# **Zaccharie Ramzi** | Deep Learning PhD student

☐ +33 628075699 • ☑ zaccharie.ramzi@gmail.com • ☐ zaccharieramzi

# **Professional experiences**

CEA & Inria Paris
PhD Student 2019-2022

- I analyzed and benchmarked the state-of-the-art in Deep Learning for MRI reconstruction.
- I designed and implemented new models for MRI reconstruction which allowed to me to secure the **2nd spot** in **the fastMRI 2020 reconstruction challenge**  $\Box$  organized by Facebook and NYU. This result was featured in 2 articles in the specialized press (CEA mag  $\Box$  and Contact  $\Box$ ).
- I used the public HPC Jean Zay ☑ for training neural networks in a distributed fashion. Also participated in creating a user's collaborative documentation ☑.
- I was the co-founder of and animated a lecture group focused on Deep Learning for students at Neurospin.
- I co-supervised 2 interns: Sophie Starck on the topic of GANs for reconstruction, and Kevin Michalewicz on the follow-up of my work on Learnlets.
- I peer-reviewed submissions for a number of scientific conferences and journals.

xbird Berlin
Data scientist 2017-2019

I built data pipelines, read scientific literature, specifically on human activity recognition, modeled and implemented ad hoc machine learning models to efficiently detect human activities with smartphone and wearable data (GPS, accelerometer), deployed to production and maintained said models, presented research results to both tech and non-tech teams.

## BioSerenity - Brain and Spine Institute

**Paris** 

Research intern April-August 2017

I benchmarked deep learning algorithms for epileptic crisis detection in EEG signals, implemented one in tensorflow and tried several improvements.

Celmatix New-York

Data engineer and data science intern

March-September 2016

As a data engineer, I implemented data pipelines for genomic meta-analysis and deployed them to production. As a data scientist, I developed a blood hormone level model.

Ekimetrics Paris

Data science intern

August 2015-February 2016

I was in charge of the full stack development of web applications and performed data analysis on said web applications as well as on social media data.

## **Education**

#### CEA Neurospin & Cosmostat - INRIA Saclay Parietal team, PhD

Paris

PhD in deep learning for image reconstruction

Since February 2019

The main focus of my thesis is to build an architecture that will allow for the reconstruction of undersampled MRI data in 3D and 3D+time. This requires working in the fields of compressed sensing, optimization, computer vision, deep learning, wavelets.

ENS Cachan, MVA Cachan

MSc in Mathematics, Vision and Learning, graduated with highest honors (16.3) 2016–2017 Courses in statistical learning, optimization, graphs, graphical models, reinforcement learning, object recognition, kernel methods, text mining, bandit theory

Telecom ParisTech Paris

Engineering diploma, specialization in machine learning 2013–2017

Courses in mathematical statistics, optimization, relational databases, data mining, data visualization, introduction to machine learning

# **Technical skills**

- o My go-to programming language: Python (TensorFlow, PyTorch, Numpy, Pytest, ...)
- $\circ$  My typical development environment: Atom + Git + Jupyter notebook
- o Programming languages I have used: Java, Scala, Ruby, Javascript, R, Matlab, Shell
- o Other tools in my stack: Docker, SLURM, LaTex, Linux, GitHub CI, Travis CI
- o **Open source contributions:** Apple's coremltools ♂, TensorFlow ♂, scikit-image ♂

# Open source projects

A selection of the open sources projects I took part in during my thesis. All of them are on Github.

## fastmri-reproducible-benchmark

Deep Learning for MRI reconstruction

Of as tmri-reproducible-benchmark

Using the code in this repo, I secured the 2nd spot in the fastMRI 2020 brain reconstruction challenge.

#### TF-KB-NUFFT

Non-Uniform Fast Fourier Transform in TensorFlow

The NUFFT is essential in applications ranging from MRI to Cosmology.

#### **GRAPPA**

GRAPPA algorithm for MRI reconstruction
The typical reconstruction algorithm used in Siemens MRI scanners.

 $\mathbf{O}$ grappa

#### PySap suite

Modular Optimisation, Multidisciplinary Image Processing

**O**ModOpt, **O**pysap-mri

### Miscellaneous

- o I was a private tutor from 2012 till 2015. I helped high school students in maths and physics.
- o French is my mother tongue and I speak English at a C1 level (TOEFL: 110). I can speak a bit of conversational German.
- o I was part of a football team for 5 years, mostly during my high school years. In the process we secured the first spot in the second departmental division and got promoted to the first division.
- o I am a huge Coen Brothers and Stanley Kubrick enthusiast. More generally I love cinema, and enjoy a lot watching the web-serie *Blow up* by ARTE.

