AAAS panel focuses on roadmap to 'radical transformation of the AI research enterprise'

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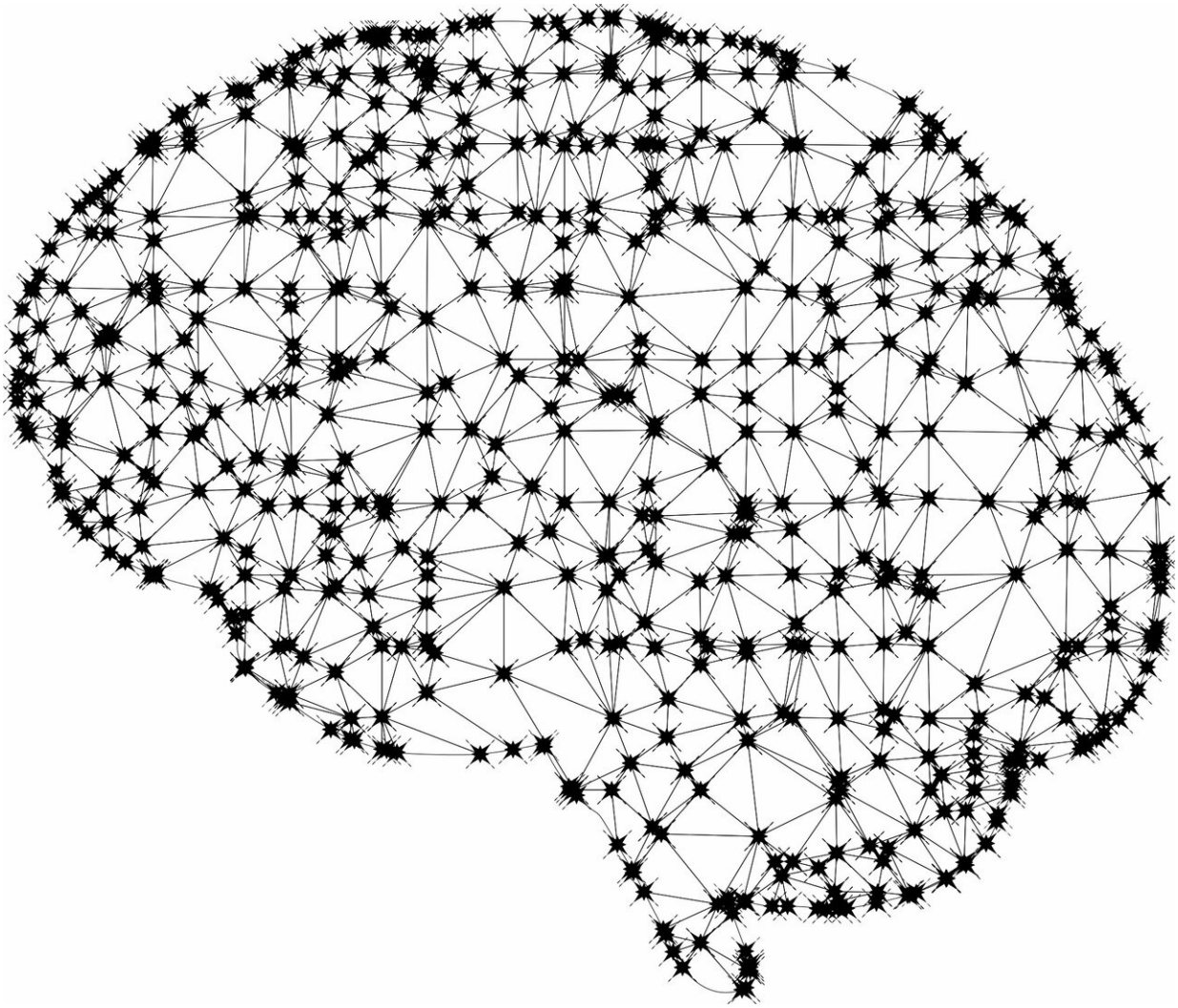

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When Dan Lopresti and his colleagues talk about the future of artificial intelligence (AI) during their upcoming panel at the annual meeting of the American Association for the Advancement of Science (AAAS), be prepared to imagine a better world.

In this world, the full potential of AI is unleashed to benefit society: health care is personalized and accessible through a friendly robot companion; education is customized to offer individualized plans for retraining and skills-building; and, businesses, large and small, operate with previously unheard-of efficiency and provide a level of customer service that can only be dreamed of today.

"The question is what are we going to see over the next ten or twenty years break loose as a result of the research, which is assuming the research gets done because of investments made," says Lopresti, a professor of computer science and engineering at Lehigh University. Lopresti is also the incoming Vice Chair of the Computing Community Consortium (CCC) Council which, along with the Association for the Advancement of Artificial Intelligence (AAAI), spearheaded the creation of "A Twenty-Year Community Roadmap for Artificial Intelligence Research in the U.S."

Lopresti will participate in a panel with the authors of the Roadmap and leaders of the initiative that led to it, Yolanda Gil (University of Southern California and President of AAAI) and Bart Selman (Cornell University and President-Elect of AAAI), on Saturday, February 15th at the AAAS annual meeting in Seattle.

The Roadmap lays out a case for the best use of resources to fulfill the promise of AI to benefit society. The 100-plus page report is introduced by an Executive Summary that argues that: "Achieving the full potential of AI technologies poses research challenges that require a radical transformation of the AI research enterprise, facilitated by significant

and sustained investment."

