

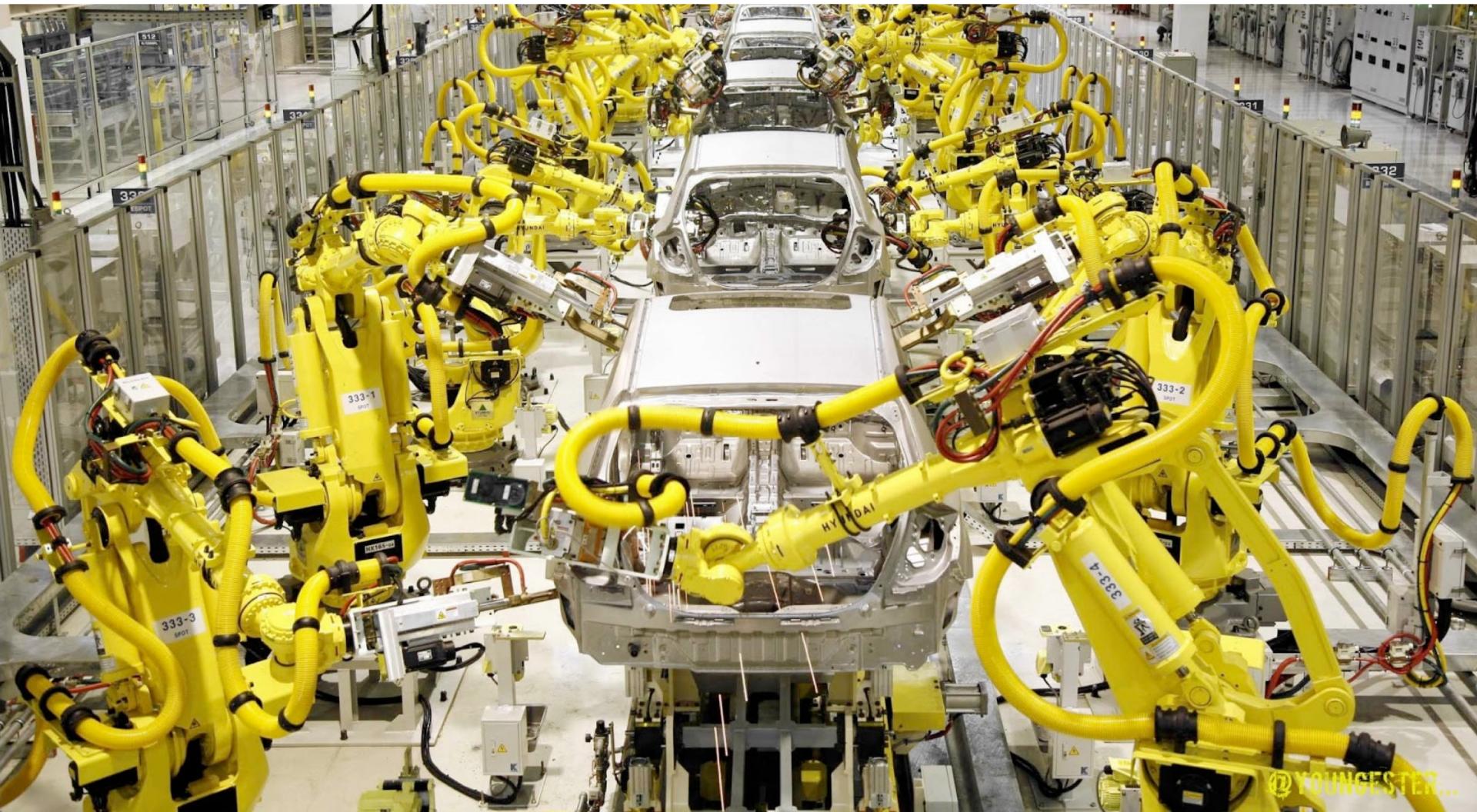
Robots and Jobs

CPSC 470 – Artificial Intelligence
Brian Scassellati

Manufacturing and Assembly

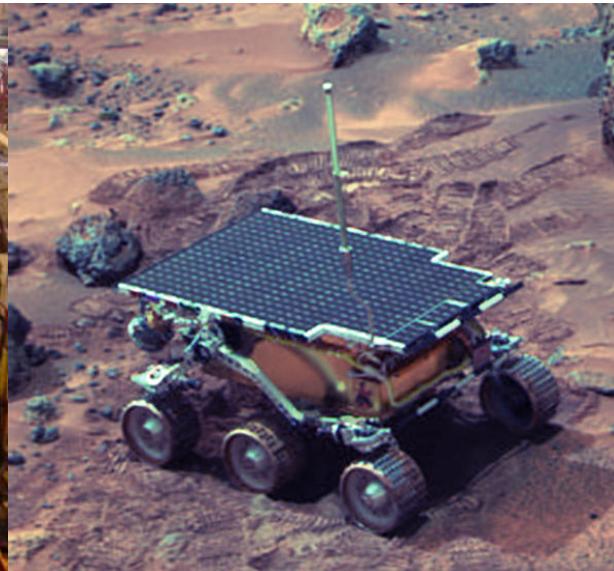


Traditional Manufacturing

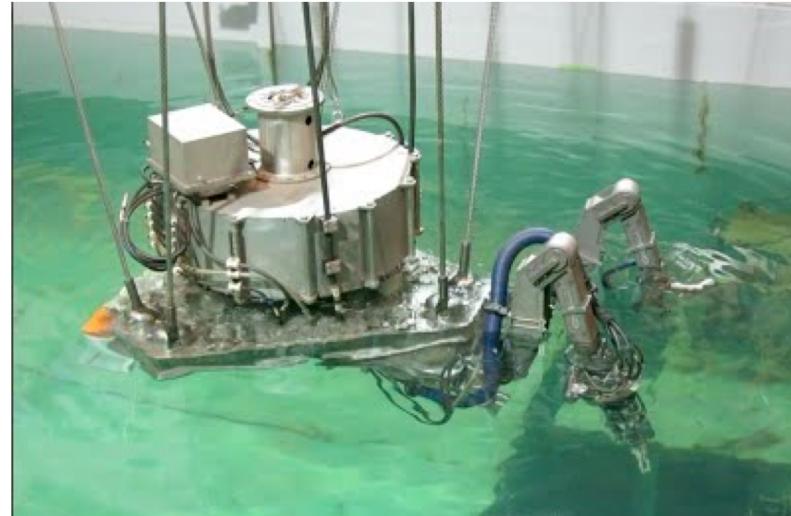


@YOUNGESTER...

Dirty, Dull and Dangerous Jobs



Robots in Dangerous Areas



Robots used for:

- Search and Rescue (above) at WTC collapse
- Investigation of the Fukushima disaster (left)

Fears of Job Loss

Unsettling New Statistics Reveal Just How Quickly
Robots Can Replace Human Workers

They're coming.

MIKE MCRAE 31 MAR 2017



The robots are coming – for as many as
800 million jobs



Will robots take your job? Humans ignore
the coming AI revolution at their peril.

Robots: Is your job at risk?

by Matt McFarland @mattmcfarland

🕒 September 15, 2017: 12:49 PM ET



Automation could kill 73 million U.S. jobs by 2030

Paul Davidson, USA TODAY

Published 7:00 p.m. ET Nov. 28, 2017 | Updated 8:39 p.m. ET Nov. 28, 2017

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01.19.17 | ROBOT REVOLUTION

Bet You Didn't See This Coming: 10 Jobs That Will Be Replaced By Robots

Harvard
Business
Review

ECONOMY

The Question with AI Isn't Whether We'll Lose Our Jobs — It's How Much We'll Get Paid

