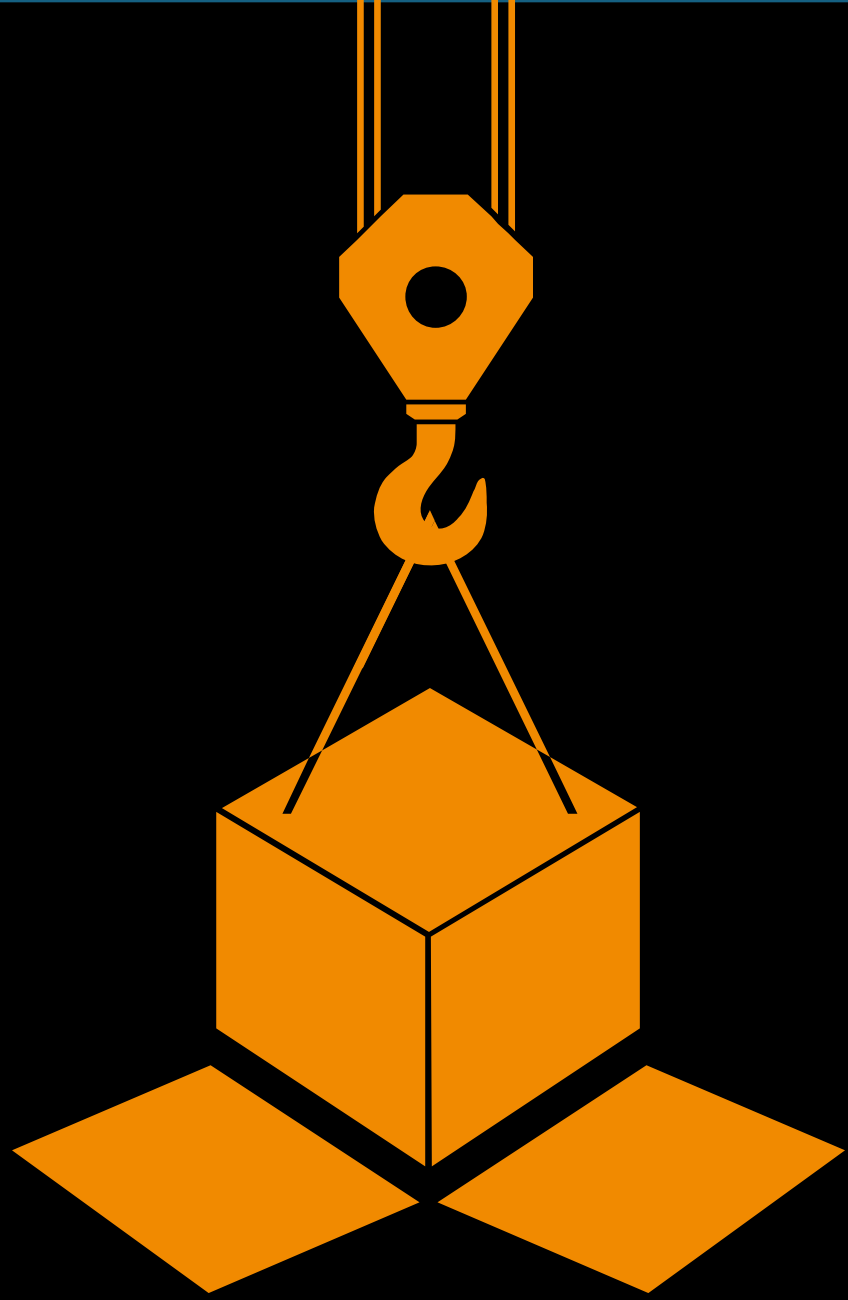
Automation and Robotics

Online Course for AMC Program

Jan-April 2026



About Myself



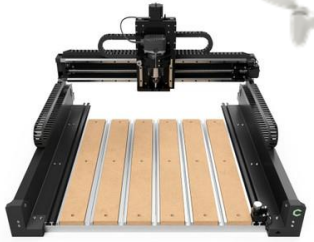
Christopher Rausch
Assistant Professor
The University of Texas at Austin

TEXAS
The University of Texas at Austin

- ~10 years of work experience across construction sectors (oil and gas, transportation, commercial, hospitality and residential, modular construction)
- Research focus: intersection of industrialization and the circular economy
- Director, Enabling Technologies for Housing Innovation Center (ETHIC)
- Director, Digital Harvest Lab (UT Austin)









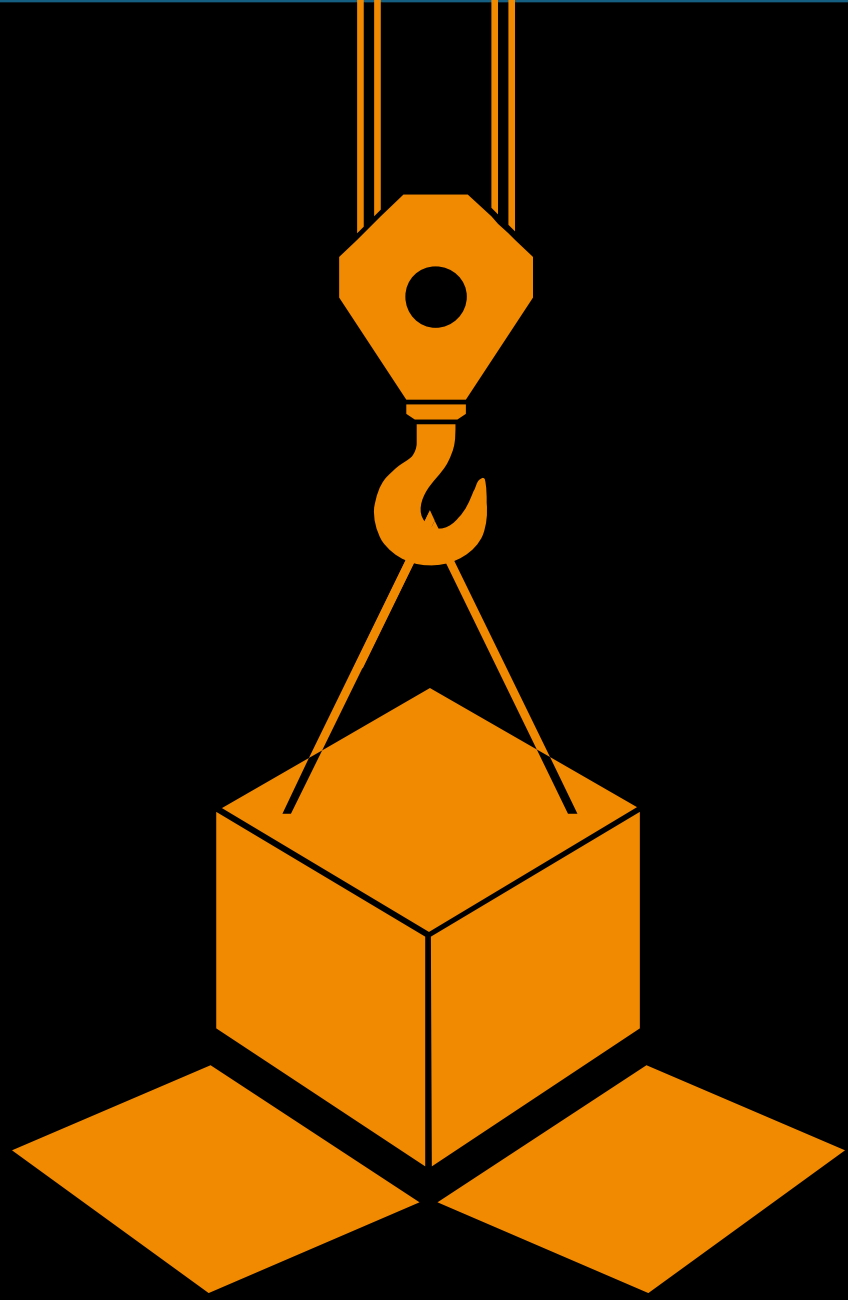




DH | Digital Harvest Lab

"Why is this course important? Why now?"

- **Labour**
- **Productivity**
- **Cost**
- **Safety**



Why is this course important? Why now?

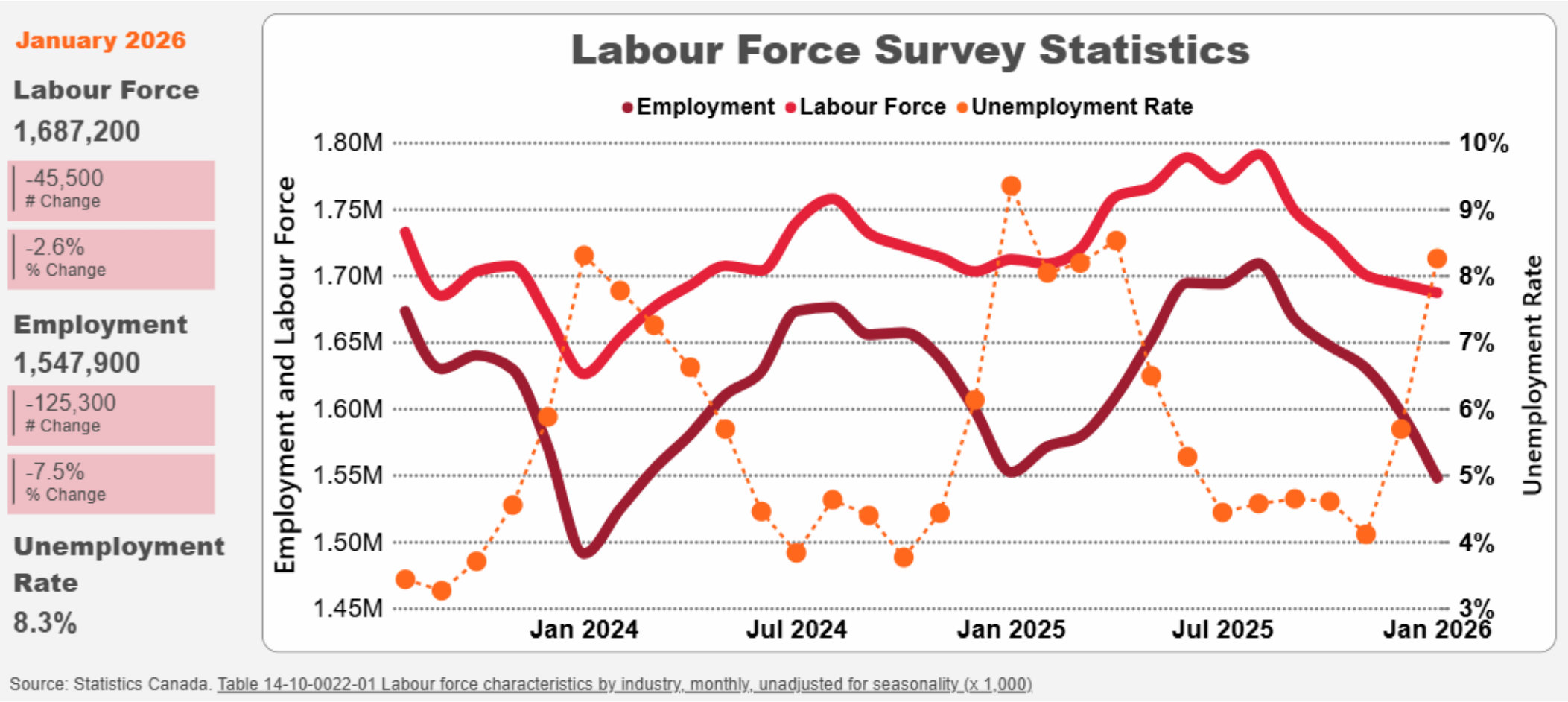
Labour Market in Canada

- 300,000+ skilled trades shortfall predicted by 2030 (BuildForce Canada)
- 260,000 workers expected to retire between 2020-2030
  - Overall construction labour market = 1.5M
  - Retiring rate ~ 17% over next decade!



Why is this course important? Why now?

