News Release

Defense Advanced Research Projects Agency

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Deep Learning Leverages Machine Learning Techniques
Program aims to address ISR data deluge using machine-based perception

The quantity of data available to DoD commanders and analysts from new sensor platforms with improved resolution and range poses tremendous challenges. This data must be quickly and correctly analyzed, currently by highly trained human operators. As sensor capabilities expand, sophisticated, powerful machines with the ability to replicate, and even surpass, human perceptual capabilities will be required. The Defense Advanced Research Projects Agency (DARPA) is exploring recent breakthroughs in the field of machine learning to meet this requirement as part of its Deep Learning program.

Through the Deep Learning program, DARPA is conducting basic research into hierarchical machine perception and analysis, and applications in visual, acoustic and somatic sensor processing for detection and classification of objects and activities. "The human visual system uses six layers of cortical processing, in addition to all of the preprocessing done by the retina and the lateral geniculate nucleus," said Deep Learning program manager Tony Falcone. "The neural net-based machines we use today generally have two or three layers. Deep Learning isn't a biomimetic program, but if we believe that biological systems exhibit an economy of complexity, this suggests that we need to go deeper and have more layers; we are just beginning to understand how to do that."

Recent Deep Learning results show progress on computer vision tasks such as identifying human activities in full motion video. These results hold promise for achieving human-level-or-better analysis of video and other sensor modalities via automated processing. According to Falcone, "The products of Deep Learning should enable commanders to make more informed decisions faster by ensuring that subtle yet critical correlations that may exist in very large collections of data are uncovered, explored and analyzed. The result is that data sources are being used more effectively, yielding greater confidence in the reliability of the information on which subsequent command decisions are made."

DARPA has contracted with researchers at Stanford University, New York University, the University of Montreal and NEC Labs of America for a multi-phase research effort in multi-layered machine learning algorithms, software and supporting technologies.

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