Róbert Csordás

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EDUCATION

IDSIA `http://idsia.ch`, Lugano, Switzerland
PhD student   2018-pesent
Supervised by Prof. Jürgen Schmidhuber. Working on systematic generalization.

Budapest University of Technology and Economics, Budapest, Hungary
Electrical Engineering. MSc (grad. 2015) and BSc (grad. 2012). Grade: excellent.

WORK EXPERIENCE

DeepMind - `https://www.deepmind.com`   2022-present
Research Scientist Intern   London, United Kingdom
Working on improving big language models.

AImotive (formerly AdasWorks) - `https://aimotive.com`   2015-2018
AI Research Scientist   Budapest, Hungary
Worked on deep neural networks for self driving cars.
- Monocular depth prediction using neural networks.
- Neural stereo matching - predicting robust depth map with neural network.
- Recurrent network research - Convolutional LSTMs for stabilizing detections, free space detection, etc.
- Object detection, semantic segmentation

Hungarian Academy of Sciences - Institute for Computer Science and Control - `https://www.sztaki.hu`   2015
Software Engineer   Budapest, Hungary
Worked on classical computer vision projects. For example:
- Detecting objects thrown over the fence; detecting human leaving a car.
- Autonomous forklift control system.

Innomed Medical Inc. - `http://innomed.hu`   2007 - 2015
Embedded Software/Hardware Engineer   Budapest, Hungary
- Designed the software architecture of Linux based patient monitor (C++, QT).
- Maintained the software of the InnoCare-S patient monitor (C++).
- Wrote low level hardware drivers for InnoCare-T12.

PUBLICATIONS

Kazuki Irie*, Róbert Csordás*, Jürgen Schmidhuber: **The Dual Form of Neural Networks Revisited: Connecting Test Time Predictions to Training Patterns via Spotlights of Attention** - We investigate dual form representations of NNs to get insights into how their behaviour depends on the training samples.
ICML 2022   `https://arxiv.org/abs/2202.05798`

Kazuki Irie, Imanol Schlag, Róbert Csordás, Jürgen Schmidhuber: **A Modern Self-Referential Weight Matrix That Learns to Modify Itself**
ICML 2022   `https://arxiv.org/abs/2202.05780`

Róbert Csordás, Kazuki Irie, Jürgen Schmidhuber: **The Neural Data Router: Adaptive Control Flow in Transformers Improves Systematic Generalization** - We propose to improve data routing in Transformers by gating and geometric

attention, achieving systematic generalization on algorithmic tasks.
ICLR 2022 `https://arxiv.org/abs/2110.07732`

<u>Róbert Csordás</u>, Kazuki Irie, Jürgen Schmidhuber: **The Devil is in the Detail: Simple Tricks Improve Systematic Generalization of Transformers** - We significantly improve the systematic generalization of Transformers on a variety of systematic generalization datasets using simple tricks.
EMNLP 2021 `https://arxiv.org/abs/2108.12284`

Kazuki Irie, Imanol Schlag, <u>Róbert Csordás</u>, Jürgen Schmidhuber: **Going Beyond Linear Transformers with Recurrent Fast Weight Programmers** - We we explore the recurrent Fast Weight Programmers (FWPs), which exhibit advantageous properties of both Transformers and RNNs.
NeurIPS 2021 `https://arxiv.org/abs/2106.06295`

<u>Róbert Csordás</u>, Sjoerd van Steenkiste, Jürgen Schmidhuber: **Are Neural Nets Modular? Inspecting Functional Modularity Through Differentiable Weight Masks** - We develop a method for analyzing emerging functional modularity in neural networks based on differentiable weight masks and use it to point out important issues in current-day neural networks.
ICLR 2021 `https://openreview.net/forum?id=7uVcpu-gMD`

<u>Róbert Csordás</u>, Jürgen Schmidhuber: **Improving Differentiable Neural Computers Through Memory Masking, De-allocation, and Link Distribution Sharpness Control** - Addresses 3 different issues with the original DNC architecture. Also proposes a new, better content-based lookup mechanism.
ICLR 2019 `https://openreview.net/forum?id=HyGEM3C9KQ`

<u>Róbert Csordás</u>, László Havasi, and Tamás Szirányi: **Detecting objects thrown over fence in outdoor scenes** - A new technique for detecting objects thrown over a critical area of interest in a video sequence made by a monocular camera.
VISAPP 2015 `http://goo.gl/ZDkk4g`

WORKSHOP PAPERS
Kazuki Irie, Imanol Schlag, <u>Róbert Csordás</u>, Jürgen Schmidhuber: **Improving Baselines in the Wild**
NeurIPS 2021 DistShift `https://openreview.net/forum?id=9vxOrkNTs1x`

HIGH SCHOOL PUBLICATIONS
CallTheTux - Development of CallTheTux, a universal GSM stack for Linux.
Petnica Papers, 2007 `https://goo.gl/QTCy5U`
RealVM - Development of a new type of virtual machine which would allow parallel execution and fast switching between different operating systems.
Petnica Papers, 2006 `https://goo.gl/8TNHf5`
PrologAPI - Enabling the usage of Prolog constructs from C++.
Petnica Papers, 2005 `https://goo.gl/KpV3sF`

PATENTS
<u>Róbert Csordás</u>, Ágnes Kis-Benedek, Balázs Szalkai: **Method and Apparatus for Generating a Displacement Map of an Input Dataset Pair** - A neural network based method for fast and robust stereo matching for depth map generation.
US10380753 `https://pimg-fpiw.uspto.gov/fdd/53/807/103/0.pdf`

TECHNICAL STRENGTHS
Python, PyTorch, TensorFlow, C, C++, CUDA, OpenCV, Algorithms, Linux, JavaScript, Bash, Matlab, Assembly

OTHER SKILLS	**Machine learning frameworks:** PyTorch, TensorFlow, Torch
	Parallel programming: CUDA, numba
	Electronics: KiCAD, Eagle, PIC, PIC32, AVR, AVR32, ARM, XMOS, Xilinx
	Databases: MySQL, MongoDB, Sphinx search
	JavaScript technologies: NodeJS, jQuery
	Mobile development: Android, iOS (Swift)
	Operating systems: Linux, OS X, Windows
	Markup languages: LaTeX, XML, Markdown

HOBBY PROJECTS

MobilECG II - `https://github.com/robertcsordas/MobilECG-II`   2014 - 2016
Open source Holter ECG. Designed the schematic diagram and the firmware.

engineerjs.com - `http://engineerjs.com`   2013 - 2015
Extendable online computing environment for engineers, with physical quantity, complex numbers and linear algebra support.

LANGUAGES   Hungarian (native); English, Serbian (fluent); German, Italian (beginner)