ISMAIL KHALFAOUI HASSANI

Doctoral Student in Artificial Intelligence

ismail.khalfaoui-hassani@univ-tlse3.fr
Google Scholar: Ismail Khalfaoui Hassani
Personal website: https://ismakh.com
github.com/K-H-Ismail
@ismailkhalfaouihassani

EDUCATION

2020 – Now
Toulouse, France

Ph.D. Student in Computer Science. (thesis defense scheduled for March 2024). **ANITI / CNRS-CerCo / IRIT**
I am a Ph.D. student in computer science at the Université fédérale Toulouse Midi-Pyrénées. Currently in my final year, my Ph.D. is supported by the Artificial and Natural Intelligence Toulouse Institute (ANITI). I am advised by Timothée Masquelier and Thomas Pellegrini, and I am part of the CNRS-CerCo lab.

My research interests are:

- Artificial Intelligence.
- Deep Learning.
- Differentiable optimization.
- Computer Vision.
- Audio and speech recognition.
- Spiking Neural Networks.

2019 – 2020
Toulouse, France

Master's Degree **INPT-ENSEEIHT / Paul Sabatier Faculty**
Holder of the international master's degree titled: Performance in Software, Media and Scientific Computing (PSMSC). The full master's syllabus is available at `(psmsc)`.

2017 – 2020
Toulouse, France

Engineering Degree **INPT-ENSEEIHT**
Obtained from ENSEEIHT engineering school, option: HPC & Big Data, in the department of Digital Sciences. For more information please see: `(syllabus-enseeiht)`.

EXPERIENCE

2020
Toulouse, France
5 months

Research and Development Internship **INRAE - MIAT unit.**
Modeling of biological spiking neural networks that encode the pitch of sounds using synchrony receptive fields as well as the process of STDP (spike-timing-dependent plasticity) using an approach based on the discrete event system specification known as DEVS (`github.com/vle-forge/irritator`) .
`C++ / Cmake / DEVS / Biological Neurons`

2019
Toulouse, France
3 months

Research and Development Internship **CERFACS - ALGO team.**
Adaptation of the existent row version of the hybrid scheme implemented in the ABCD Solver to the column version, for solving large sparse unsymmetrical or overdetermined systems of equations on distributed memory parallel computers.
`C++ / MPI Boost / Cmake / Slurm`

SELECTED PUBLICATIONS

2023

Audio classification with Dilated Convolutions with Learnable Spacings **Neurips 2023 workshop Machine Learning for Audio.**
Khalfaoui-Hassani, I., Masquelier, T., & Pellegrini, T. (2023). Audio classification with Dilated Convolution with Learnable Spacings. arXiv preprint arXiv:2309.13972. (github.com/K-H-Ismail/Dcls-Audio).

2023

Dilated Convolution with Learnable Spacings: beyond bilinear interpolation **ICML 2023 workshop Differentiable Almost Everything.**
Khalfaoui-Hassani, I., Pellegrini, T., & Masquelier, T. Dilated convolution with learnable spacings: beyond bilinear interpolation. In ICML 2023 Workshop on Differentiable Almost Everything: Differentiable Relaxations, Algorithms, Operators, and Simulators, 2023. (`https://openreview.net/forum?id=j8FPBCltB9`).

2023

Adapting a ConvNeXt model to audio classification on AudioSet **InterSpeech 2023.**
Pellegrini, T., Khalfaoui-Hassani, I., Labbé, E., & Masquelier. Adapting a ConvNeXt model to audio classification on AudioSet. 24th INTERSPEECH Conference (INTERSPEECH 2023), Aug 2023, Dublin, Ireland.

2023

Dilated convolution with learnable spacings **ICLR 2023.**
Khalfaoui-Hassani, I., Pellegrini, T., & Masquelier, T. Dilated convolution with learnable spacings. In the 11th International Conference on Learning Representations (ICLR 2023), May 2023, Kigali, Rwanda. (`https://openreview.net/forum?id=Q3-1vRh3HOA`). (`github.com/K-H-Ismail/DCLS`).

2019

The Column Block Cimmino Method **CERAFCS - Technical report.**
Khalfaoui-Hassani, I., Leleux, P., & Ruiz, D. Internship report: The Column Block Cimmino Method.

SUBMISSIONS AND WORKING PAPERS

2023 **Learning Delays in Spiking Neural Networks using Dilated Convolutions with Learnable Spacings** **Submitted: arXiv preprint.**
Hammouamri, I., Khalfaoui-Hassani, I., & Masquelier, T. (2023). Learning Delays in Spiking Neural Networks using Dilated Convolutions with Learnable Spacings. arXiv preprint arXiv:2306.17670.

TEACHING ASSISTANTSHIP

During my doctoral studies, I served as a **part-time lecturer** at the **University of Toulouse** III, Paul Sabatier, where I delivered lectures, led discussion sections, and graded assignments and exams for undergraduate and master's courses. Over two years, I taught for a total of **120 hours**. This experience allowed me to develop strong teaching and mentoring skills, as well as to gain valuable experience in the classroom setting.

2022 – 2023 **Mathematics** **Level: first-year undergraduate (L1).**
Linear algebra.

2022 – 2023 **Optimization** **Level: first year of master's degree (M1).**
Convex analysis. Optimality conditions. Unconstrained optimization: descent algorithms, gradient method. `(link to the syllabus)`.

2021 – 2022 **Mathematics** **Level: first-year undergraduate (L1).**
Functions. Complex numbers. Polynomials.

2020 – 2023 **Introduction to sound processing & speech recognition** **Level: Master's +.**
Lecture on sound processing & speech recognition in AI. `(link to the recorded lecture)`.

SOFTWARES AND PROGRAMMING LANGUAGES

Drawing upon my experience, I am confident in my good **Python** skills, as well as my strong proficiency in **Pytorch**, **git**, **UNIX** commands and **LaTeX**. I am also highly proficient in **C++** and **Slurm**, with an extensive experience working with **MATLAB**, **R**, **CUDA**, **Java** and **MPI**.

Additionally, I am fully proficient in **multi-GPU**, **multi-node** parallel computing. This is illustrated by my experience carrying out many production runs on the **Jean Zay** supercomputer.

My diverse programming skill set highlights my ability to work with a range of languages and tools, and I am confident in my technical expertise to make valuable contributions to programming projects.

LANGUAGES

English - Advanced. C1. (TOEIC 2019: 950/990)

French - Fully bilingual

Arabic - Native

REFERENCES

Prof. Timothée Masquelier,
Expert in spiking neural networks,
CNRS CERCO Toulouse.
Timothee.MASQUELIER@cnrs.fr.

Prof. Daniel Ruiz,
Expert in numerical analysis.
IRIT Toulouse. INP Toulouse.
daniel.ruiz@enseeiht.fr.

Prof. Thomas Pellegrini,
Specialist in deep learning for audio applications,
IRIT Toulouse. INP Toulouse.
thomas.pellegrini@irit.fr.

Prof. Fabrice Gamboa,
Specialist in applied statistics and probability,
Vice-President of International Relations at
Paul Sabatier University.
fabrice.gamboa@math.univ-toulouse.fr.