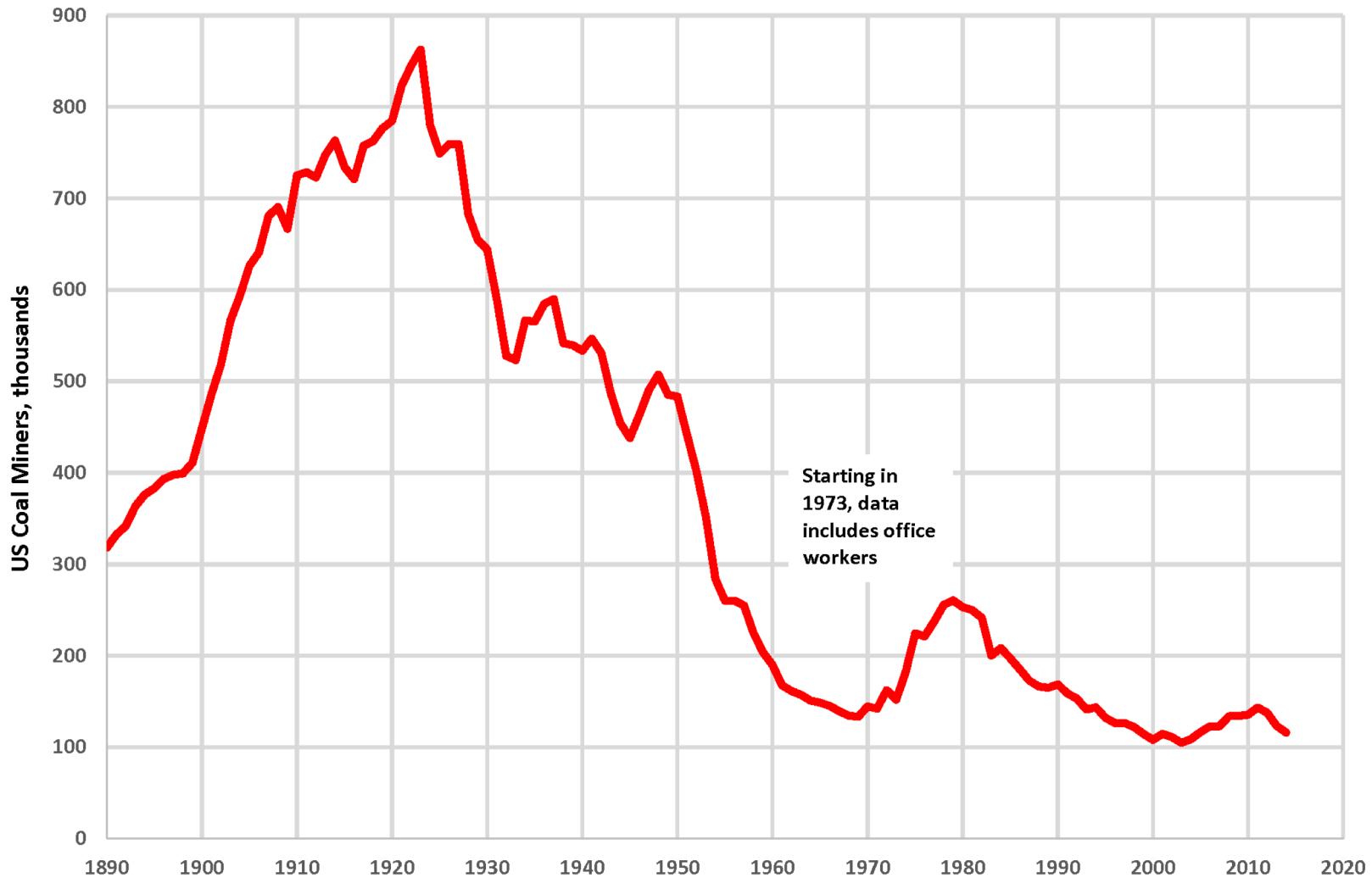
Will Robots Take My Job

<https://willrobotstakemyjob.com/>

Jobs are Changing



Coal Mining Jobs in the US



Data from St. Louis Federal Reserve Board

Collaborative Manufacturing

(Transforming Large Enterprise Manufacturing)



Coordinated Manufacturing

(Optimizing Large Enterprise Manufacturing)



