

Qualcomm Announces the Winners of the European Qualcomm Innovation Fellowship Program

Qualcomm Technologies, Inc., a subsidiary of Qualcomm Incorporated, today announced the winners of the Europe Qualcomm Innovation Fellowship (QInF) program. QInF is an annual program that focuses on recognizing, rewarding and mentoring the most innovative engineering PhD students across Europe, India, and the United States. The program is part of Qualcomm's continued commitment to driving research and development and innovation across mobile technologies and beyond. Qualcomm's leadership in areas such as 5G is the result of the company's innovation focus as it strives to push the envelope of what's possible in mobile. This program identifies and supports the next generation of leading engineers.

"The Qualcomm Innovation Fellowship began in 2009, and has continued to grow with the addition of more universities, more candidates and expansion to our research centers internationally. This year, we received a record number of top-notch proposals that warranted serious consideration," said Peter Rauber, senior director of engineering at Qualcomm International, Inc. and the head of Qualcomm's European research offices. "Each delivered fresh, innovative, and leading-edge ideas consistent with Qualcomm Research's high standard."

Rauber, who participated in the QInF Europe judging panel for a seventh year, continued, "We believe that creativity, curiosity, and courage lead to great research. That is the key to harnessing ideas and creating new technologies. Our interaction with the QInF participants support that vision. Our goal is to enable students to pursue their futuristic innovative ideas."

After careful review, three winners were selected from all received applications for their outstanding proposals with Henri Rebecq from University of Zurich and ETHZ, Rakshith Shetty from Max Planck Institute, and Thomas Moerland from Delft University. Each winning student will receive \$40,000 as part of the fellowship along with mentoring by a Qualcomm researcher.

Europe QInF program winners:

- Henri Rebecq, supervised by Davide Scaramuzza, has been selected for his proposal: "Learning Representations for Low-latency Perception with Frame and Event-based Cameras". In this proposal, Henri outlines an approach for combining conventional and event-based cameras for low-latency perception tasks, such as motion estimation and 6-DoF SLAM. Event-based cameras measure changes of intensity at very low latency and with high dynamic range. By learning a joint, multimodal feature descriptor for frame and event-based data, the benefits of both types of sensors can be combined.
- Rakshith Shetty, supervised by Bernt Schiele and Mario Fritz, has been selected for his proposal: "Learning to Controllably Edit Images". Humans have the ability to imagine how things could be different from what is actually observed, and this faculty plays an important role in human cognition. This proposal is aimed at enabling machines to do the same. Using a Generative Adversarial Network based approach, Rakshith aims to build a system that can reliably change a

single attribute in an image. The system can be applied for enhanced privacy (e.g. removing a credit card number from an image), automated adversarial testing of vision models, and efficient semantic data augmentation.

- Thomas Moerland, supervised by Catholijn Jonker and Joost Broekens, has been selected for his proposal: “Double Uncertain Exploration”. Estimating the uncertainty in action values is an important problem in reinforcement learning, because knowledge of uncertainties would allow for efficient exploration of actions for which uncertainty is high. A lot of work has been done on this problem, but existing methods do not take into account the fact that the policy is still evolving, which leads to non-stationary input distributions and therefore a higher uncertainty in the action values. In this proposal, Thomas suggests a way to properly estimate uncertainties using a combination of neural networks and Monte Carlo tree search.

The seven invited universities for QInF Europe all have outstanding programs in our areas of interest. The schools are located in Belgium (KU Leuven), the Netherlands (Delft University), Switzerland (ETHZ and EPFL), the United Kingdom (Imperial College and Cambridge University) and Germany (Max Planck Institute for Informatics, Saarbruecken). The QInF Europe finalist event was hosted by [QUVA](#), the joint research lab, founded by Qualcomm Technologies, Inc. and the University of Amsterdam, and focused on advancing state-of-the-art machine learning techniques for computer vision.

The judging panel consisted of the following:

- Amirhossein Habibian, Staff Engineer/Manager, Qualcomm Technologies Netherlands B.V.
- Taco Cohen, Staff Engineer, Qualcomm Technologies Netherlands B.V.
- Tijmen Blankevoort, Staff Engineer, Qualcomm Technologies Netherlands B.V
- Daniel Fontijne, Senior Staff Engineer, Qualcomm Technologies Netherlands B.V
- Koen van de Sande, Senior Staff Engineer, Qualcomm Technologies Netherlands B.V
- Antonio Rodriguez, Senior Engineer, Qualcomm Technologies Netherlands B.V
- Luke Tunmer, Director Engineering, Qualcomm Technologies International, Ltd.
- Peter Rauber, Senior Director Engineering, QUALCOMM International, Inc.

For more information about QInF, please visit www.qualcomm.com/invention/research/university-relations/innovation-fellowship/2018-europe

About Qualcomm

Qualcomm invents breakthrough technologies that transform how the world connects and communicates. When we connected the phone to the Internet, the mobile revolution was born. Today, our inventions are the foundation for life-changing products, experiences, and industries. As we lead the world to 5G, we envision this next big change in cellular technology spurring a new era of intelligent, connected devices and enabling new opportunities in connected cars, remote delivery of health care services, and the IoT — including smart cities, smart homes, and wearables. Qualcomm Incorporated includes our licensing business, QTL, and the vast majority of our patent portfolio. Qualcomm Technologies, Inc., a subsidiary of Qualcomm Incorporated, operates, along with its subsidiaries, all of

our engineering, research and development functions, and all of our products and services businesses, including, the QCT semiconductor business. For more information, visit Qualcomm's website, OnQ blog, Twitter and Facebook pages.

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