The authors write that AI systems have the potential for transformative impact across all sectors of society and for substantial innovation and economic growth and articulates AI benefits in several specific areas: 1) boost health and quality of life, 2) provide lifelong education and training, 3) reinvent business innovation and competitiveness, 4) accelerate scientific discovery and technical innovation, 5) expand evidence-driven social opportunity and policy, and 6) transform national defense and security.

The report also recognizes the tremendous social change that will result, says Lopresti, and that this must be addressed as well. Ethics is also an important consideration across the board.

Eighteen "vignettes" bring the envisioned future of AI to life, such as:

- Vignette 1: Jane is a video game enthusiast and loves spicy food. She suffers from anxiety, has been under treatment for Type 1 diabetes since her early teens, and has a rare allergy to sesame seeds. Her health-focused personal assistant has been helping Jane manage her physical and mental health for years. It monitors Jane's vital signs and blood sugar, has access to her electronic medical records, and can draw on online health information from high-quality sources to generate recommendations and advice. It helps Jane manage her chronic illness, ensuring that the treatment is being administered correctly and has the intended effects. It stays up to date with the latest breakthroughs in diabetes treatment and reasons about how these might affect Jane...

- Vignette 11: Joe is a worker who was laid off in a company restructuring. He wants to retrain, but needs income in order to support his family and cannot afford to embark on full-time education. A free AI system helps him plan for career change—what is a feasible job he

could take that would either build the skills he needs along the way or would pay the bills while giving flexibility to study and advance his career. To explore his short- and long-term career opportunities, Joe navigates to an interactive AI system and describes his skills and interests. The system visualizes a number of possible career paths for him, including both short- and longterm steps he can pursue to make progress on those paths...

- Vignette 12: Hollis runs a small online business, where she sells customized personal devices and customized robots, which she designs and builds on demand. Some objects are aesthetic, such as integrating light and motion sensors with embedded LED lighting to add responsiveness to jewelry; others are more functional, such as customized wristbands that integrate her designs with medical sensors and small displays. An interactive AI systems allows Hollis to rapidly develop specialized products for her customers, enabling new business opportunities...

The report acknowledges the challenges that must be overcome to achieve these scenarios and presents a number of recommendations amounting to "a reinvention of the AI research enterprise." The recommendations fall under three broad categories: 1) create and operate a national AI infrastructure; 2) re-conceptualize and train an all-encompassing AI workforce, and 3) ensure that core programs for basic AI research are expanded and supported.

"One of the goals is to create the infrastructure needed to keep faculty in universities doing research at a high level," says Lopresti. "We also need to keep students interested in the idea -when they get their graduate degrees—to go the faculty route rather than the industry route."

As Lopresti explains, to do cutting-edge research not only does one "...need access to tremendous software and tremendous computing

power, you also need access to tremendous amounts of data. A lot of machine learning is based on data. And, if you go to Facebook or Google you get the data. A lot of people who leave universities to go to Google or Facebook, it's not so much about the money or the stock options, or the free lunches or the other perks, it's because they believe they can do the best research there because they will have access to the best data. That's a huge, huge issue with keeping people in academia."

He adds: "There are a lot of things that Google does that are really cool. Yet, there are obviously commercial interests driving Google. And the whole idea is that in academia, our work shouldn't be mired in or colored by commercial interests. At a university that's not our reason to be. It's to be the independent voice, independent scientists. That's really important."

They write that a reconceptualization and training of an all-encompassing AI workforce should build upon the National AI Infrastructure. Among the elements they describe are: developing AI curricula at all levels; incentivizing emerging interdisciplinary areas; and, engaging underrepresented and underprivileged groups to bring the best talent into the AI research effort. They emphasize that AI ethics and policy must be central, and highlight the importance of incorporating ethics and related responsibility principles as central elements in the design and operation of AI systems.

The new initiatives, they write, cannot come at the expense of core programs for basic AI research which are critical, adding: "These core programs—which provide well-established, broad-based support for research progress, for training young researchers, for integrating AI research and education, and for nucleating novel interdisciplinary collaborations—are critical complements to the broader initiatives described in this Roadmap, and they too will require expanded support."

Creating the roadmap: "a marshalling of the community"

According to the Computing Community Consortium, the goal of the 20-year Roadmap initiative was to identify challenges, opportunities, and pitfalls in the AI landscape, and to create a compelling report to inform future decisions, policies, and investments in this area.

The Roadmap was based on broad community input gathered via a number of forums and communication channels: three topical workshops during the fall and winter of 2018/2019, a Town Hall at the annual meeting of the AAAI, and feedback from other groups of stakeholders in industry, government, academia, and funding agencies.

"We marshalled the community," says Lopresti. "This was an amazing effort. In a period of about a year, we got info from hundreds of computing researchers around the country. We ran a series of workshops that were very well attended and produced this Roadmap for AI Research which is this quite hefty document that looks out twenty years."

The "hefty document" paints a compelling vision of a future made better through the unleashing of AI's full potential, with an understanding that attention must also be paid to the possible negative repercussions of this revolution. It's a future, they say, that can only be realized through strategic, substantial and sustained investment and a reimagining of how AI research is done.

Provided by Lehigh University

Citation: AAAS panel focuses on roadmap to 'radical transformation of the AI research