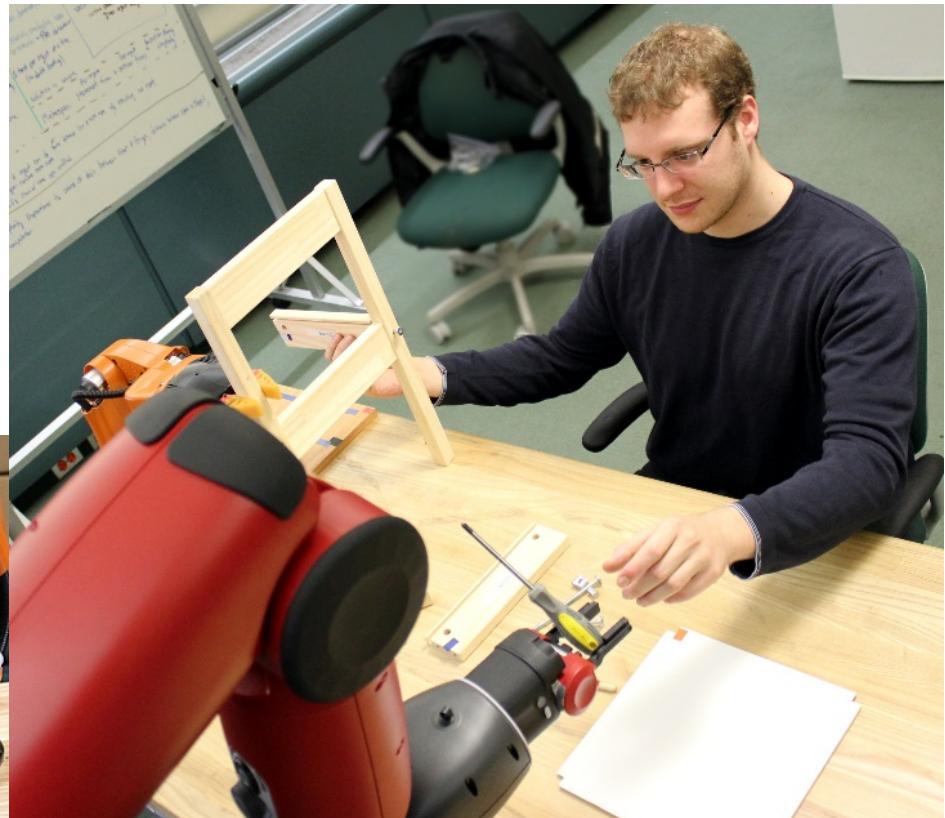
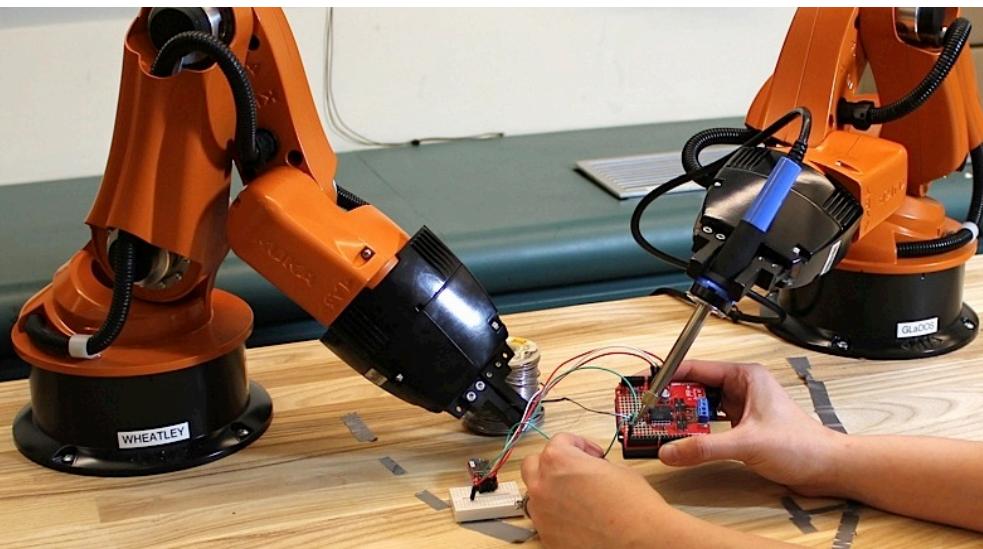
SME Manufacturing

