Keynote Talks 1 (DCCS)

Advanced Techniques for Deep Neural Network Repair

Paolo Arcaini

Abstract

Deep Neural Networks (DNNs) are used for different tasks in many domains, some safety critical like autonomous driving. When in operation, the DNN could misbehave on some inputs that have not been seen during training. DNN repair is a new emerging technique that tries to improve the DNN to fix these misbehaviours, without affecting the correct behaviours. The talk will give an overview of some search-based DNN repair approaches that we have recently proposed: a repair approach that targets different types of misbehaviours; a repair approach that is able to adaptively change the target of repair during the search; and a repair approach for DNN controllers used in AI-enabled cyber-physical systems.

Short Biography

Paolo Arcaini is an associate professor at the National Institute of Informatics, Japan. He received a Ph.D. in Computer Science from the University of Milan in 2013. Before joining NII, he held an assistant professor position at Charles University, Czech Republic. His current main research interests are related to testing of autonomous driving systems, testing of quantum programs, automatic repair of neural networks, and falsification of hybrid systems. More information is available at https://group-mmm.org/~arcaini/

Keynote Talks 2 (DCCS)

On Perfect Sampling for Stochastic Petri Nets

Hiroyuki Okamura

Abstract

Stochastic Petri Nets (SPNs) are a powerful modeling language for representing complex systems. In dependable computing, SPNs are used to analyze quantitative dependability measures through a model-based approach. There are two main methods to obtain system dependability measures from SPN models: the analytical/numerical approach and the simulation approach. While the analytical/numerical approach has limitations in analyzing the dependability of complex systems, the simulation approach remains useful for systems with a large number of states. A representative method of the simulation approach is Monte Carlo (MC) simulation, which generates sample paths of system states using random numbers and computes estimates of dependability measures based on these sample paths. One practical problem with MC simulation is determining when to stop the simulation to obtain steady-state measures. Steady-state measures are calculated from the samples of system states after the system has operated for an infinite amount of time. In the context of MC simulation, it is challenging to ascertain whether the system has reached a steady state, as the simulation time is finite. Perfect sampling is a promising solution to this problem. It is a technique that allows drawing samples of system states in the steady state with finite computation time. This talk explains how to draw such samples in a steady state and discusses methods to perform perfect sampling on SPN models.

Short Biography

Hiroyuki Okamura is a full professor at the Graduate School of Advanced Science and Engineering, Hiroshima University, Japan. His research interests include performance evaluation, dependable computing, and applied statistics. He is a co-author of over 200 journal and conference publications, including IEEE TR, IEEE/ACM TON, RESS, IEEE TDSC, JSS, Stoch. Models, Perform. Eval., SQJ, QE, and so on. He serves for WoSAR 2013 and ICECCS 2022 as PC Co-Chairs, ISSRE 2011 and ISSRE 2024 as Finance Co-Chairs, as well as APARM 2024 as General Chair. He holds memberships in several professional organizations, including the Operations Research Society of Japan (ORSJ), the Reliability Engineering Association of Japan (REAJ), the Institute of Electrical, Information and Communication Engineers (IEICE), the Japan Society for Industrial and Applied Mathematics (JSIAM), the Information Processing Society of Japan (IPSJ), and the Association for Computing Machinery (ACM), and the Institute of Electrical and Electronics Engineers (IEEE).