

# Róbert Csordás

e-mail: robert@idsia.ch

tel: +41 76 4961457

website: <https://robertcsordas.github.io/>

## EDUCATION

**IDSIA** <http://idsia.ch>, Lugano, Switzerland

PhD student

2018-present

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

**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>

Róbert Csordás, 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, Róbert Csordás, Jürgen Schmidhuber: **Going Beyond Linear Transformers with Recurrent Fast Weight Programmers** - 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>

Róbert Csordás, 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>

Róbert Csordás, 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>

Róbert Csordás, 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, Róbert Csordás, Jürgen Schmidhuber: **Improving Baselines in the Wild**

*NeurIPS 2021 DistShift*

<https://openreview.net/forum?id=9vx0rkNTs1x>

## 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

Róbert Csordás, 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, X MOS, Xilinx

**Databases:** MySQL, MongoDB, Sphinx search  
**JavaScript technologies:** NodeJS, jQuery  
**Mobile development:** Android, iOS (Swift)  
**Operating systems:** Linux, OS X, Windows  
**Markup languages:**  $\text{\LaTeX}$ , 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)