(Making local production cost-effective)



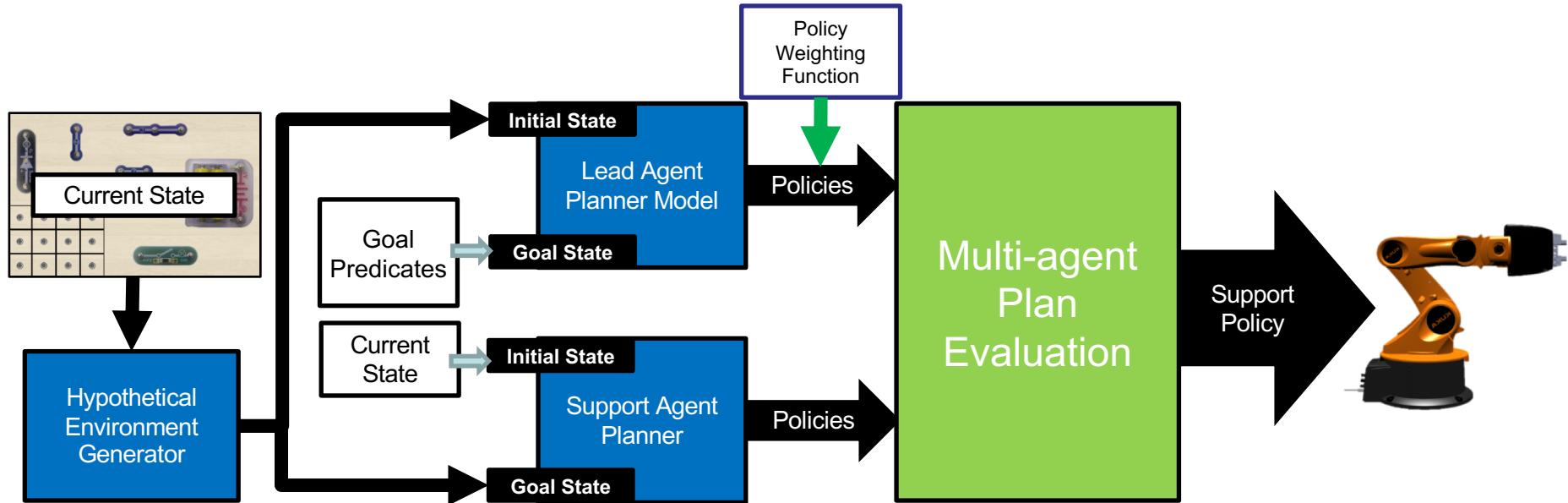
Enabling Technologies for Collaborative Manufacturing

- Learning from Demonstration
- Compliant Actuation
- Activity Recognition
- Intention Detection
- Coordinated Task and Motion Planning



