Intel Neuromorphic Research Community (INRC) Partner Quotes in Support of Loihi 2 Launch (Sept. 30, 2021)

"Advances like the new Loihi-2 chip and the Lava API are important steps forward in neuromorphic computing. Next-generation neuromorphic architecture will be crucial for Accenture Labs' research on brain-inspired computer vision algorithms for intelligent edge computing that could power future extended-reality headsets or intelligent mobile robots. The new chip provides features that will make it more efficient for hyper-dimensional computing and can enable more advanced on-chip learning, while the Lava API provides developers with a simpler and more streamlined interface to build neuromorphic systems."

-- Edy Liongosari, chief research scientist and managing director, Accenture Labs

"While analyzing digital trends that challenge todays computing paradigms, we identified Intel's first-generation neuromorphic chip Loihi as a promising approach for optimization problems such as route planning for our railway network. In first evaluations we observed significantly lower energy consumption and a fast response time on a proof-of-concept problem. Advanced new features such as flexible choice of neuron models and non-binary communication between spiking neurons in Loihi 2 show promise for scaling up to real-world constrained optimization problems, some of which challenge the state-of-the-art approaches in computing."

-- Jörg Blechschmidt, head of Technology Trend Management at DB Systel, IT subsidiary of Deutsche Bahn AG

"Our quadrupedal robots are built for navigating rough terrains and rely on fast model-predictive control to plan and control the footholds and body motion. This can be formulated as optimization problem with multiple constraints that should be solved in real-time on the robot. As a solution, we are currently investigating the use of the second generation Loihi chip, which provides necessary features of massive parallel compute at very low power."

-- Marco Hutter, Professor, Robotics Systems Lab, ETH Zurich

"Investigators at Los Alamos National Laboratory have been using the Loihi neuromorphic platform to investigate the trade-offs between quantum and neuromorphic computing, as well as implementing learning processes on-chip. This research has shown some exciting equivalences between spiking neural networks and quantum annealing approaches for solving hard optimization problems. We have also demonstrated that the backpropagation algorithm, a foundational building block for training neural networks and previously believed not to be implementable on neuromorphic architectures, can be realized efficiently on Loihi. Our team is excited to continue this research with the second generation Loihi 2 chip."

-- Dr. Gerd J. Kunde, staff scientist, Los Alamos National Laboratory

"In clinical trials at the ALYN hospital in Jerusalem, we are currently evaluating a prototype wheelchair-mounted robotic arm system under Loihi control. Loihi uniquely allows these arms to be controlled in a safe, adaptive way while satisfying the constraints of a battery-powered mobile platform. Using Loihi 2, we see the next version of these systems demonstrating commercial viability. Lava promises to simplify and accelerate the application coding of the complete system by unifying all processing elements, including novel event-based accelerometers developed at OUI, in a single event-based neuromorphic programming framework."

-- Elishai Ezra Tsur, assistant professor, The Open University of Israel

"Simultaneous Localization and Mapping (SLAM) algorithms are at the heart of autonomous mobile vehicles that are deployed in unknown, GPS-deprived, or dynamic environments. Visual place recognition is a particularly challenging part of SLAM that requires robust recognition and discrimination of hundreds of thousands of locations in different conditions. Animals display amazing navigation capabilities, solving this large-scale memory formation and recognition problem with an unprecedented efficiency, flexibility, and robustness. New features of Loihi-2 enable more complex neuronal models and neural plasticity rules, making it well-positioned to implement the next generation of biologically inspired navigation and map formation algorithms that could surpass today's state of the art in the field."

-- Michael Milford, Professor, joint director, Centre for Robotics, Queensland University of Technology

"Breakthroughs in neurally-inspired machine learning have still only scratched the surface of what could be learned from the most complex machine of the universe, the human brain. One frontier is to build neuromorphic agents whose behavior is shaped by their own sensory inputs, which they, in turn, control and steer. By forcing us to address how neural processes enable specific cognitive or motor functions, building such systems both advances our understanding of brain processes and our ability to develop brain-like technology. The dynamics of activation in populations of neurons is the best predictor of behavior. The new Loihi chip greatly facilitates building population level neural dynamics by enabling the transmission of graded information along with spikes and by extending the range of implementable neuron models. The new three factor learning rule opens the chip to autonomous learning, a key problem in brain-like technology. Building neuromorphic models of brain function requires scaling and modularity. The new Lava framework will make it much easier to achieve both."

-- Gregor Schöner, professor, Director Institute for Neural Computation, Ruhr Universitaet Bochum

"At TU Delft, we are taking inspiration from flying insects to apply compact, evolutionarily optimized spiking neural networks to control micro air vehicles (MAVs), systems that require highly robust, efficient and autonomous maneuvering. We've demonstrated Loihi-powered flying drones executing smooth controlled landings, similar to how honeybees land on a flower. We hope that the higher neuron density and new features of Loihi 2 will enable demonstrations on tiny drones of the complete perception and control process, advancing their insect-inspired AI."

-- Guido De Croon, professor, Micro Air Vehicle Laboratory, TU Delft

"To improve usability of drones for commercial applications such as package delivery, inspection, search and rescue, it is critical to advance computer vision for on-board cameras in ways that are also computationally efficient. Our early explorations on Intel's Loihi for ultra-fast vision-driven control of drones show that it can be a faster, more energy efficient architecture compared to conventional hardware. We look forward to continuing our exploration of neuromorphic technology for racing drones with the second-generation Loihi 2, notably its support for new event-based deep networks that bridge the divide between binary spiking neural networks and more conventional neural network models."

-- Davide Scaramuzza, Professor and Director Robotics and Perception Group, University of Zurich

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