ARTEMIS Robot: Building Artificially Intelligent Robots with Child-like Curiosity

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Abstract

Intelligent robots and their algorithms are usually task specific. A robot that plays chess can train itself to become a better chess player. The same robot cannot train itself to sort out garbage or learn how to do diagnostic tests for COVID19. This is different from how humans learn. Human start developing multiple capabilities from birth, moving their limbs, tracking movements with their eyes, turning head towards source of sound, and identifying faces, emotions and body language. They can also specialize in many tasks, such as driving, cooking, and playing sports without losing their multiple capabilities. Humans learn by observing, practicing, getting positive or negative reinforcements, and asking questions. These have multimodal ways - vision, speech, hearing, smell, taste, touch, and emotions to gather data. The learning is continuous and happens over years. As a result, they can combine their vast repository of knowledge and skill sets, transfer their learnings, apply logic to handle a diverse range of tasks.

For robots, we expect them to develop superhuman capabilities. In return, we train them on singular stream such as text or still images, provide no contextual data of their environment, complete absence of multi-modal inputs such as sound or touch to triangulate information they have received, and the learning is non-continuous and non-immersive. This goes against how humans learn. So, how can we build robots that learn just like humans and become more intelligent gradually every day? The ARTEMIS (Artificially intelligent Real-time Training by Environment, Mapping, Immersion, and Sounds) Robot is a curious robot. It learns just like humans do by interacting with other humans and acquiring knowledge through multiple modes about its environment. In this process, it becomes a little more intelligent every day and starts developing multiple capabilities. ARTEMIS has stereo vision, hearing capabilities and is embedded with multiple sensors including GPS, accelerometer, temperature, sound, and brightness sensor. Using machine learning it can identify faces and objects, and their depth and position. It is also able to identify different sounds and classify them as familiar sounds, white noise or those requiring attention. It uses embedded logic and probability ranges to deduce the environment it is in - home, street, office, or school. By combining and comparing global data with data from its sensor it can make appropriate conversations.

Just like a child learns through encouragement and repetition, ARTEMIS looks forward to having its logical deductions confirmed or reinforced by humans. If that does not happen or if its logic does not match its observations, then it asks a question. The response to that question allows ARTEMIS to reconfigure its logic, the probability estimates, and make a more accurate deduction next time. This constant-human robot interaction helps ARTEMIS improve its learning and develop multi-capabilities. As learnings of each ARTEMIS robot is based on its interaction with humans and environment, each ARTEMIS is unique and will have different logical, conversational and skills capabilities.

Keywords
Robot, Machine Learning, Stereo Vision, Logic, Probability

Biography

Artash Nath is interested in the intersection of space, robotics, and machine learning. He has been building robots, rovers, rockets and writing machine learning algorithms to solve global challenges for the past few years. His most recent projects include using machine learning to predict risk index of asteroids colliding with earth and applying

machine learning to predict exoplanetary atmospheres. He is the Gold Medal winner of the 2020 IRIC North American Science Fair Competition and won the top awards at the 2020 Canada-online STEM Fair.

He has presented his projects at several conferences including the 2020 Americas World Summit on Artificial Intelligence, the 2020 ARIEL Science Mission Conference in the Netherlands, the 2019 Planetary Defense Conference in Washington DC, the 2019 Google DevFest, the 2019 Montreal Space Symposium, the 2019 Toronto Tech Summit, and the 2018 Toronto Machine Learning Summit. He is the winner of NASA Space Apps Challenge Toronto 2020 (Finalist), 2018, 2017, 2014. In 2017 he won the Jesse Ketchum Award of the Royal Astronomical Society of Canada for his work on taking measurements of the Total Solar Eclipse. In 2014, he co-founded HotPopRobot.com to bring space and astronomy education to the next generation.