Future Manufacturing

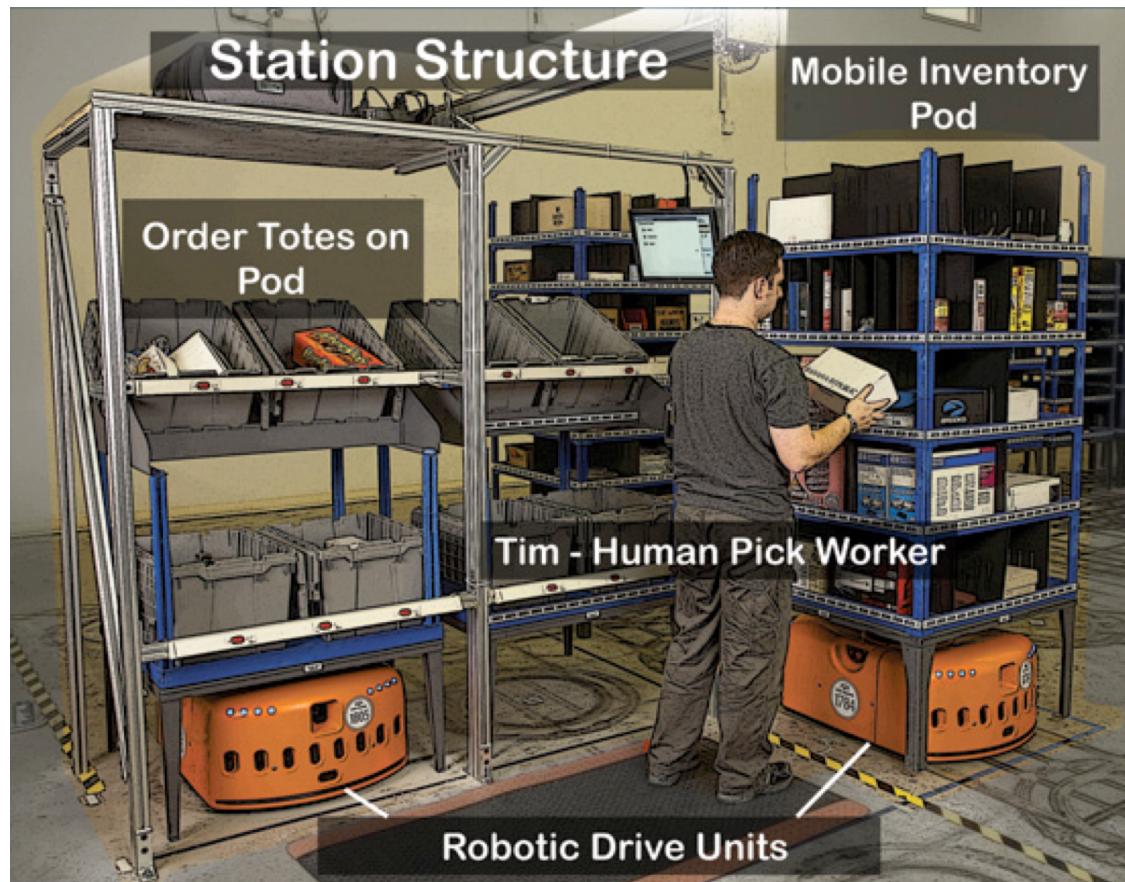
Learning Individual Preferences



- Predict lead agent behavior using a user model
- Hypothesize future world states based on their plans
- Plan supportive actions that would simplify achieving this world state (or prevent sub-optimal plans)

Warehousing and Distribution: Kiva Robotics

- Inventory Management
- Shift from moving humans to moving stock
- External motion planning system
- 1000-3000 lb lift
- 1.3 meters/second
- Sold to Amazon for \$775M



Kiva (now Amazon Robotics)



<https://www.youtube.com/watch?v=cLVCGEmkJs0>

Amazon Picking Challenge



- Allowed to create novel hardware
- Challenge areas:
 - Object identification (occlusions, lighting, etc.)
 - Grasp selection (non-rigid objects, planning)
 - Manipulation challenges (uneven weight distributions)

Amazon Robotics Challenge

amazon robotics challenge

Nagoya, Japan, July 2017

Team NimbRo Picking Practice Run



<https://www.youtube.com/watch?v=qDI459EIIBo>

Robot delivery systems



Robomarts



Starship Technologies



Kiwi Robotics

Savioke Delivery Robots



- Constrained environment
- Known map
- Electronic Keys
- Single-trip deliveries
- Customer satisfaction

Savioke Delivery Robots



<https://www.youtube.com/watch?v=AiZj7LTMjzs&t=68s>

Robots in Retail



- Bossa Nova robots scan for
 - Missing prices
 - Incorrect prices
 - Out of stock
- 2-3 mph, 3 trips per day
- Testing in 50 Walmart locations in spring 2018

Discussion Topics

- What jobs are at risk?
- Will jobs change or will they be eliminated?
- Will technology change where and how manufacturing occurs in the US?
- Do we want robots in service jobs?
- What will be the economic drivers for continued automation? When will those end?
- Should we consider taxing robot labor or regulating the number of robot workers?

Administrivia

- Coming up:
 - Monday: Healthcare Robotics
 - Wednesday: AI & Ethics
 - Friday: Course summary and AI predictions
- PS 7 due tonight
- PS 8 out now, due next Friday