УДК 004.896
Kateryna Panichuk[1], Nataliia Zhukova[2]
[1]student of group CST-130, National University «Zaporizhzhia Polytechnic»
[2]PhD (Philology), assistant prof. National University «Zaporizhzhia Polytechnic»

DEVELOPMENT OF THE LOIHI NEUROMORPHIC COMPUTING CHIP

Loihi is a neuromorphic research test chip designed by Intel Labs, which mimics the architecture of the human brain, including neurons and synapses. The aim of this report is to tell about its development from the moment of its creation to the present day.

The first study was conducted in collaboration with neurophysiologists at Cornell University who study the biological olfactory system in animals and measure the electrical activity as they smell odors. The team took a dataset consisting of the activity of 72 chemical sensors in response to 10 gaseous substances circulating within a wind tunnel. The chip rapidly learned neural representations of every smell and identified them even in the presence of strong background interferents. Potentially, the technology can be used in the design of robots that will search for weapons, explosives, drugs. Furthermore, the chip can be useful in medicine for the recognition of diseases that emit specific smells. It can be embedded in robots used for environmental monitoring and dangerous materials detection, or quality control chores in factories.

Further results were obtained by various companies participating in the Intel Neuromorphic Research Community, which includes more than 100 members who help to study the use of technology in business. Accenture compared the use of Loihi to a standard GPU for voice recognition and found that this chip could achieve the same accuracy, but 200 milliseconds faster and 1000 times more energy efficient. Mercedes-Benz is interested in this result and considering the possibility of including this technology into its vehicles.

It was also noticed that by processing data from a neuromorphic camera, Loihi can learn new gestures in just a few exposures. This could be applied to a diversity of use cases, such as interacting with smart products in the home or touchless displays in public spaces.

Researchers from the retail industry evaluated Loihi for image-based product search applications. They found the chip could generate image feature vectors over three times more energy-efficiently than CPU and GPU solutions while maintaining the same level of accuracy.

Intel and its partners have discovered that Loihi can solve optimization and search problems over 1,000 times more effective and 100 times quicker. It can be used to enable drones to plan and make complex navigation decisions in real-time.

Rutgers and TU Delft researchers published new demonstrations of robotic navigation and control applications running on Loihi. TU Delft's drone performed optic flow landings with an evolved 35-neuron spiking network running at frequencies over 250 kilohertz.

In conclusion, the technology behind the Loihy chip, compared to the components already in use, shows the same accuracy of results with less time and energy investments. But the price of this device is too high to be utilized for the same tasks that conventional equipment can handle. The use of Loihi can be considered justified when performing complicated and complex tasks that require a lot of time and resources.