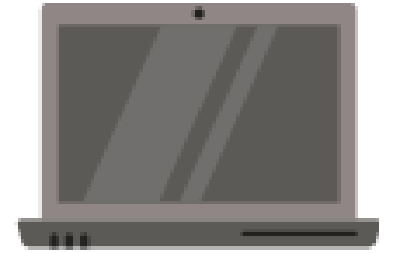


Good Team Work

- Plant
- Monitor-Evaluator
- Specialist

- Coordinator
- Team Worker
- Resource Investigator

- Shaper
- **Implementer**
- Completer/Finisher



Implementer

Good Team Work

- Plant
- Monitor-Evaluator
- Specialist

- Coordinator
- Team Worker
- Resource Investigator

- Shaper
- Implementer
- Completer/Finisher



Completer-Finisher

Good Team Work

Raymond Meredith Belbin (born 1927): **Belbin Team Inventory**

Place Kirstin!



maximillion.co.uk

Good Team Work

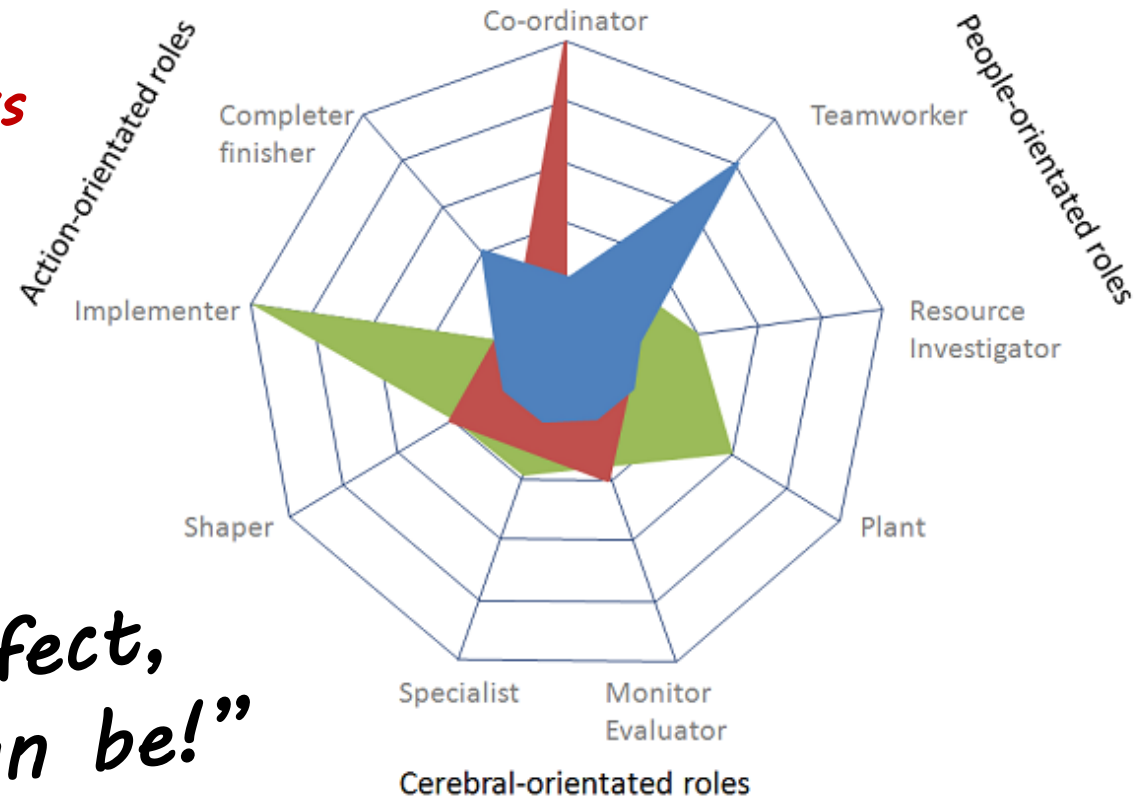
- Plant
- Monitor-Evaluator
- Specialist

- Coordinator
- Team Worker
- Resource Investigator

- Shaper
- Implementer
- Completer/Finisher

What are the risks of this team?

“Nobody’s perfect, but a team can be!”



- Mixed teams perform better
- Work on your own weaknesses
- Know the weaknesses of your team
- Use your strengths

Intelligent Physical Systems @Cornell



Robotics at Cornell

Home

News

Robotics Seminar

Courses

Faculty

- Robotics mailing list:
ROBOTICS-L@list.cornell.edu
- Robotics Seminar (1 credit):
Tuesdays at 2:55-4:10pm, Upson 106



Go Build Robots!



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Piazza: <https://piazza.com/cornell/fall2018/ece3400/home>