

NEUROTECH

Deliverable D3.3: Neurotech prize announced

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Executive summary

The Neurotech prize series has been launched successfully. Several prizes have already been awarded, announced, and paid to the recipients. The prizes have been advertised at the relevant events.

Introduction

Within the NEUROTECH project, WP3 “Outreach and forming public awareness” aims at representing the neuromorphic technology community towards their stakeholders and to increase the visibility of this technology in the public. The task 3.3 consists in awarding NEUROTECH prizes at scientific events. The goal is to promote the neuromorphic computing and the NEUROTECH network, especially among early career scientists. For instance, a PhD student who sees their hard work rewarded by a NEUROTECH prize will be more inclined to trust and join the network. Competition for the NEUROTECH awards will add to the prestige of the network and stimulate attendance at the corresponding events.

Results

1) Decision to award several small prizes instead of one large prize

Initially, the plan was to award one large NEUROTECH prize. After more reflection and discussions, we decided that awarding several smaller prizes was a better way to reach a broader audience. The prizes value is still high enough to attract competition from good scientists (250 to 500 €). Having several prizes allowed us to be present at several relevant conferences and therefore have more visibility.

2) Scope of the prizes

We have decided to award the prizes to early career scientists (i.e. students and postdocs) to encourage them to keep working in neuromorphic computing and also because they are more in need than senior scientists. The prizes are awarded for demos and presentations that have an applied component. While demos are encouraged, the prizes are not restricted to them in order to not exclude work on emerging technologies. Nevertheless, work that is directed towards

applications and making progress towards concrete realizations and demonstrating NCT in a competitive setting is privileged.

3) List of prizes awarded

- **IEEE International Conference on Artificial Intelligence Circuits and Systems (AICAS)**

Date: 18 to 20 March, 2019

Location: Hsinchu, Taiwan

The NEUROTECH consortium committed to encourage a demo session at this conference by sponsoring a prize for the best demonstration of neuromorphic technology. Projects were evaluated by NEUROTECH members Yulia Sandamirskaya (INI Zürich) and Paolo Bortolotti (THALES), with support from Tobi Delbrück (INI Zürich).

Prize: 2 prizes of 250 euros each

Details about the winning projects:

"Flyintel – a Platform for Robot Navigation based on a Brain-Inspired Spiking Neural Network"

Huang-Yu Yao, Hsuan-Pei Huang, Yu-Chi Huang, and Chung-Chuan Lo, from National Tsing Hua University, Hsinchu, Taiwan

They have shown network, inspired by circuits found in the fly brain for tracking the orientation of the insect, that was realised in a low-power spiking network simulation. The network was controlling and tracking the orientation of a robot, therefore demonstrating an “embodied” spiking network in a real-world environment. The winning contribution is that it demonstrated how biological inspiration can allow us to use very simple circuits — inspired by the smallest animals — to control robots efficiently.

"Artificial Intelligence of Things Wearable System for Cardiac Disease Detection"

Yu-Jin Lin, Chen-Wei Chuang, Chun-Yueh Yen, Sheng-Hsin Huang, Peng-Wei Huang, Ju-Yi Chen, and Shuenn-Yuh Lee, from National Cheng Kung University, Tainan, Taiwan

They have shown a working demonstration of a system for detecting cardiac diseases (one out of four) based on measurements from a single electrode. One could attach the electrode “live”, see recorded signals and the output of a CNN that was running on a PC/GPU (not on the device itself, but they have created the whole system, in which the electrode communicated the measurements wirelessly to a little box with the computer running CNN, with a nice GUI that showed the results). The demo was showing the prototype (which is close to clinical testing) in live operation. The neuromorphic aspects is brought in by the use of a state of the art neural network architecture to classify time series. Further, the use of neuromorphic hardware might allow to shed the big computing box that is still necessary

to achieve real-time performance, therefore this application might be a good case promoting neuromorphic technology.

- **International Conference on Memristive Materials, Devices & Systems (MEMRISYS)**

Date: 8 to 11 July 2019

Location: Dresden, Germany

Prize: one prize of 500 euros

The prize was for the best demonstration of memristor-based hardware and applications in the field of neuromorphic computing technology. The price was publicly announced to all participants, and open to any type of contributions presented by early career people (Ph.D. students, and postdocs / young researchers up to 7 years from the Ph.D. award). The participants interested to the prize were requested to apply for it, and we received more than 15 applications.