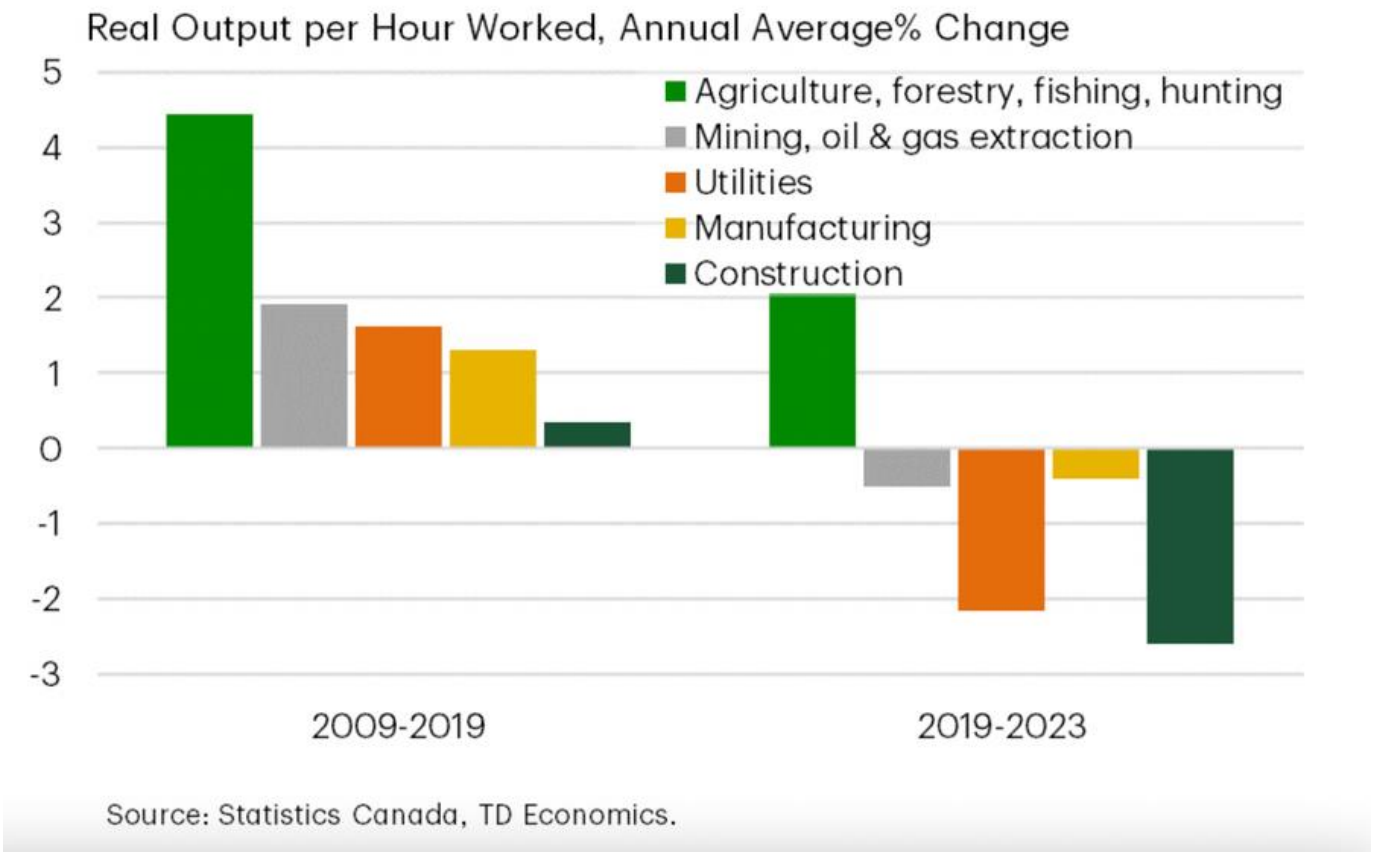
Labour Market in Canada



Source: Statistics Canada. Table 14-10-0022-01 Labour force characteristics by industry, monthly, unadjusted for seasonality (x 1,000)

Why is this course important? Why now?

Industrial Productivity



Why is this course important? Why now?

Industrial Productivity

Chart 8. Productivity for Highway, Street, and Bridge Construction, 2002-24

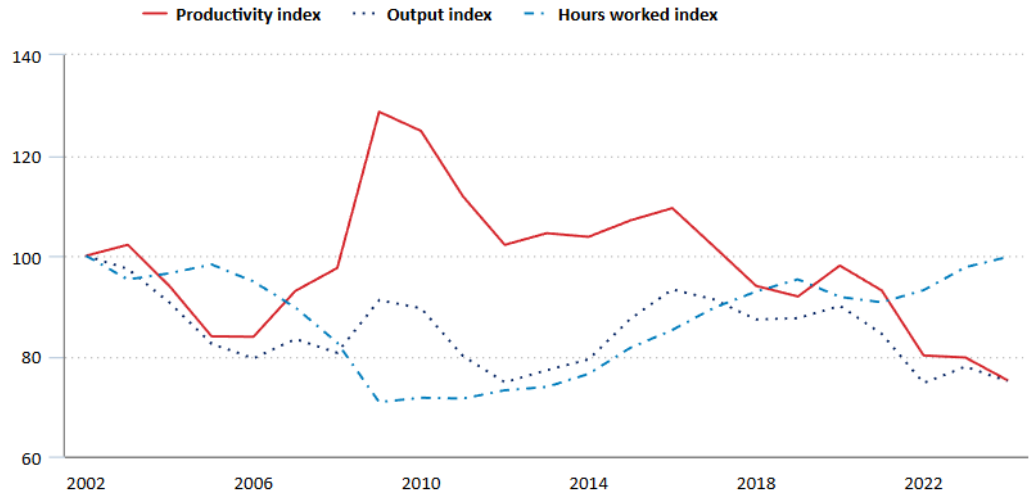


Chart 7. Productivity for Industrial Building Construction, 2006-24

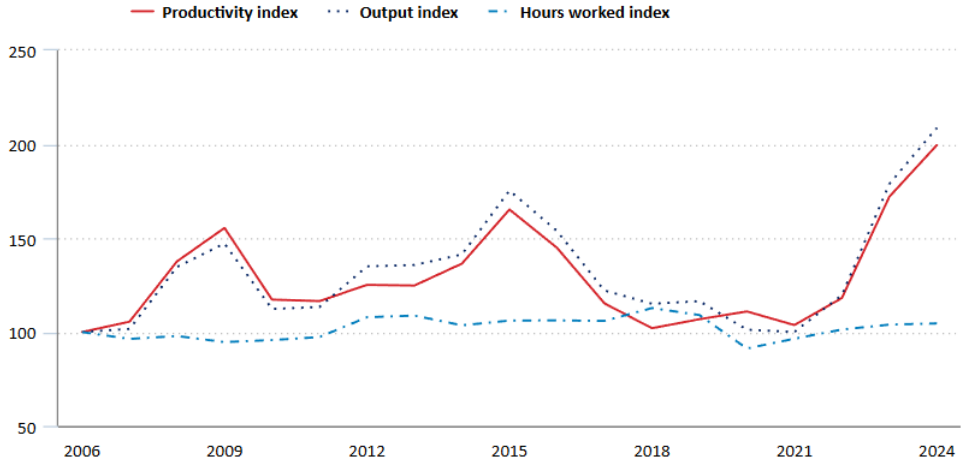
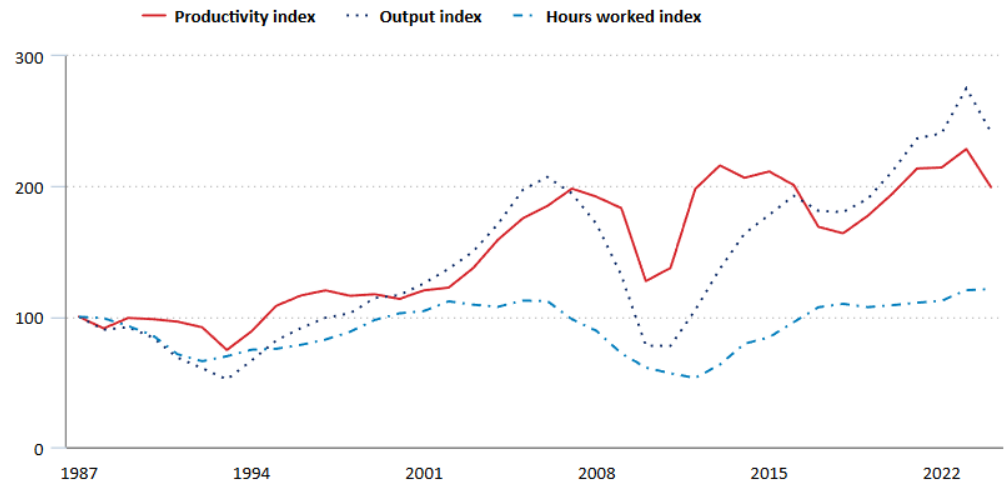


Chart 6. Productivity for Multiple-Family Residential Construction, 1987-2024



https://www.bls.gov/productivity/highlights/construction-labor-productivity.htm

Why is this course important? Why now?

Rising Costs

38%

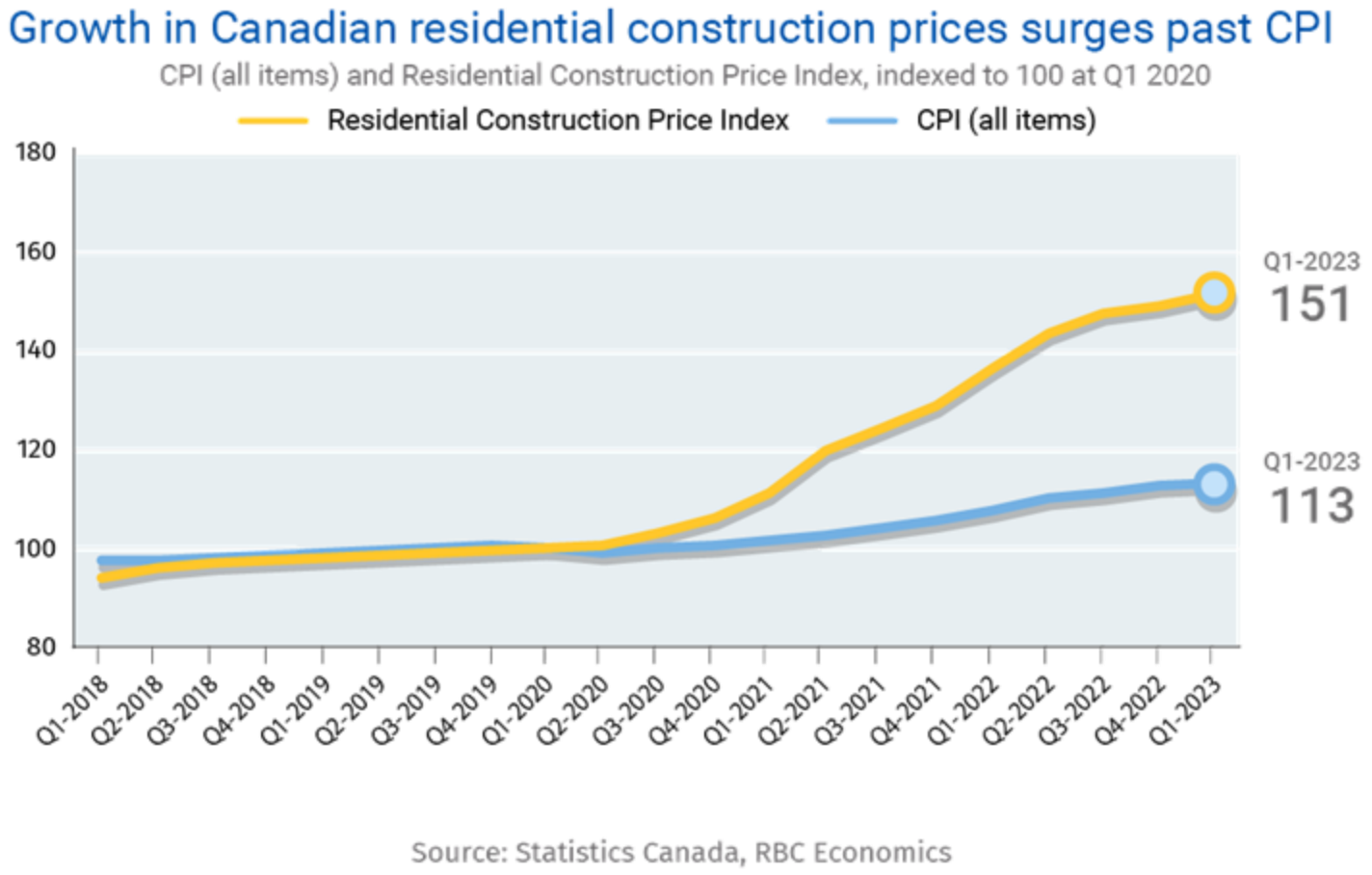
Average cost overrun on Canadian major projects (2023 KPMG)

$52B

Estimated annual rework cost to Canadian construction industry

18%

Labour cost inflation in Canada 2021–2024 (StatsCan)





$1,000

Phone



$1,000

Door

Why is this course important? Why now?

