# NRI: FND: CRAFTING QUALITY LAW AND POLICY FOR ROBOTICS Award ID# 2024872, year 2

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## Knowledge gap: Law and Policy

Law and policy experts don't know robotics/AI, which leads to tech-blind policy

- Does not account for what robots can (and cannot) do

This is exacerbated by tech people over-anthropomorphising robots

- Relating to human capabilities (to help a lay audience understand)
- Or to sell their product



## Knowledge gap: Law and Policy

Example: Current sidewalk robot legislation is primarily focused on size and weight, not around safety, potential privacy problems, liability

- On the practicalities of Robots in Public Spaces, Cindy Grimm and Kristen Thomasen, We Robot 2021 (draft)



## Knowledge gap: Law and Policy

Example: Law/policy that gives robotics/AI system the same status as an individual (leaving the company not responsible)

- *The Legal Construction of Black Boxes,* Ryan Calo, Elizabeth Kumar, Andrew Selbst, and Suresh Venkatasubramanian, We Robot 2021 (draft)



Image: https://blogs.3ds.com/northamerica/future-robots-and-ensuring-human-safety/

## Knowledge Gap, Roboticists

Roboticists don't know law and policy

- Design decisions can make a tech more (or less) prone to liability
- Similar for privacy laws

Robots deployed in the real world need to meet existing (and upcoming) regulations

- Occupational Health and Safety (OSHA)
- Decisions made early on in design may, again, make it harder to get regulatory approval



Image: https://robothouse.herts.ac.uk/access/



### Knowledge Gap, Roboticists

Example: A robot driving a car is NOT the same as a robotic car

- How should the law think about robots, Neil M. Richards, William D. Smart, We Robot 2012 (draft)



## Knowledge Gap, Roboticists

Sidewalk robot examples:

- Robot crushed by train:
- https://twitter.com/WeeklyRobotics/status/1499289460680404994
- Car damaged by sidewalk robot:
- https://www.nbcdfw.com/news/nbc-5-responds/nbc-5-responds-what-happens-if-youre-ina-crash-with-a-robot/2442345/



The incident in question happened at a crossing where the robot was travelling at a low speed of 2 mph and scuffed the bumper of a car.



## Challenge: Bridge the Knowledge Gap



### Reason properly about

- Robot capabilities
- Types of failures

... NOT teach them about how the technology works

### Structured conversations

- Policies match robot capabilities
- Consequences of technology accounted for early (self-regulation)

### **Basic understanding**

- How historical context, existing law, plus exemplars combine in new laws and policies
- How technology choice can influence subsequent law and policy



Experiences with existing technologies (eg snapchat, maps)

Interactive experiences

- Capabilities
- Limitations



Case law approach

- Mix-and-match policies, technologies
- Case law structure
  - Policies
  - Technologies



Narrative-based examples

- Historical context of court examples
- Essence of Tort law (who is responsible and how is that established)
- Highlights of OSHA etc regulations



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## IM: Hypotheses

- Hypothesis 1: Interactive, hands-on activities paired with real-world experiences are effective at enabling non-technical people to reason properly about robot capabilities.
  - Hypothesis 1a: Reasoning correctly about robot capabilities and potential failures does not require a deep technological understanding of the underlying mechanisms
  - Hypothesis 1b: People's experiences with everyday technology can be leveraged to "ground" reasoning about robot capabilities
- Hypothesis 2: Narrative examples in law are sufficient for extending reasoning to new situations.
  - Hypothesis 2a: Narrative exemplars are more effective than fact-based exemplars
- Hypothesis 3: Language choice (eg, detects versus sees) can reduce the tendency to anthropomorphize robots

## **IM: Evaluation**

- Hypothesis Evaluation:
- Quantitative measurement of effectiveness of scaffolding material, interactive experiences
  - Ability to correctly assess robotic capabilities/failures in novel cases
- Quantitative measurement of effectiveness of scaffolding material, narrative examples
  - Ability to effectively extend narrative examples to new scenarios
- Overall evaluation
  - Qualitative assessment of case studies by law and technology experts

## Interactives: Navigation - Hospital Model

- Interactive exercises for each topic with specific reasoning objectives
- Study: Web-page + video versus in-person interactive



### **EDUNAVIGATION**

#### LEARNING OUTCOMES:

- In a given task, identify the three major components of navigation: path planning (map), localization, and obstacle avoidance.
- Figure out real-world conditions when robots fail to navigate and provide possible reasons for it

#### What is robot navigation?

As humans, we can easily figure out how to get to different places such as a shopping center. In the shopping center, we can find the store that we initially set out to visit as well as the aisle in which the product that we are interested in buying is kept. We usually use instruments like paper maps and GPS to figure out where we are and where the destination is with respect to us.

How do robots do this? How and when do they fail? This site walks you through why robots fail in odd ways when navigating.

#### Robot Navigation

Enter













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## Enter Robot Navigation Path Planning









### Interactive experiences: EDUVision

- How robots detect objects in images
- Common failures (lighting, angle, distance, occlusion, clutter)



#### **EDUVISION:**

#### WHAT COMPUTER VISION CAN (OR CANNOT) DO



Computers can be programmed to detect objects in images. They do this in a very different way than humans, leading to unexpected behavior - detecting objects that aren't there or *not* detecting objects that are.

#### LEARNING OUTCOMES:

- Predict real-world conditions where computers might fail to detect an object (or see an object that isn't there).
- Provide possible reason(s) for why a computer failed to detect an object (or saw one that wasn't there).
- Identify information computers do not use to detect an object.

#### What is object detection?

As humans we can easily detect and label objects in images. How do computers do this? And how and when do they fail? This site walks you through why computers can fail in odd ways when detecting objects in images.



Ente











### Case studies: Sidewalk robots

- WeRobot 2021 paper: <u>On the Practicalities of Robots in Public Spaces</u> (Cindy Grimm and Kristen Thomasen)
- British Columbia Law Institute: AI & Tort law
  - Miro diagrams of how robot/AI systems are assembled
  - Miro diagrams of <u>how design decisions affect systems</u>
- Narrative explanation of robot tech and how it impacts law & policy

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## Crafting Quality Law and Policy for Robotics

### Scientific Impact

 Framework for establishing effective communication between law and policy and technology experts

### Tangible outcomes

- Interactive materials for law and policy workshops/courses
- Narrative examples for a robotics course module
- Case study framework for developing new law and policy
- Case studies, evaluation materials, design framework Award #2024872



### Broader Impact

- Law and policy around robotics that align with technological capabilities
- Designing robotics research agendas in the context of the public and society

## Acknowledgements

### Team

• Dr. Ross Sowell (PI)



- Marisa Hudspeth '22, Osman Celikok '22, Waldo Abu Al-Afia '23
- Dr. Cindy Grimm (PI) and Dr. William Smart (Co-PI)
  - Sogol Balali (PhD)
  - Kenneth Kang '22, Kelton Bruslind '22, Sergiy Greblov '23, Myla Garlitz '23
- Ruth West (PI)
  - Hannah Helgesen '21
  - Ian Afflerbach '22
  - Jessica McCurry '22



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