Safe Autonomy

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Why Safe Autonomy?

Student Introductions

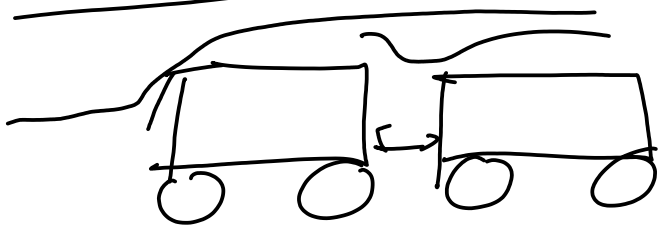
- Smiti: MS student. ML,
- Kevin. MS Vision & Learning, some robotics.
- Martin: BS. Formal methods. Control.
- Austin: MS. NNs, Robotics.

What is Safe Autonomy?

⊗ Autonomy is not ML.

⊗ Autonomy
- By "itself"
- Making decisions
- Goals?
- Constraints (time, schedule
- Rules, planning, resources)
- "Efficiency" AVs.

Tracks: Engineer: 0.2%



5%

⊖ Dynamic Environment.

Safe Autonomy: Performing "autonomous" activities while satisfying "safety" specifications.

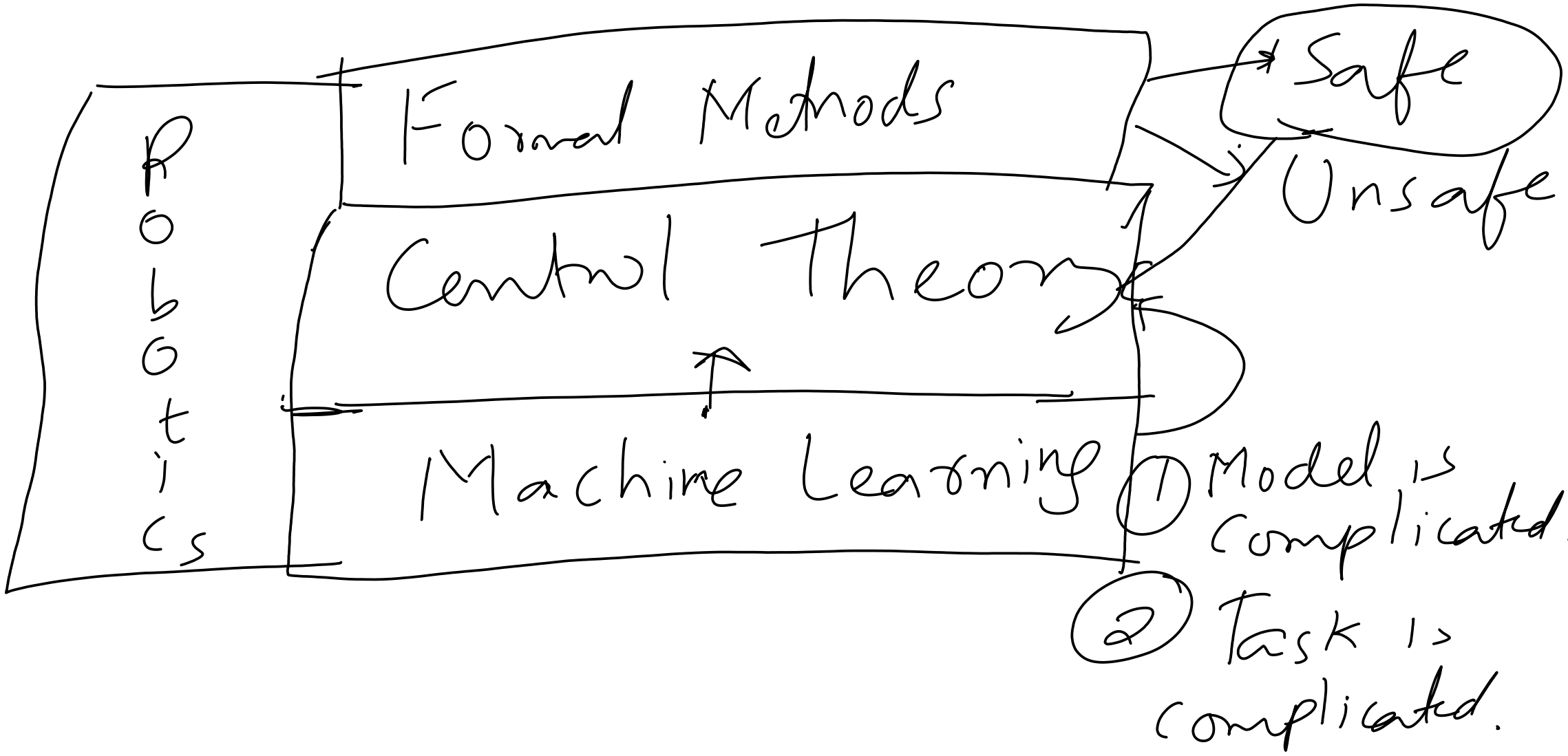
GCAS: Rescue pilot in case of emergency.

AV: Transport people comfortably.

Drones: Navigate from source to dest. in various environments.

Safe Autonomy

1. Formal Methods: Prove that a system satisfies a spec.
2. Control Theory: Program physical systems to behave according to my "desires"
3. Robotics
4. Machine Learning: Pattern Discovery


Robotics
Formal Methods
Control Theory
Machine Learning
Safe
Unsafe
① Model is complicated.
② Task is complicated.

List of Topics

1. Logic & formal specification
   - First Order logics / Temporal logics — Capture the safety spec.
   - Proving the safety specification

② Control Theory

① What are primary problems → Tracking, Regulation

② What are the main tools

- ⊗ Lyapunov
- ⊗ Optimal
- ⊗ Model Predictive Control
- ⊗ M.L.

⊗ Proving safety spec of Controls.

③ Robotics : Planning : Safe planning

④ M.L : Basics, R.L.,

(*) Techniques for proving safety of systems with ML components.

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① Suggest Papers : Go through it, 2 weeks

② Git ids.

Logistics

(x) Class & Project

Class
↓
Participate
- Give written reviews
- Presenting papers

Project
↓
2 projects
1 project

Basics
4-5 weeks
Course project
Every week for 15-30 min
3 weeks: Proj def
End: Project Report.