Safety

235

Canadian construction fatalities annually (AWCBC avg.)

1 in 4

Workplace fatalities in Canada occur in construction

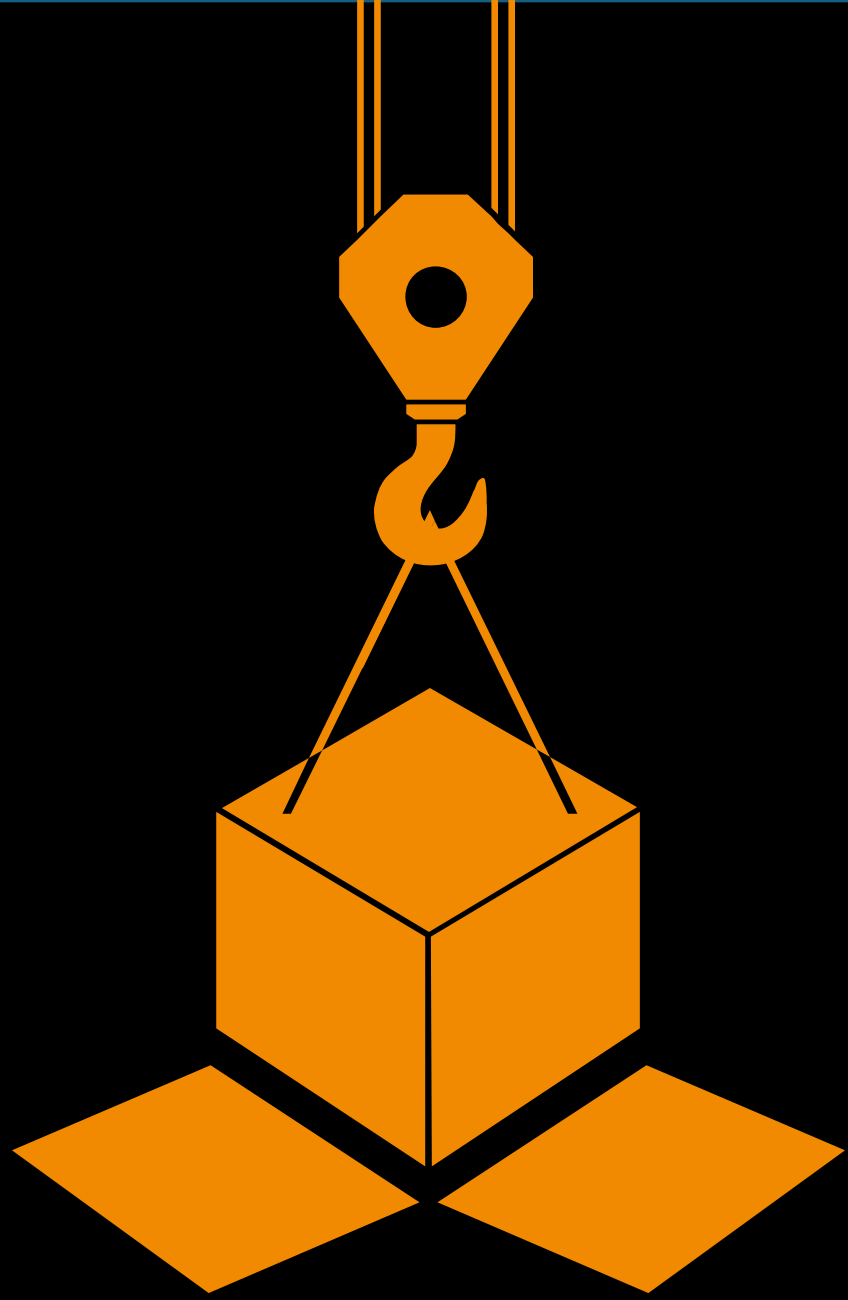
~3%

of project costs are budgeted for injuries

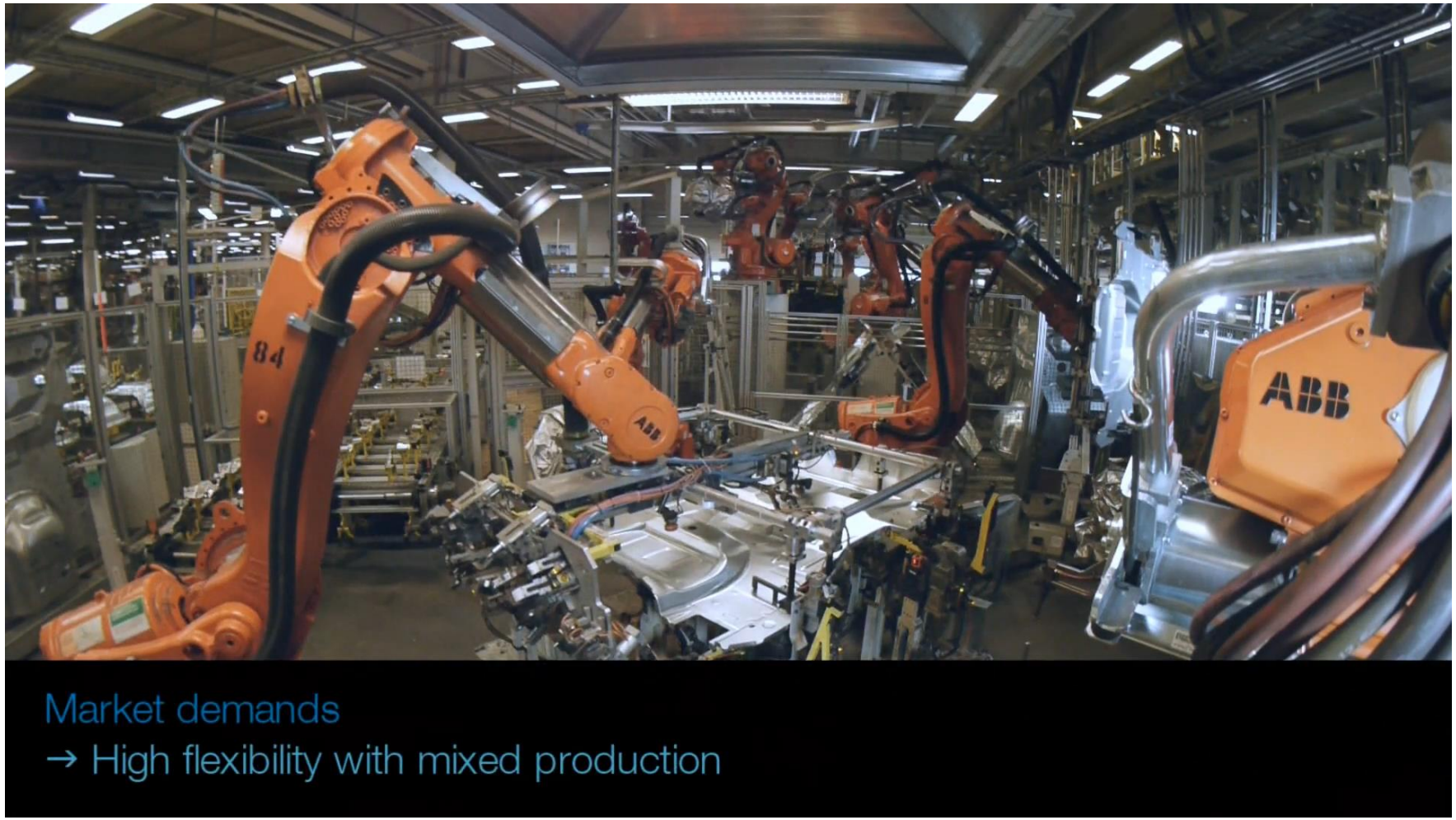


“How can Automation and Robotics Help?”

- **Labour** ↑
- **Productivity** ↑
- **Cost** ↓
- **Safety** ↑

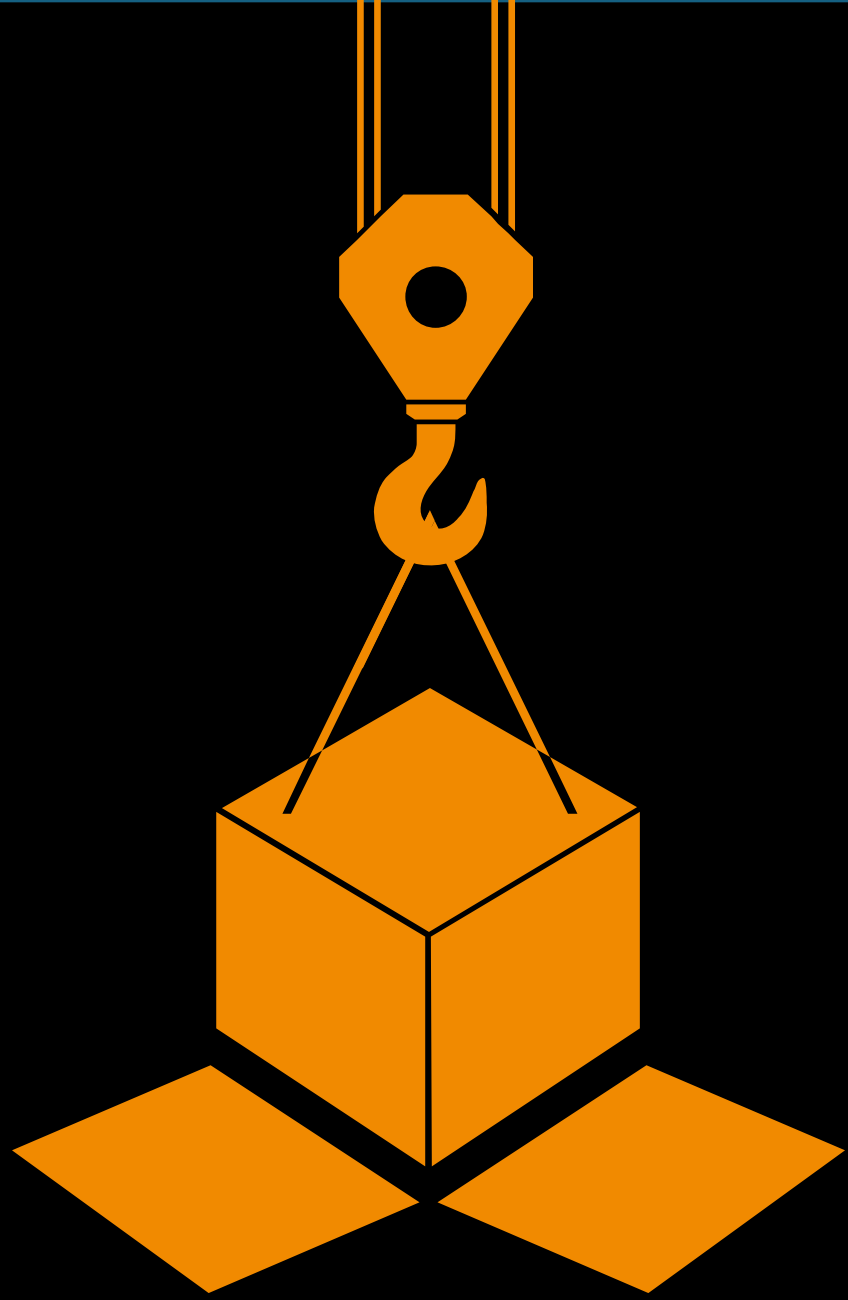


Automation & Robotics in Manufacturing



https://youtu.be/ArxzMqf3aZg

Course Outline



Description & Objectives

- Explore the role of automation for industrializing construction, including its feasibility and impact on construction projects.
- Identify opportunities to implement emerging automation technologies while prioritizing safety, productivity, cost and quality.
- Understand the role of DfMA principles to support the automation of offsite manufacturing for components.