The contributions were evaluated by a selected committee with complementary expertise including NEUROTECH members Sabina Spiga and Stefano Brivio (CNR-IMM, Agrate Brianza (Italy), and international experts in the field (Damien Querlioz, CNRS and Univ. Paris Sud; Bernabé Linares-Barranco, CSIC, Spain; Stephan Menzel and Regina Dittmann, Forschungszentrum Juelich GmbH – Germany; Michael Kozicki, Arizona State University, USA).

Details about the winning project:

"Memristive Edge Detection for Spiking Neural Network"

by D J. Mannion, WH. Ng, A. Mehonic, and A J. Kenyon; Department of Electronic & Electrical Engineering, , University College London, London (UK)

Presenter: Daniel John Mannion, PhD student at University College, London (UK).

In this work the authors have shown an edge detection circuit designed for spiking neural networks, and using metal-SiO_x-metal resistance switching devices as the core of our memristive circuit.

- **Capo Caccia Cognitive Neuromorphic Engineering Workshop**

Date: 23 April to 4 May 2019

Location: Alghero, Italy

Winner: Damien Drix (University of Hertfordshire, UK): “Olfactory Navi”.

Prize: 500 euros

Capo Caccia Workshop has a strong hands-on component, so it was a perfect place to foster demonstration of neuromorphic technology in use. The prize was announced in

the beginning of the Workshop, to motivate students to work on projects that could lead to a live demo in a 2 weeks time. At the end, we received eight submissions:

- ScarpoCaccia: a tactile perception system inspired by scorpion's vibration-perception;
- Olfactory Navi: a robot navigating guided by smell, perceived with a neuromorphic gas-sensor
- Radar SLAM: neuromorphic SLAM based on radar signals
- E2MGx2: EMG signal classification with a mixed-signal SNN on chip
- iCub HD network: implementation of an SNN for path integration on Intel's research chip Loihi to track the 2D head pose of the iCub humanoid robot
- Stereo Matching: implementation of a stereo matching SNN algorithm (for depth perception) on the mixed-signal device "DYNAP"
- FUSE: a sensor fusion project (event-based vision and auditory sensing)

All Demos were shown on the last day of the workshop, in a 2h long demo session, when all Workshop participants were divided in groups and circled through the demos. We decided to let all Workshop participants to participate in the vote: each participant could give each demo points from 1-10 in an anonymous way. We counted this "public vote" as 50%, the other 50% were given by a senior jury that consisted of the present NEUROTECH consortium members (Chiara Bartolotti, Michael Schmuker, Giacomo Indiveri) and Workshop organizers (Gabriela Michel and Moritz Milde).

- **IROS 2019 Workshop "Towards Cognitive Vehicle: perception, learning and decision making under real-world constraints. Is bio-inspiration helpful?"**
<https://cogvehicles2019.github.io>

Date: 8. November 2019

Location: Macau, China

Y. Sandamirskaya co-organised the CogVehicle workshop in name of the NEUROTECH Project. The workshop investigated robustness and reliability of neuronally-inspired architectures in a safety-critical domain, such as cognitive vehicle. We didn't aim for the focus on autonomous driving, rather emphasizing the intelligence in the cockpit, but many contributed talks covered autonomous driving and neuronal architectures in this domain as a well. The project has sponsored one of the invited speakers and did not provide monetary compensation for the Best Poster Prize, but the Prize was announced as a NEUROTECH Prize. The winners were selected by workshop organisers (BMW Labs and Y.S.) and have obtained a small monetary award (50\$) and a certificate, featuring NEUROTECH and BMW Group as the Prize-giving organisations.

A dynamic neural model for endowing intelligent cars with the ability to learn driver routines: where to go, when to arrive and how long to stay there?

Authors: Flora Ferreira, Weronika Wojtak, Wolfram Erlhagen, Paulo Vicente, Ankit Patel, Sergio Monteiro and Estela Bicho (University of Minho, Guemaraes, Portugal)

Exploration for Objects Labelling Guided by Environment Semantics using UAVs.

Authors: Reem Ashour, Tarek Taha, Jorge Dias, Lakmal Seneviratne and Nawaf Almousa.

Finally, at the Telluride Neuromorphic Workshop 2019, the NEUROTECH project was present and we announced the Prize, spurring some competitive spirit in building nice demos. However, after the Demo session, we decided not give the prize at the workshop, raising the bar for the quality of the demo: both their “neuromorphic” character (using neuromorphic hardware) and the “working demo” aspect (at least solving the task; ideally, demonstrating going beyond the state of the art). We encouraged participants to continue working on their demos and submit a completed version to the AICAS2020 conference, where we will have a separate track for the Telluride demos. We have received 2 submissions in that track. NEUROTECH will also sponsor the Best Demo Prize of the AICAS conference itself.