Deep Learning at the Edge

Deep Learning and Embedded Systems Session of the H2020 ALOHA Project

ibis Linz City (Kärntnerstraße 18-20, 4020 Linz)

7 February 2019

15:00 - 19:00

ALOHA is an H2020 project, started in January 2018, on a software framework for runtime-adaptive and secure deep learning on embedded systems

Details: https://www.aloha-h2020.eu/

Contacts

Organizers:

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AGENDA

15:00 - 15:10   Introduction

15:10 - 15:50   Deep Learning: Research & Applications

Bernhard Nessler, Johannes Kepler University Linz (JKU), Austria
Bernhard Moser, Software Competence Center Hagenberg (SCCH), Austria

We give an overview of running and planned research projects at JKU and SCCH on deep learning with applications in various fields such as mobility, surveillance, industry and bioinformatics. In this context we illustrate potentials and challenges of emerging developments.

Speaker information:
Bernhard Nessler *is a post-doctoral researcher at the Institute of Machine Learning at the Johannes Kepler University, Austria, since 2015. His main research interest focuses on biologically inspired deep learning methods. He is the author of a number of publications in top-rated conferences in the area of artificial intelligence and deep learning. He currently is project leader of the "AUDI.JKU Deep Learning Center" for autonomous driving.*

Bernhard Moser *is habilitated for mathematics at JKU with research focus on mathematical aspects in machine learning. Since 2005 he is with SCCH which is an RTO located in Hagenberg close to Linz with focus on AI driven software systems and engineering. There, he is research coordinator for the center and scientific head of the data science area consisting of about 30 researchers. He is co-initiator of an academic platform consulting the Austrian government for the AI strategy for Austria.*

15:50 - 16:30   Cognitiveness at the edge: Platforms, Models, Tools - an insight into the ALOHA project

Paolo Meloni, University of Cagliari (UniCa), Italy

We present challenges related with bringing cognitive intelligence to edge CPS devices, we discuss the state of the art, focusing on novel processing platforms and on utilities supporting designers and programmers. We also give an overview of the current status

of the ALOHA H2020 research project, focusing on efficient and secure running of Deep Learning algorithms at the edge.

Speaker information:
Paolo Meloni *is assistant professor since 2012 at the Department of Electric and Electronic engineering of University of Cagliari, Sardinia. His main research interest is on application-specific design and programming of heterogeneous processing architectures, with specific emphasis on low-power and optimized performance, to be exploited in different domains such as artificial intelligence and biomedical engineering. He is currently scientific coordinator of the ALOHA H2020 project.*

16:30 - 16:50   Coffee break

16:50 - 17:30   Bringing Deep Learning to the Edge

Francesco Conti, Swiss Federal Institute of Technology in Zurich (ETH Zurich), Switzerland

Deep Learning and Deep Neural Networks (DNNs) have emerged in the last few years as the go-to algorithmic choice for any application that requires advanced artificial intelligence capability. The high workload and energy cost of DNNs, however, have so far hindered their application to devices such as IoT nodes and cyber-physical systems that have to operate under stringent constraints.
In this talk, we will focus on techniques that can be used to actually bring DNNs to the edge and to the real world for applications such as autonomous UAV guidance, using a combination of specialized hardware and controlled algorithmic approximations.

Speaker information:
Francesco Conti *received the Master and Ph.D. degrees from the University of Bologna in 2012 and 2016 respectively and is currently a post-doctoral researcher at the Integrated Systems Laboratory, ETH Zurich, Switzerland and the Energy-Efficient Embedded Systems laboratory, University of Bologna, Italy. His current research interests focus on energy-efficient heterogeneous multicores and their applications to ultra-low-power embedded artificial intelligence. He has been the recipient of three best-paper awards in international conferences for his work on high efficiency hardware acceleration for embedded*

artificial intelligence, as well as of the 2018 HiPEAC technology transfer award.

17:30 - 18:10   Evaluating Security of Deep Learning to Adversarial Examples

Maura Pintor, Pluribus One, Italy

Deep learning has obtained impressive results in many tasks, from computer vision to speech recognition, thanks to the increasing availability of data, hardware and software tools, raising the attention of the scientific and industrial communities, and of society at large. However, it has been shown that such systems can be misled by adversarial examples, i.e., opportunely-modified input data that cause these algorithms to fail their main task of understanding what the input represents. Depending on the application, the risk of an attack causing great damage can be high. In this talk, I will discuss some attack algorithms capable of generating adversarial examples, how to use them to evaluate the robustness of a deep network, and how such threats can be countered and mitigated, in the context of specific application examples. To this end, I will also show a concrete demonstration of the security evaluation tool that we developed in the context of the H2020 ALOHA project.

Speaker information:
Maura Pintor *collaborates with Pluribus One on the development of secure learning algorithms for cybersecurity. She is a first-year PhD student at the University of Cagliari. She graduated at the same University in Telecommunications Engineering (summa cum laude) in 2018. Maura's research interests include machine learning and network security.*

18:10 - 19:00   Poster session