https://www.ecohome.net/en/guides/3773/the-construction-of-mid-rise-residential-buildings-in-canada-wood-v-concrete/

Course Structure & Deliverables

- Online delivery (Spring 2026, 13 teaching weeks)
- Structure:

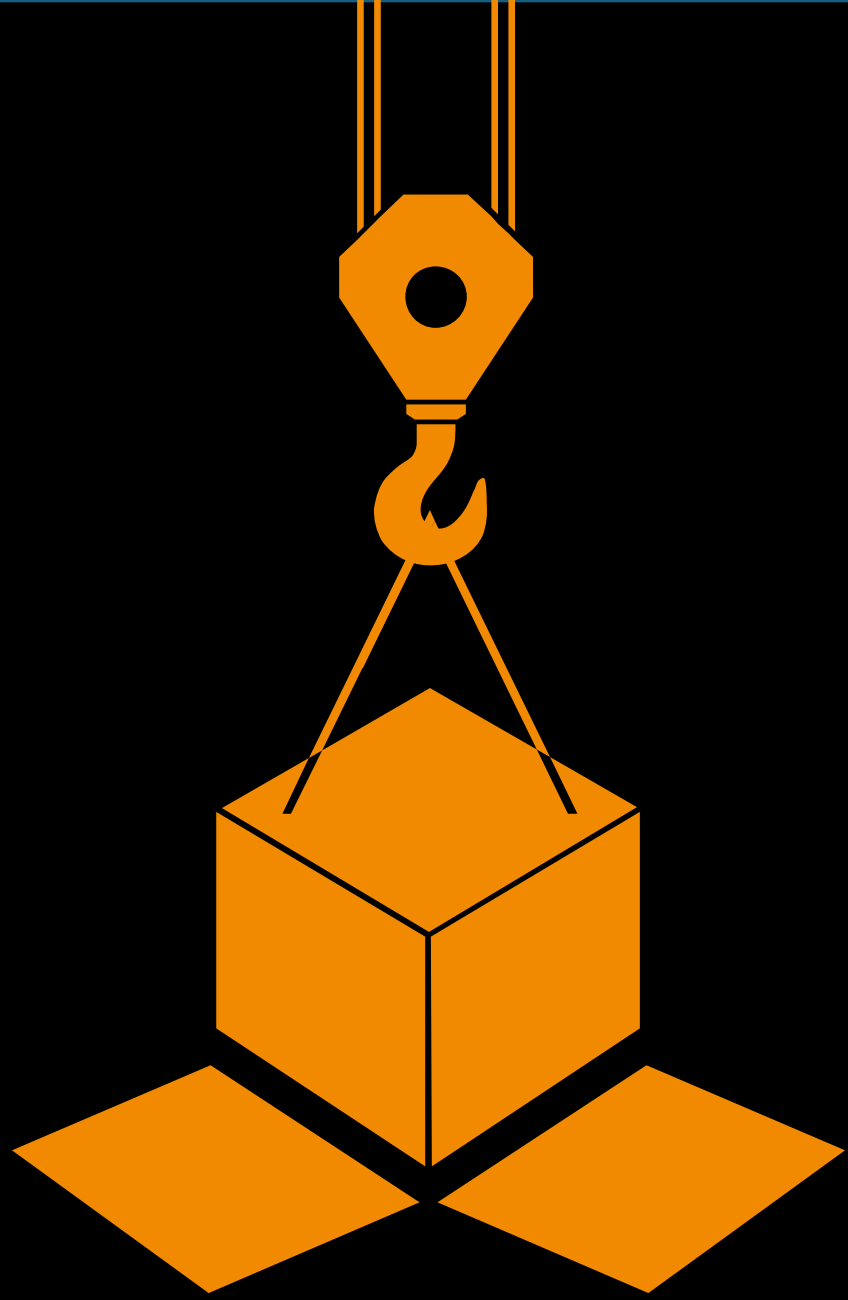


Course Project

Develop a Consultant's Playbook to guide an automation engagement for a Canadian construction company.

Diagnose › Select › Implement › Handover

Module 1: Foundations



Historical Progression of Automation and Robotics

1

Pre-Modern
~1850–1945

Steam power, cast iron, early cranes. Craft methods persist; machines augment rather than replace.

2

Industrial Mechanization
1945–1970s

Post-war reconstruction drives heavy equipment. Tower cranes, concrete pumps, backhoes become standard.

3

First Robotics Wave
1980s–1990s

Japan leads R&D into site robots. Academic field emerges. IAARC founded 1988. Ambition exceeds deployment.

4

Digital Integration
2000s–2010s

BIM, laser scanning, GPS machine control. Sensing and modeling mature. Automation remains task-specific.

5

Intelligent Jobsite
2015–present

AI, autonomous platforms, additive manufacturing. Commercial products emerge. Field undergoing genuine industrial transition.

Historical Progression of Automation and Robotics

1	2	3	4	5
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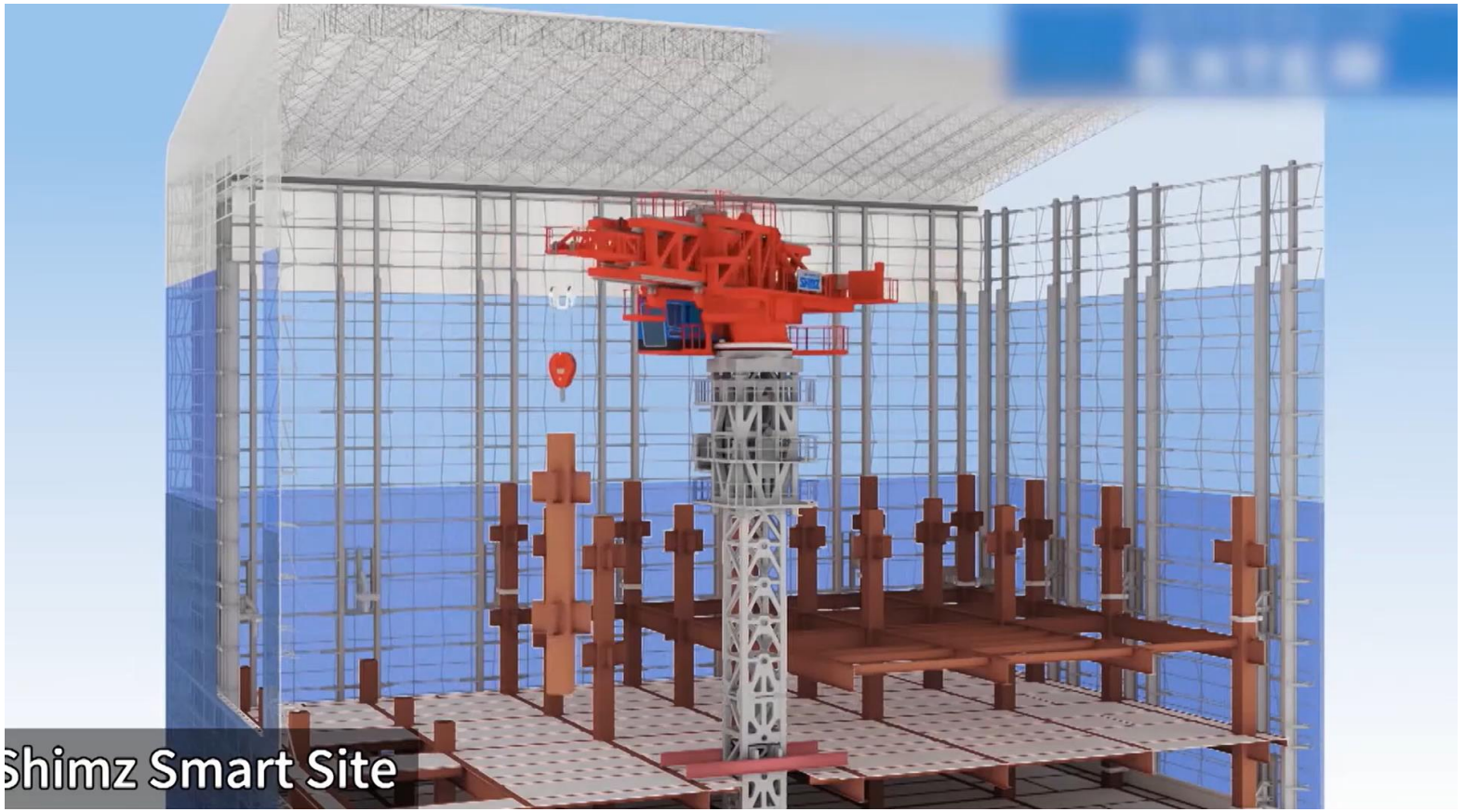

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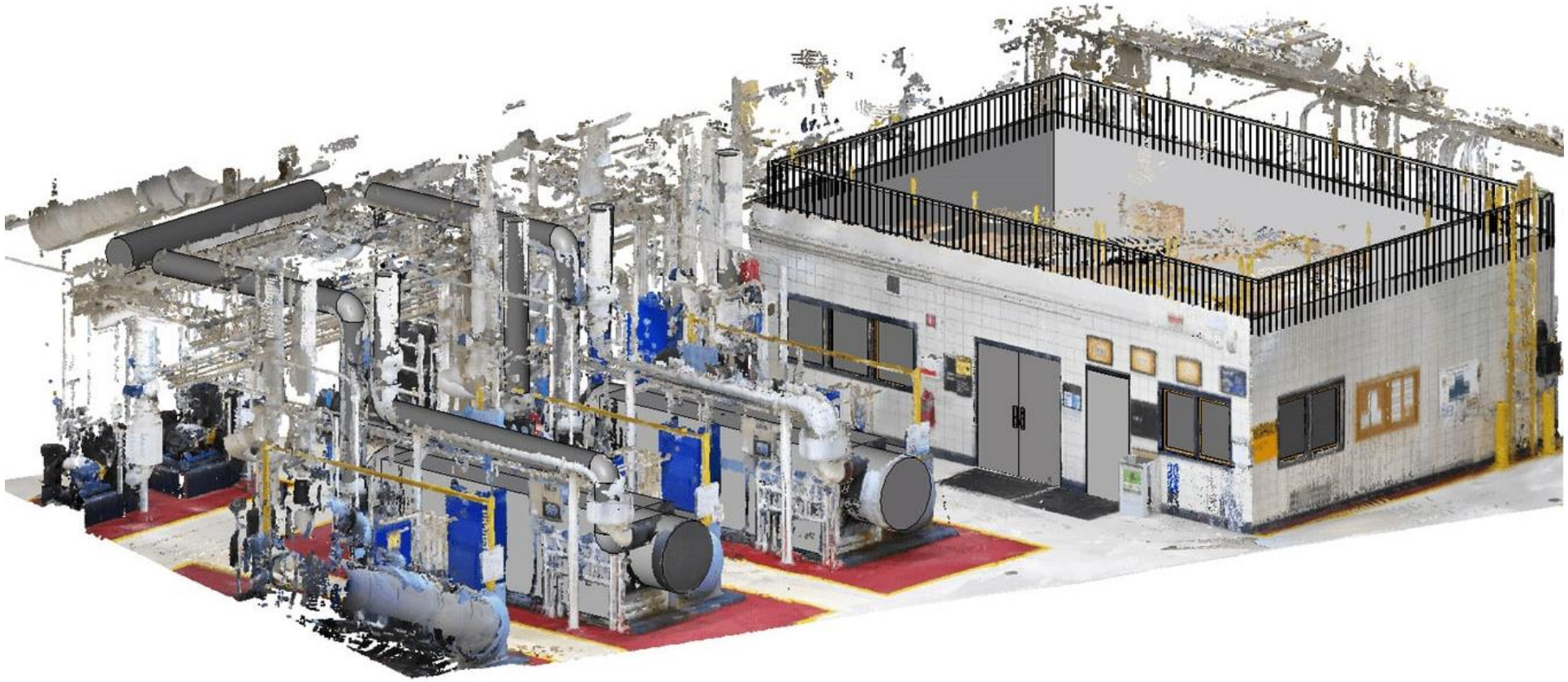

