Testimony to the PA Senate Majority Policy Committee
Pennsylvania as an Innovation Leader – Shaping the Future for Tomorrow
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Thank you for this opportunity to tell you a little bit about robotics here in Pittsburgh. Although we're sitting in a room on the North Side right now, I would like to use this opportunity to take you on a brief tour of the Robotics Institute at Carnegie Mellon University. The RI at CMU is a hub of robotics research and the source of a lot of employment and innovation in this city.

If we were on the CMU campus, we would begin at the front of Newell Simon Hall, the department's main campus building. The first thing you'd see upon entering is our robot receptionist, "Tank". Tank has a 3D animated head rendered on a computer monitor, and a tall cylindrical-shaped robot body. Tank doesn't have any arms, but that's okay, because the robot's main purpose is to make conversation. You can talk to Tank just as you would a human receptionist, except you use a keyboard instead of your voice. The project to create Tank[1] was led by Professor Reid Simmons and includes a collaboration between Robotics and CMU's School of Drama. Standing ready at the front desk of the RI for the last 15 years, Tank serves as an illustration of what a social robot in our daily lives might look like.

If we kept walking, I could steer you by the office of Professor Illah Nourbakhsh, Executive Director of the Center for Shared Prosperity, whose community-focused robotics projects empower everyday citizens with technologies like crowd-sourced air pollution monitoring[2]. I could take you down a few floors to the office of Professor Chris Atkeson, whose soft robot exoskeleton technology inspired the assistive robot Baymax in the Disney movie Big Hero 6[3]. If we continued further, we could get to Mission Control, the heart of a project led by Professor Red Whittaker to send the first American rover to drive on the moon[4].

This is just a tiny fraction of the incredible robotics research that goes on at CMU every day. In our tour, we would of course have to save time to visit our second building on campus, Smith Hall, then hop in a car (perhaps an autonomous one) to cross town to the National Robotics Engineering Center in Lawrenceville, and finally stop by our newest department extension in Squirrel Hill.

CMU founded the first Robotics PhD program worldwide about 30 years ago, and also founded the first Bachelors degree in Artificial Intelligence in the United States. Each of the 900+ members of the Robotics Institute---students, project staff, administrative staff, and faculty---have a shared mission of developing transformative robotic technologies and training the next generation of innovators. There are over 80 robotics companies located in Pittsburgh, and many of them have ties back to CMU in one way or another.

CMU is arguably the best place in the world to do robotics research because of both our breadth and depth of talent. From snake robots that can climb trees[5], to autonomous drones that fly through forests[6]; from artist robots that paint with acrylics[7], to healthcare robots that assist with feeding and dressing[8], the range and potential impact of robotics research from CMU is hard to overstate. You are all probably familiar with the recent surge of interest in AI after ChatGPT and other large language models made breakthroughs in natural language understanding and generation. Robots at CMU integrate these kinds of technologies and more.

In my own research, I focus on assistive and collaborative robots that are capable of intelligent interactions with human partners[9]. My lab develops robots to help people who need it with tasks like eating food or preparing a meal. We focus on how, where, and when a robot should take assistive actions. Just like a good caregiver is able to recognize their charge's needs from body language, context, and familiarity, we aim to develop robots that can identify a person's need from implicit cues, then take proactive assistive behaviors. We study how robots can become better assistants by learning from their interactions and personalizing their behavior to their individual users. We also investigate how people respond to these robots, and how to make robot behavior explainable to improve trust and acceptability. My goal is to develop robots that improve people's quality of life, and I would say this is a recurring theme among my colleagues in the RI.

Beyond foundational research, the RI has a tremendous impact on industry in Pittsburgh. The National Robotics Engineering Center (NREC), an operating unit within the Robotics Institute, is a particularly strong source of commercial and entrepreneurial activity. NREC positions itself between the basic research happening on campus and the needs of government and industry clients. The staff there help develop, mature, and commercialize robotic technologies so they can be used globally. NREC staff or former staff have been responsible for starting more than 20 tech firms with a total valuation of over $25 billion. In fact, three out of every five employers in the robotics, AI, or tech sector in Pittsburgh have direct staff ties to NREC alumni.

We can't discuss the role of robotics in Pittsburgh without thinking about policies that make it happen. Despite my job, I don't believe in technological progress at all costs. I look to policy makers like you to help shape the role of technology in society, making sure it is positioned to do as much good as it can. In my view, that means investing in many diverse and innovative early-stage ideas and supporting the transition of promising technologies to market. It also means supporting the academic research labs like those at CMU where foundational ideas are created.

