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Keynote Lecture

Towards Neuro-Symbolic AI

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Professional outline
Radu Grosu is a full Professor, the Head of the Cyber-Physical-Systems Division, and the former Head of the Computer-Engineering Institute, at the Faculty of Informatics, Technische Universität Wien, Austria. Radu Grosu is also a Research Professor at the Department of Computer Science, of the State University of New York at Stony Brook, USA.

The research interests of Radu Grosu include the modeling, the analysis and the control of cyber-physical systems and of biological systems. The applications focus of Radu Grosu includes smart-mobility, Industry 4.0, smart-buildings, smart-agriculture, smart-health-care, smart-cities, IoT, cardiac and neural networks, and genetic regulatory networks.

Radu Grosu is the recipient of the National Science Foundation Career Award, the State University of New York Research Foundation Promising Inventor Award, the ACM Service Award, and is an elected member of the International Federation for Information Processing, Working Group 2.2.

Before his appointment at TU Wien, Radu Grosu was an Associate Professor in the Department of Computer Science of SUNY at Stony Brook, where he co-directed the Concurrent-Systems Laboratory and co-founded the Systems-Biology Laboratory.

Radu Grosu earned his doctorate (Dr.rer.nat.) in Computer Science from the Faculty of Informatics of the Technical University München, Germany. He was subsequently a Research Associate in the Department of Computer and Information Science, of the University of Pennsylvania, an Assistant, and an Associate Professor in the Department of Computer Science, of the State University of New York at Stony Brook, USA.

Abstract
A central goal of artificial intelligence is to design algorithms that are both generalisable and interpretable. We combine brain-inspired neural computation principles and scalable deep learning architectures to design compact neural controllers for task-specific compartments of a full-stack autonomous vehicle control system. We show that a single algorithm with 19 control neurons, connecting 32 encapsulated input features to outputs by 253 synapses, learns to map high-dimensional inputs into steering commands. This system shows superior generalisability, interpretability and robustness compared with orders-of-magnitude larger black-box learning systems. The obtained neural agents enable high-fidelity autonomy for task-specific parts of a complex autonomous system.

(Joint work with Ramin Hasani, Mathias Lechner, Alexander Amini, Daniela Rus and Tom Henzinger)