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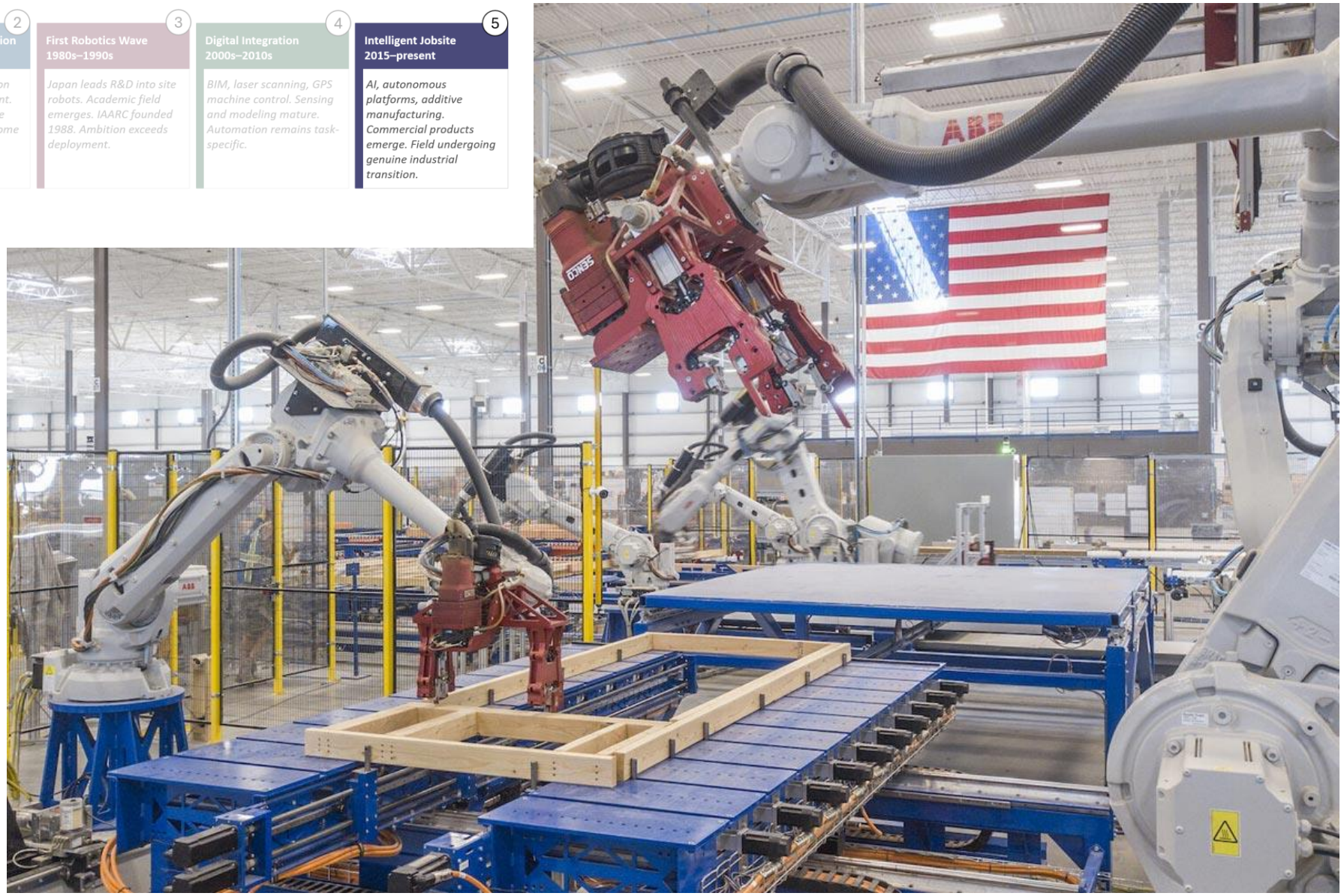
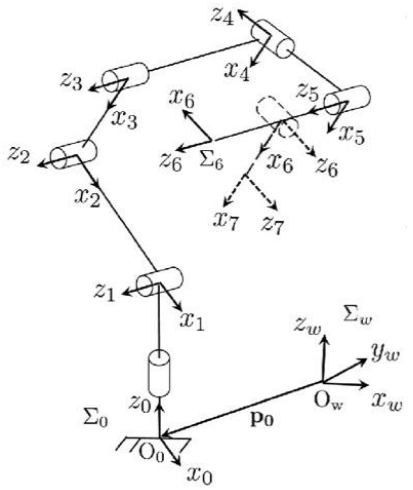


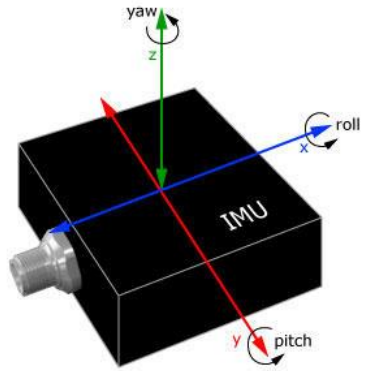
Robotics Concepts

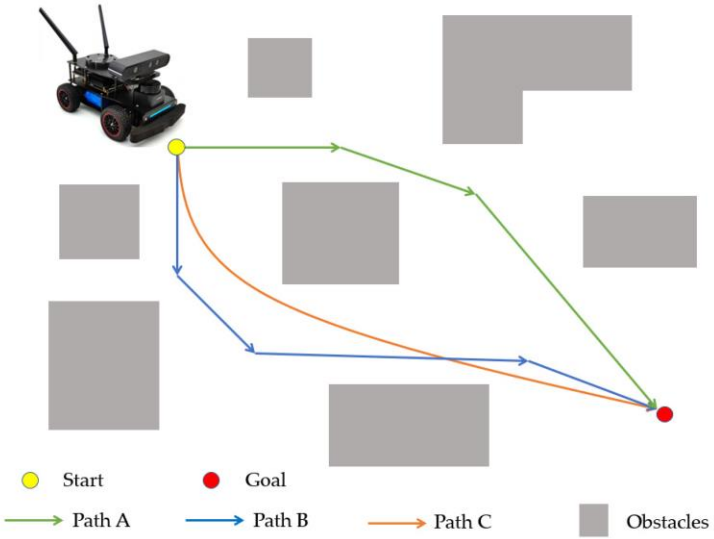
- Kinematics
- Sensors and perception
- Robot control
- Path planning
- Computer vision