I like to end my tour of the Robotics Institute by bringing visitors to the catwalk overhanging the Newell Simon high bay. From this vantage point one story above the floor, you have a clear view down on a wide-open warehouse-like room containing some of our biggest projects, in both ambition and physical size. You might see a four-wheeled robot designed to autonomously inspect and repair utility pipelines[10], an underwater robot built to do ship and harbor inspections[11], or a crop-monitoring robot to help farmers manage their yields[12]. As we gaze on the robots below us, I hope you consider just how much impact robotics can have in Pittsburgh, in the US, and in the world.
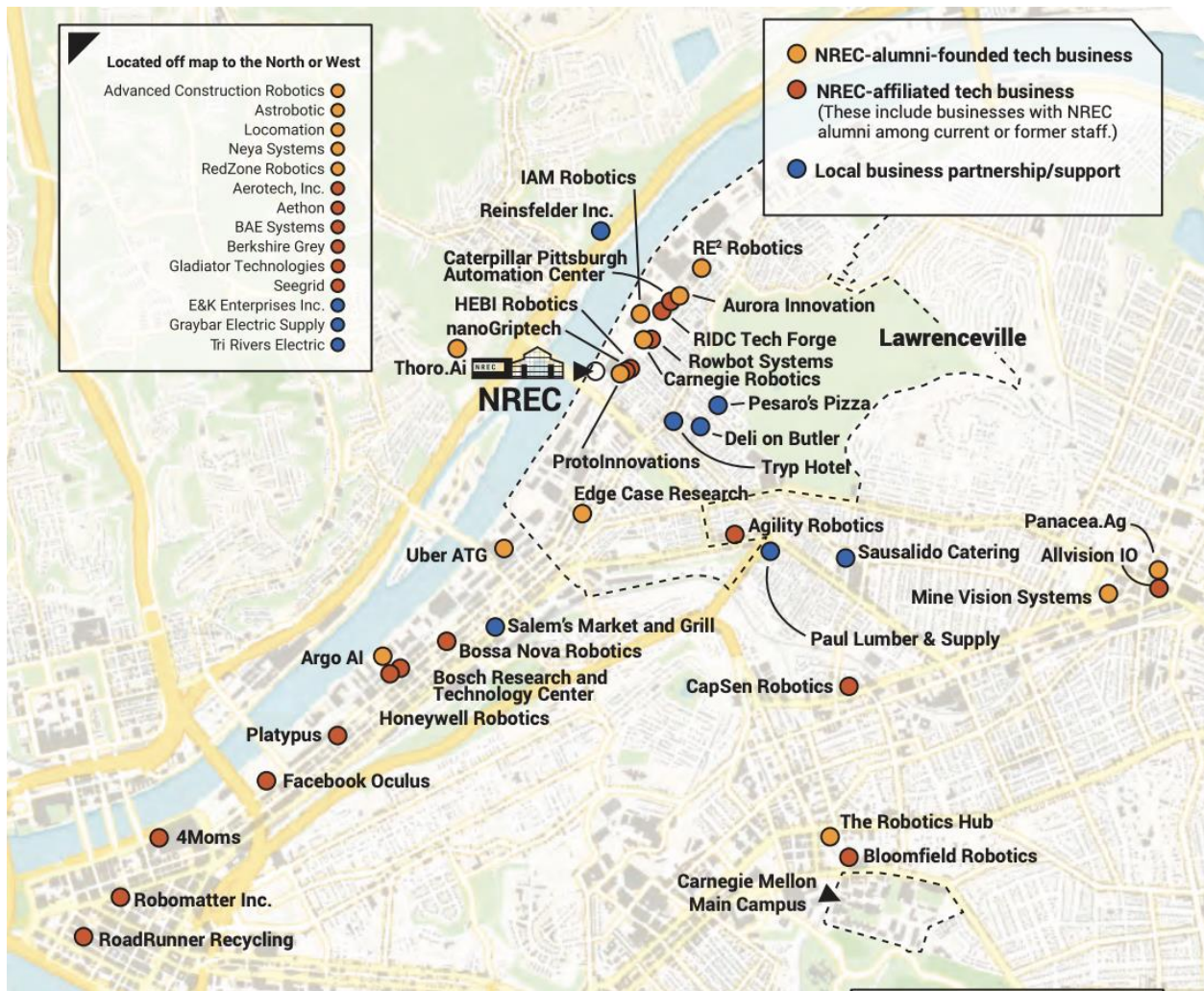
Image from: Fourth Economy. (2021). "Robots in the Backyard: An Economic Impact Study."

[1] https://www.ri.cmu.edu/project/roboceptionist/
[2] https://cmucreatelab.org/home
[3] http://www.cs.cmu.edu/~cga/bighero6/
[4] https://irislunarrover.space/
[5] http://biorobotics.ri.cmu.edu/index.php
[6] https://theairlab.org/
[7] https://www.cs.cmu.edu/~./jeanoh/big/
[8] https://rchi-lab.github.io/
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[11] http://rpl.ri.cmu.edu/
[12] https://www.nrec.ri.cmu.edu/solutions/agriculture/index.html