# **Publications**

- Ramzi, Z., Vignaud, A., Starck, J.-L., Ciuciu, P., "Is good old GRAPPA dead?" In *ISMRM*, 2021. [Online]. Available: https://arxiv.org/abs/2106.00753.
- Muckley, M. J., Riemenschneider, B., Radmanesh, A., Kim, S., Jeong, G., Ko, J., Jun, Y., Shin, H., Hwang, D., Mostapha, M., Arberet, S., Nickel, D., **Ramzi, Z.**, Ciuciu, P., Starck, J. L., Teuwen, J., Karkalousos, D., Zhang, C., Sriram, A., Huang, Z., Yakubova, N., Lui, Y. W., Knoll, F., "Results of the 2020 fastMRI Challenge for Machine Learning MR Image Reconstruction," *IEEE Transactions on Medical Imaging*, pp. 1–12, 2021. [Online]. Available: https://arxiv.org/abs/2012.06318.
- **Ramzi, Z.**, Mannel, F., Bai, S., Starck, J.-L., Ciuciu, P., Moreau, T., "SHINE: SHaring the INverse Estimate from the forward pass for bi-level optimization and implicit models," Jun. 2021, [Online]. Available: http://arxiv.org/abs/2106.00553.
- Ramzi, Z., Ciuciu, P., Starck, J.-L., "Density Compensated Unrolled Networks for Non-Cartesian MRI Reconstruction," in 2021 IEEE 18th International Symposium on Biomedical Imaging (ISBI), 2021. [Online]. Available: http://arxiv.org/abs/2101.01570.
- Ramzi, Z., Starck, J.-I., Moreau, T., Ciuciu, P., "Wavelets in the deep learning era," in *European Signal Processing Conference*, 2020, pp. 1417–1421. [Online]. Available: https://hal.archivesouvertes.fr/hal-03020214.
- Remy, B., Lanusse, F., **Ramzi, Z.**, Liu, J., Jeffrey, N., Starck, J.-L., "Probabilistic Mapping of Dark Matter by Neural Score Matching," in *NeurIPS 2020 Machine Learning for Physical sciences workshop*, 2020, pp. 1–6. [Online]. Available: http://arxiv.org/abs/2011.08271.
- Ramzi, Z., Remy, B., Lanusse, F., Starck, J.-L., Ciuciu, P., "Denoising Score-Matching for Uncertainty Quantification in Inverse Problems," in *NeurIPS 2020 Deep Learning and Inverse Problems workshop*, 2020. [Online]. Available: http://arxiv.org/abs/2011.08698.
- Farrens, S., Grigis, A., El Gueddari, L., **Ramzi, Z.**, Chaithya, G., Starck, S., Sarthou, B., Cherkaoui, H., Ciuciu, P., Starck, J.-L., "PySAP: Python Sparse Data Analysis Package for multidisciplinary image processing," *Astronomy and Computing*, vol. 32, 2020. [Online]. Available: https://arxiv.org/abs/1910.08465.
- Ramzi, Z., Ciuciu, P., Starck, J. L., "Benchmarking MRI reconstruction neural networks on large public datasets," *Applied Sciences (Switzerland)*, vol. 10, no. 5, 2020. [Online]. Available: https://www.mdpi.com/2076-3417/10/5/1816.
- Ramzi, Z., Ciuciu, P., Starck, J.-L., "Benchmarking Deep Nets MRI Reconstruction Models on the FastMRI Publicly Available Dataset," in *ISBI 2020 International Symposium on Biomedical Imaging*, 2020. [Online]. Available: https://hal.inria.fr/hal-02436223.
- GR, C., Ramzi, Z., Ciuciu, P., "Learning the sampling density in 2D SPARKLING MRI acquisition for optimized image reconstruction," 2021, [Online]. Available: https://hal.inria.fr/hal-03158831v2.
- Ramzi, Z., Ciuciu, P., Starck, J.-L., Starck Benchmarking, J.-L., "Benchmarking proximal methods acceleration enhancements for CS-acquired MR image analysis reconstruction," in *SPARS 2019 Signal Processing with Adaptive Sparse Structured Representations Workshop*, 2019. [Online]. Available: https://hal.inria.fr/hal-02298569.
- **Ramzi, Z.**, Ciuciu, P., Starck, J.-L., "XPDNet for MRI Reconstruction: an Application to the fastMRI 2020 Brain Challenge," Tech. Rep., 2020, pp. 1–4. [Online]. Available: http://arxiv.org/abs/2010.07290.