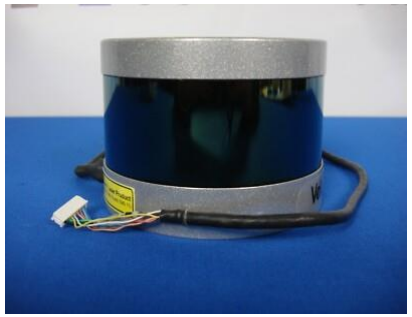


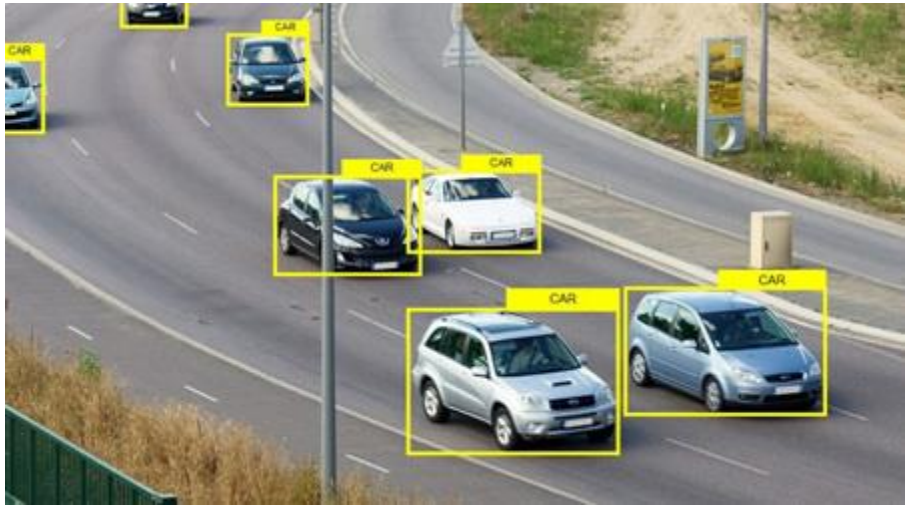




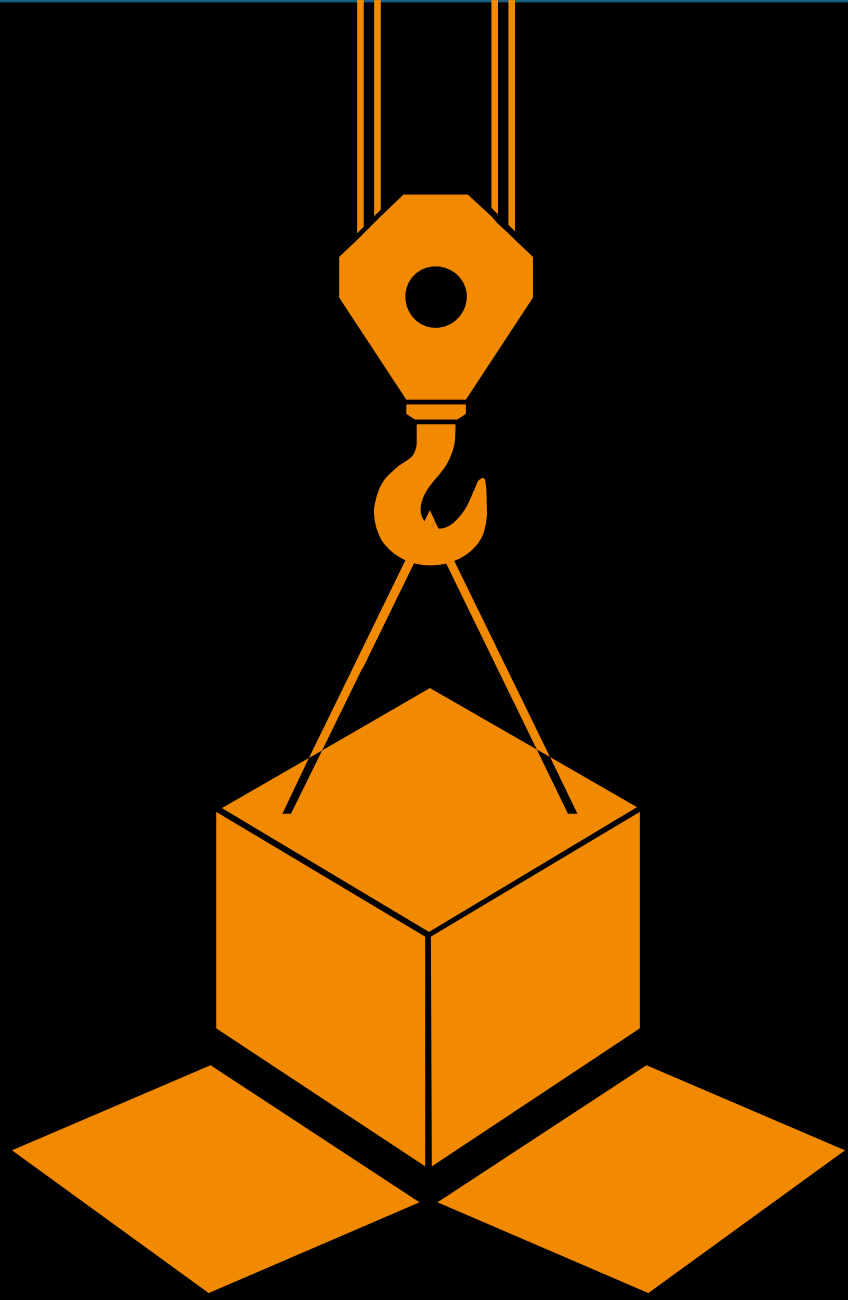




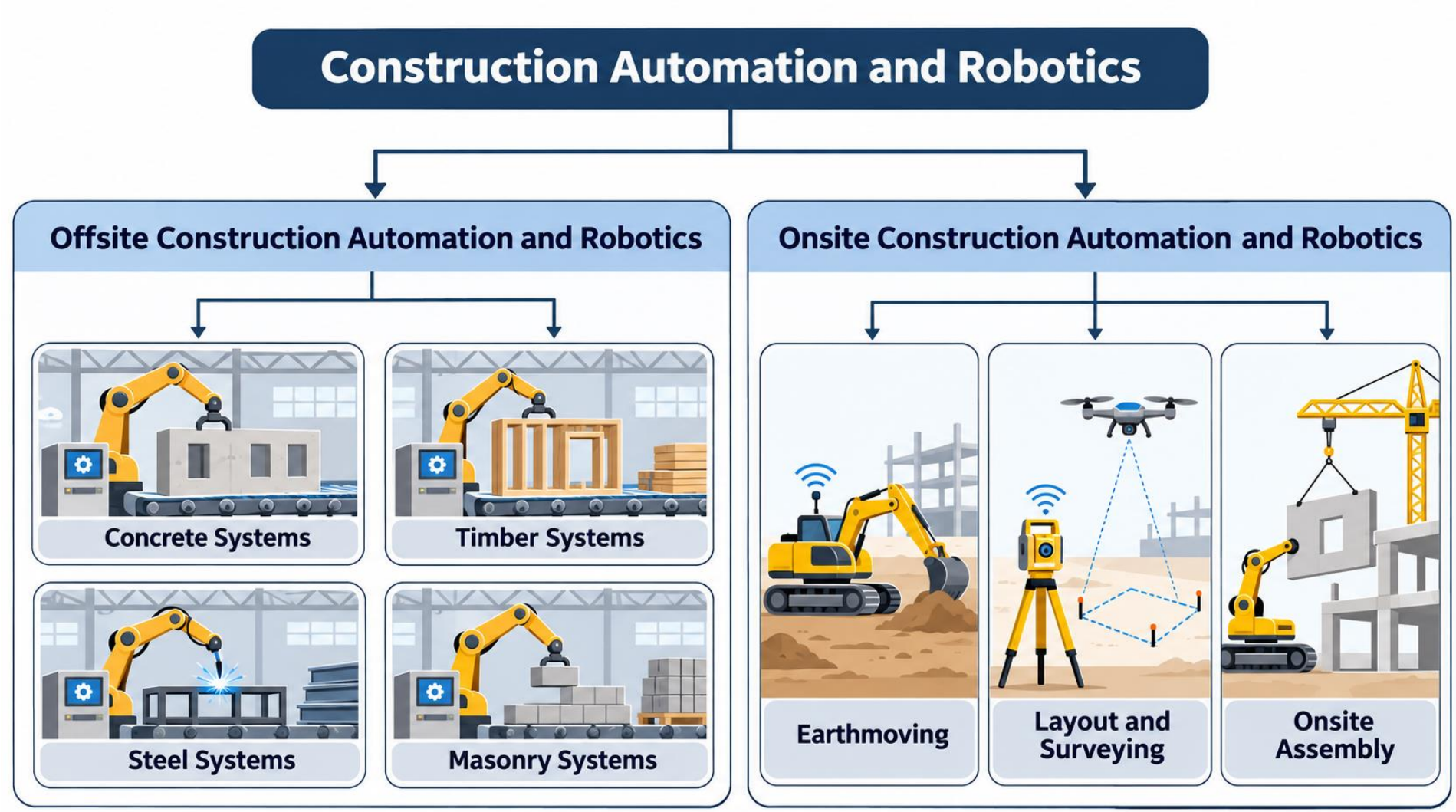




Module 2: Technology and Applications



Technology and Applications



Offsite Construction Automation and Robotics





Stage 1 – Carcass Fabrication


Panel fabrication / casting


3D Module after casting


Module ready for delivery

Stage 2 – Fit Out Installation


Module arrangement


Fit out works


Module ready for delivery

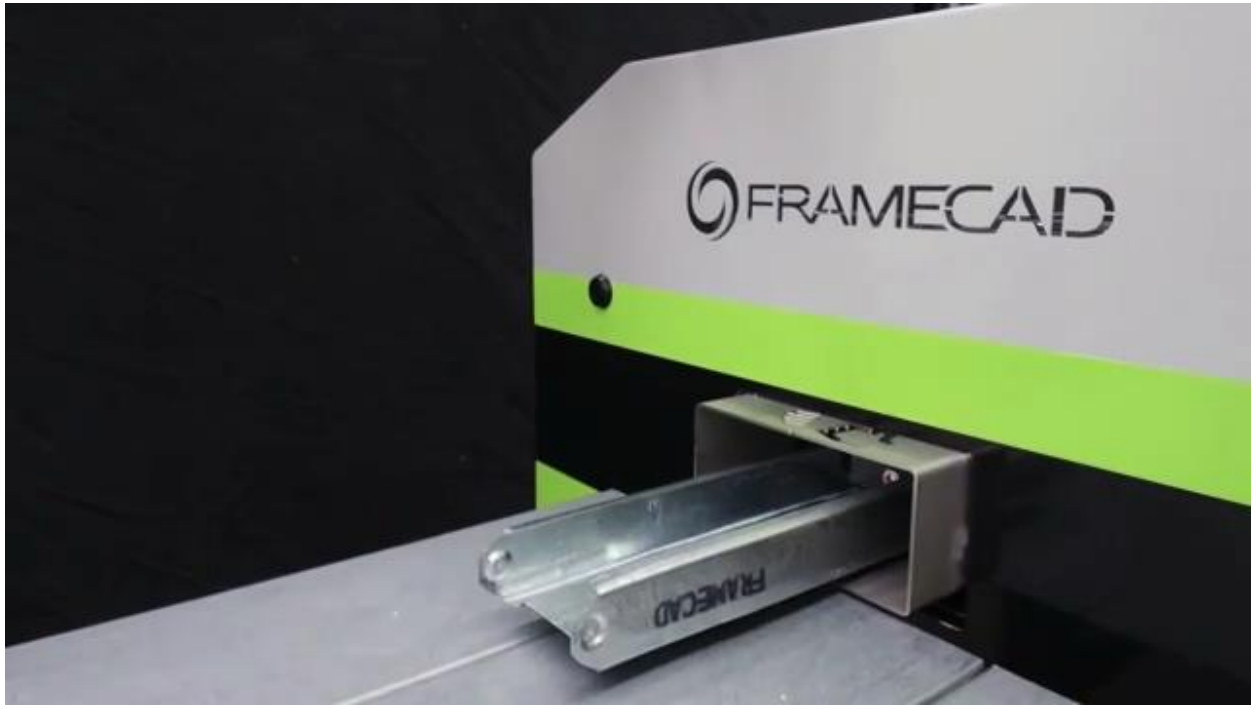
Stage 3 – Site Installation


Preparation for Transfer Slab

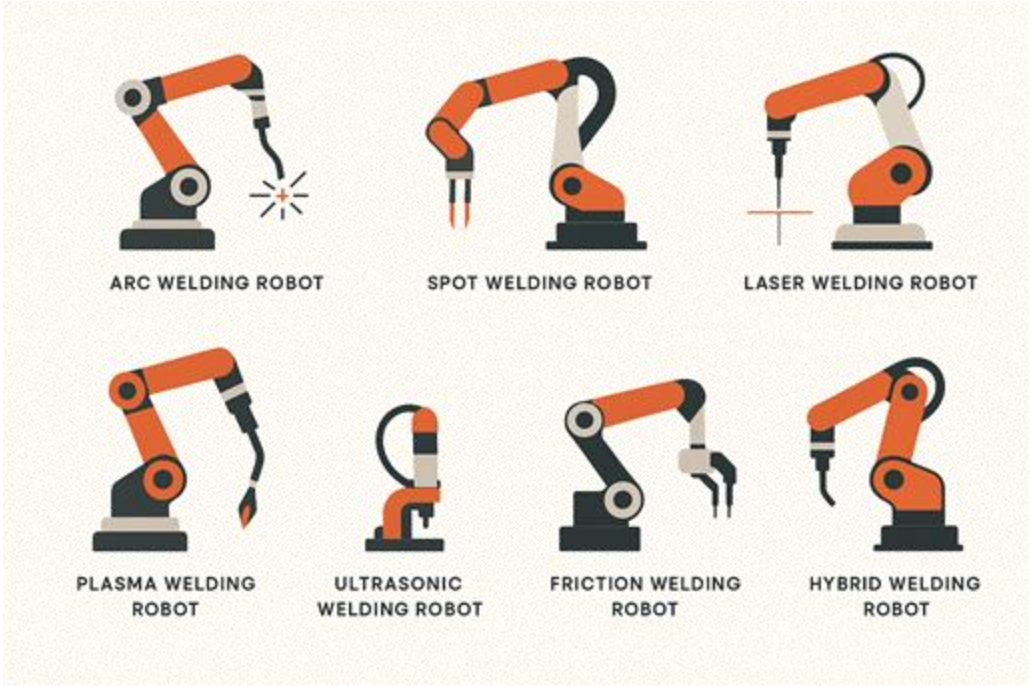

Lifting process


PPVC Module is installed

Offsite Construction Automation and Robotics

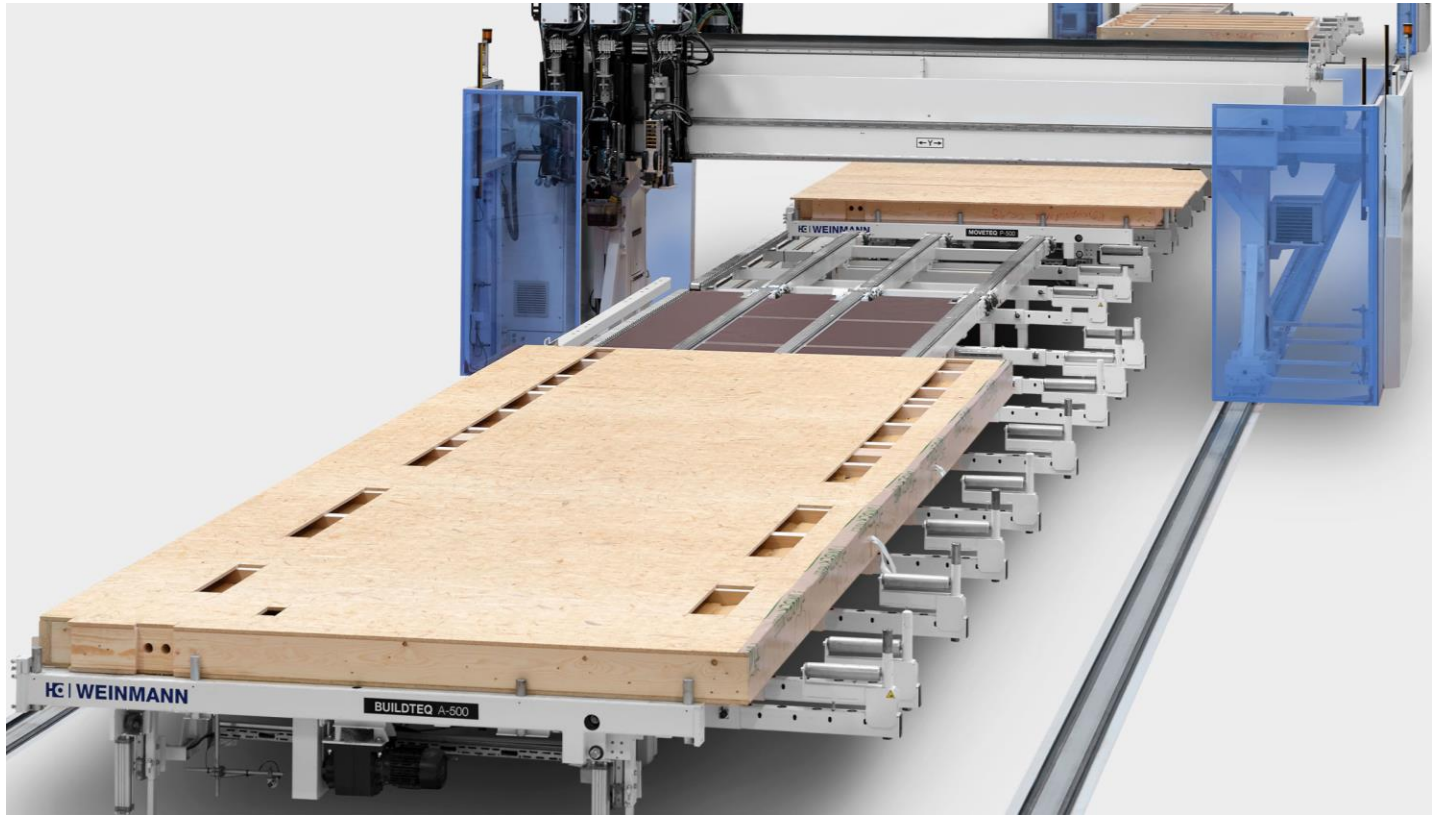


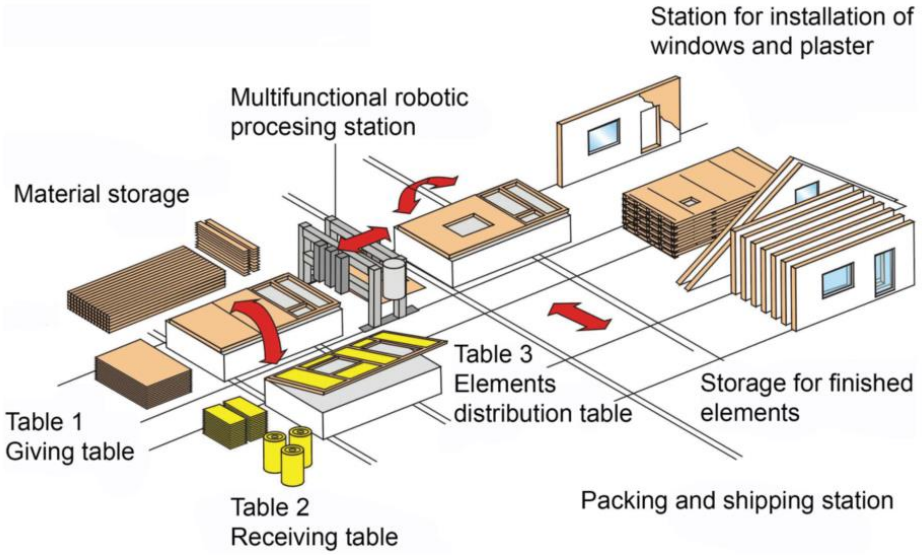
https://video.framecad.com/framecad-f325it-ideal-for-residential-and-light



https://standardbots.com/blog/choosing-the-right-welding-robot-for-your-business

Offsite Construction Automation and Robotics





https://www.homag.com/fileadmin/product/houseconstruction/assembly-tables/element-table-BUILDTEQ-A-500.jpg

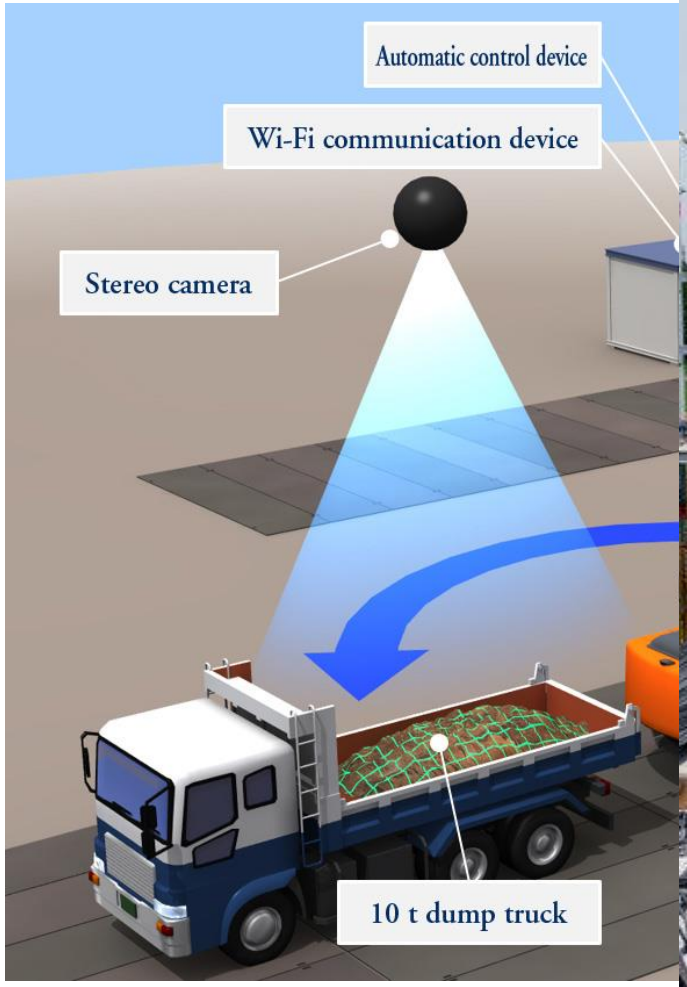
Offsite Construction Automation and Robotics





https://www.roetzer-werk.de/

Onsite Construction Automation and Robotics

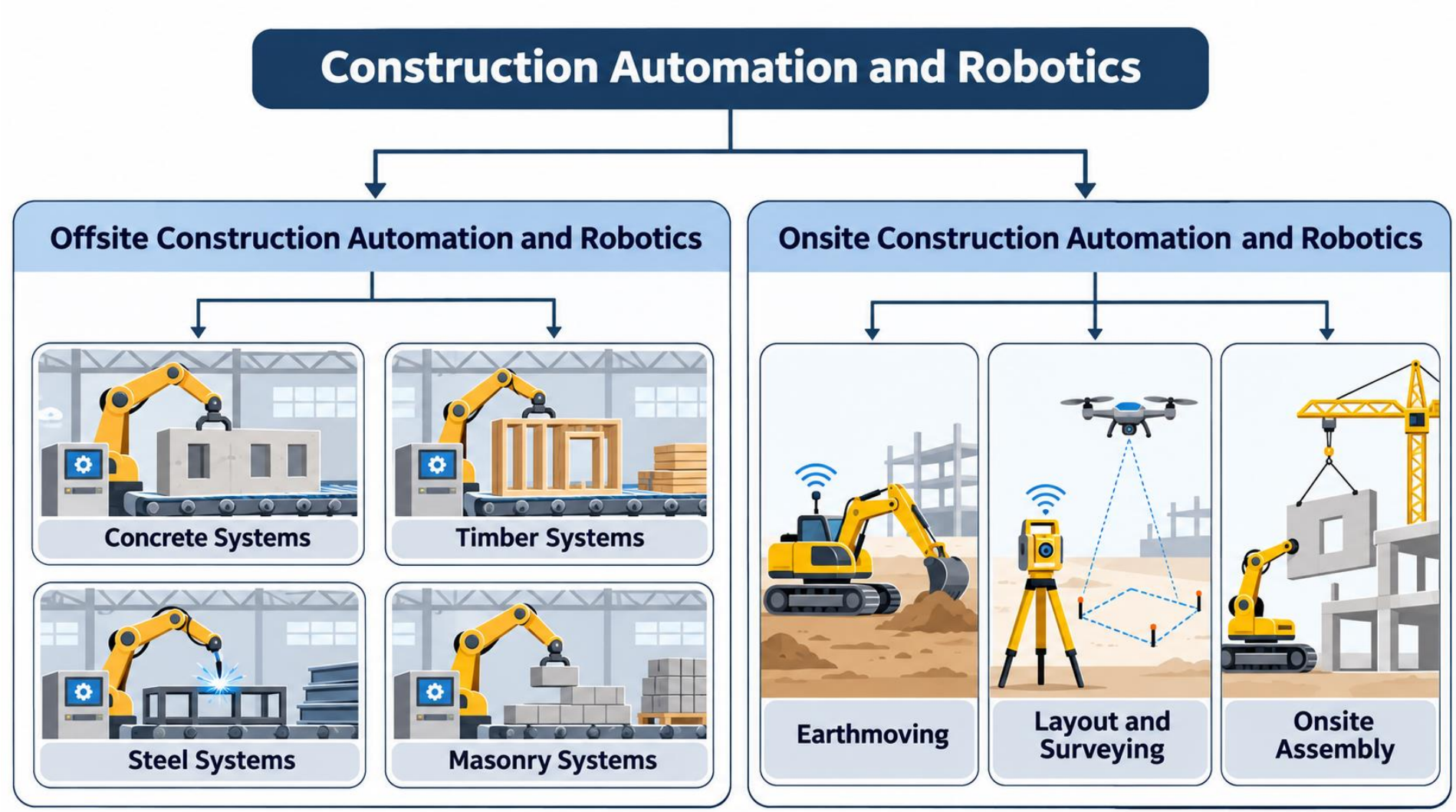




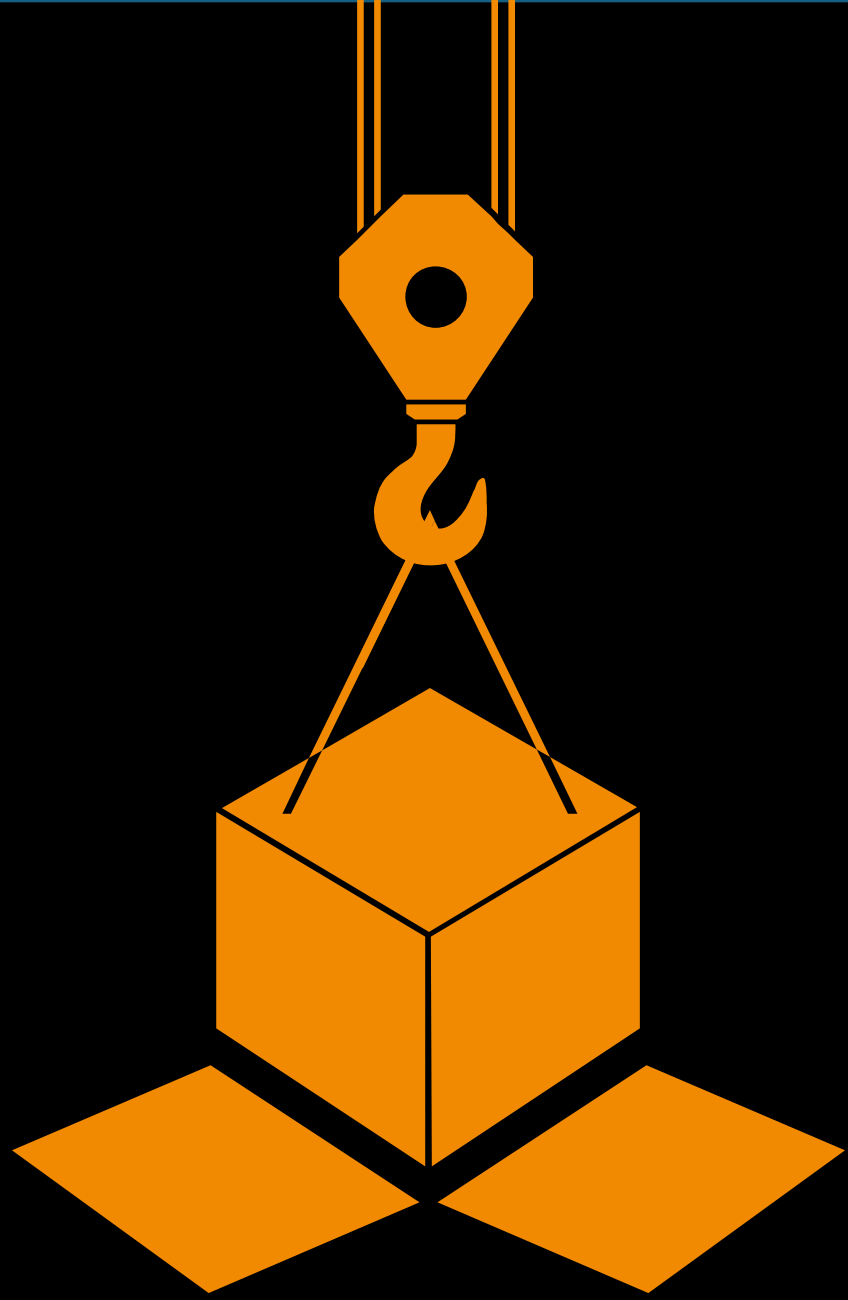
Onsite Construction Automation and Robotics



Technology and Applications



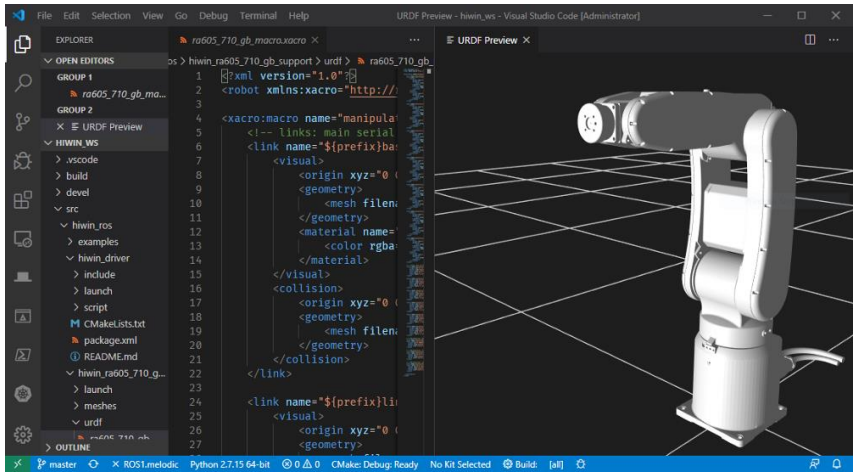
Module 3: Implementation & Future Impact



Unique Challenges for Construction Implementation

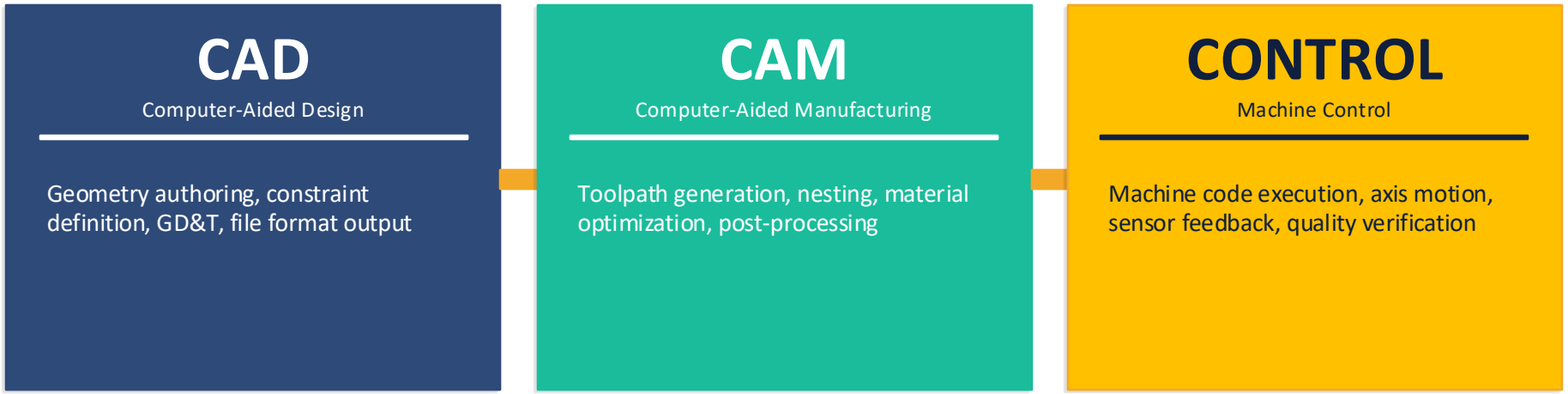
- Unstructured environments
- Interoperability
- Safety
- Organizational and supply chain
- Scale







Digital Fabrication Workflows



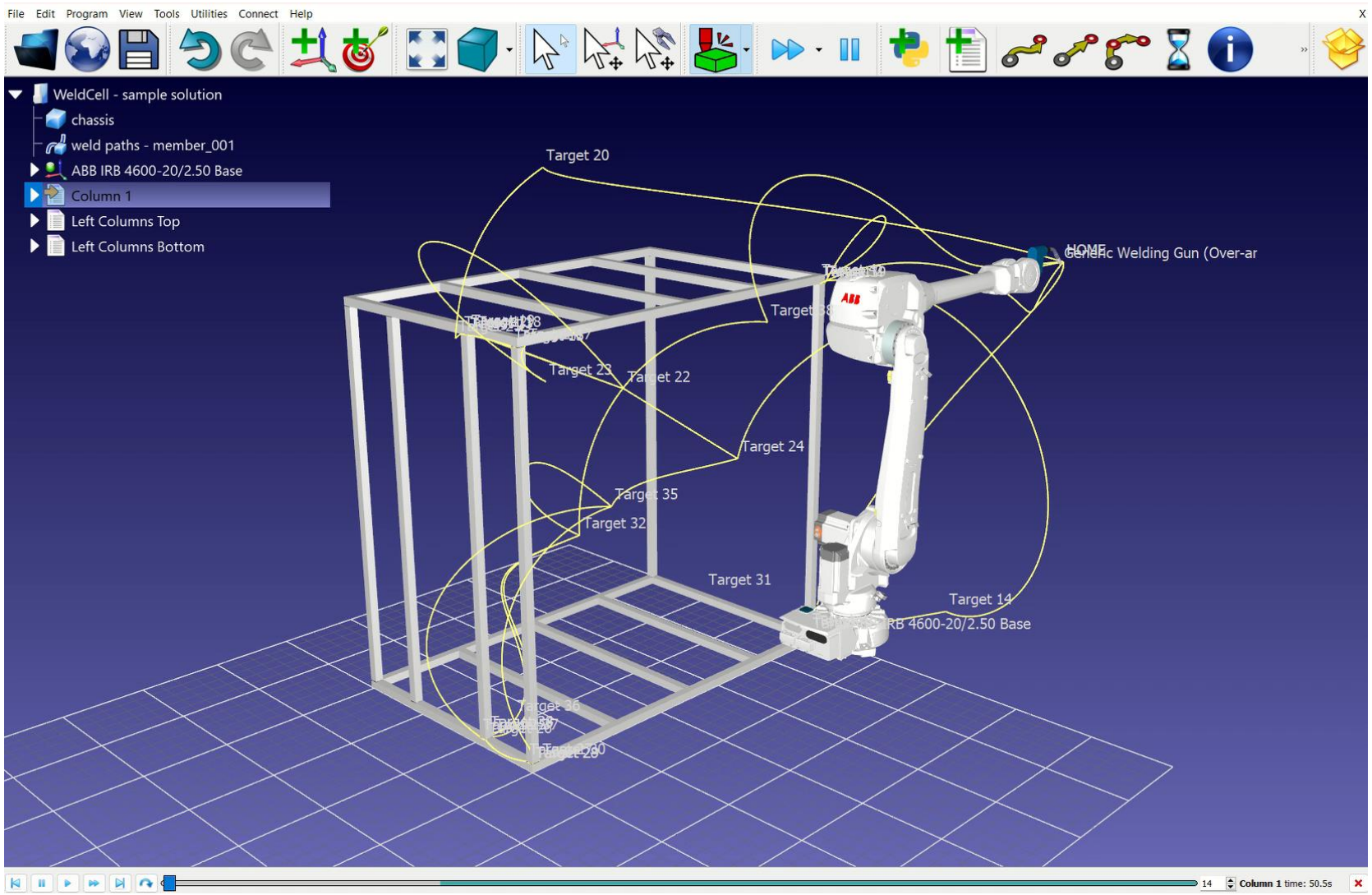
Simulation Platforms



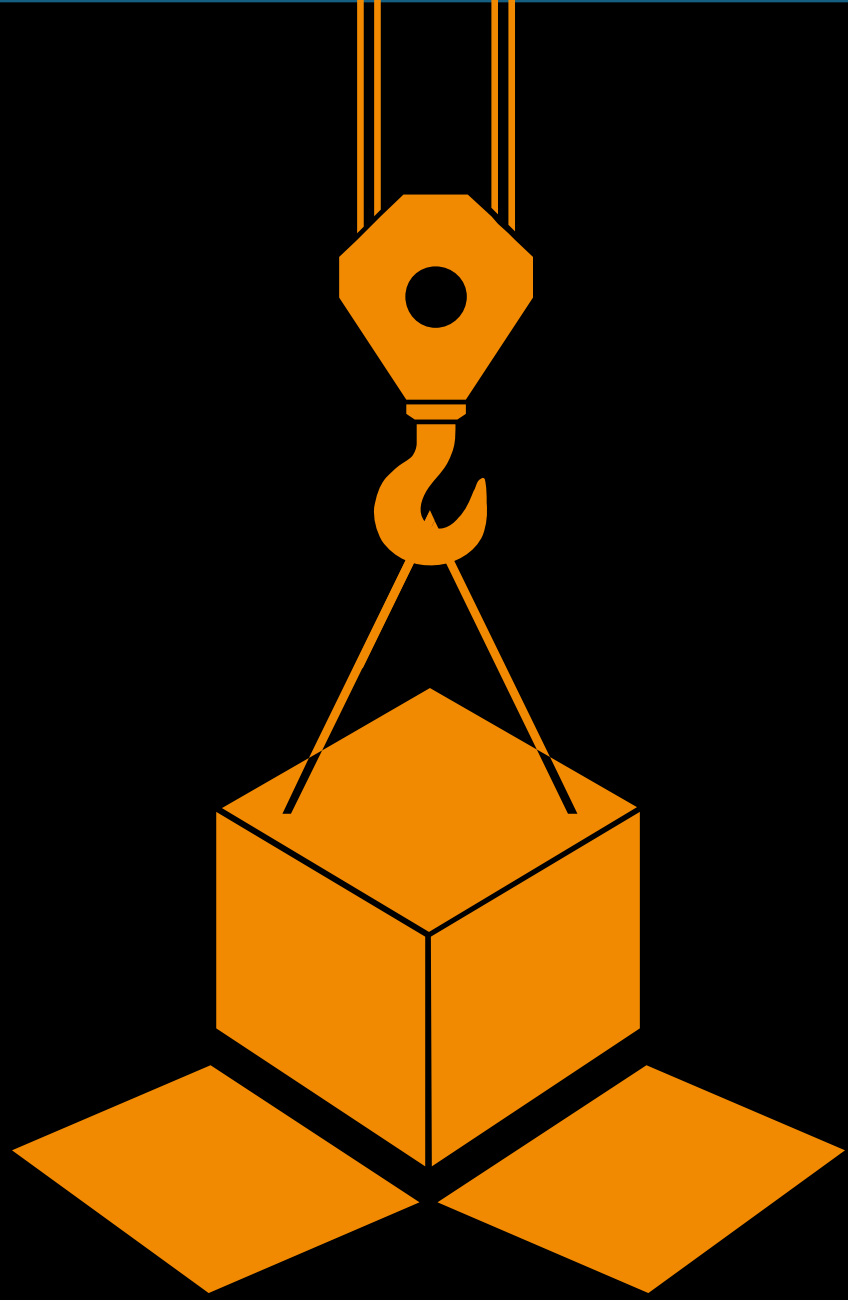
Design Automation (Rhino/Grasshopper)



Robot Simulation (RoboDK)



Summary



Main Outcomes

1



Measure feasibility and impact of automation

2



Assess opportunities for emerging automation technologies

3



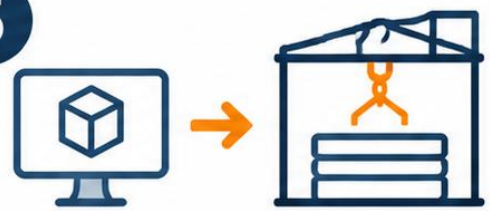
Select and implement automation solutions for project needs and constraints

4



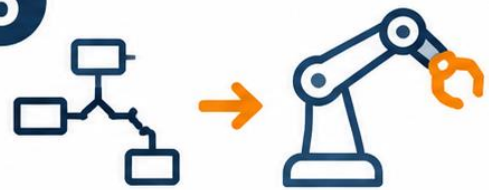
Evaluate benefits across safety, productivity, cost, and quality

5



Apply DfMA for design-to-manufacturing of off-site components

6



Streamline and improve construction processes (Lean) before automating