Joaquim Campos

Personal data

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In Brief

I am an engineer and researcher specializing in signal processing and artificial intelligence, and I am also a Python developer. In academia, my focus has been on deep learning, learning theory, image and video compression, and inverse problems. Additionally, I co-founded Radiobooks, a startup that assists independent authors and self-learners in automatically converting their books into audiobooks using AI. Through this venture, I have gained knowledge in both product development and DevOps.

Highlights:

- 7 publications with over 300 citations in top-tier venues, and 3 patents.
- Contributed to the development of pioneering methods in neural compression.
- Crafted novel algorithms for learning the activation functions of a neural network.
- Created the "Deep Splines" PyTorch package.
- Co-Founded Radiobooks—a startup that makes AI text-to-speech technology.
- Built the back-end of a complex text-to-speech app.

Education

2020 Feb 2016 Sep	**MSc in Communication Systems.** *Specialization: Signals, Images and Interfaces.* EPFL (École Polytechnique Fédérale de Lausanne), Lausanne, Switzerland. School: School of Computer and Communication Sciences. Grade: **5.67/6.00** — Ranking: 2nd/31 Focus on signal processing and artificial intelligence. Master's thesis: *Higher-Order Regularization Methods for Supervised Learning.*
2016 Jul 2013 Sep	**BSc in Electrical and Computer Engineering.** Universidade de Lisboa, Lisbon, Portugal. School: Instituto Superior Técnico. Grade: **16.4/20.0**

Work experience

2023 Dec 2022 Aug	**Co-Founder at Radiobooks.** *Converting books into audiobooks automatically using Artificial Intelligence* • Designed and built an app for revising AI-generated audio. • Our tech stack included Python, FastAPI, MongoDB, Pytest, Docker, GitHub Actions, Codecov, Fly.io, AWS S3, and Better Stack.
2021 Sep 2020 Apr	**Research and Teaching Assistant** *Supervised Learning with Sparsity-Promoting Regularization* Biomedical Imaging Group, EPFL, Lausanne, Switzerland. • Developed a novel framework to learn the activation functions of a neural network; • Designed a spline-based supervised learning method which constructs piecewise-linear models with few regions (sparse).
2018 Aug 2019 Mar	**Research Intern** *Image and Video Compression using Deep Learning* Disney Research Studios, Zurich, Switzerland. • Developed the first content-adaptive neural image compression scheme; • Aided in the construction of a state-of-the-art neural video compression framework.

Teaching experience

Current 2020 Sep	**Teaching assistance in the courses MICRO-310/11: Signals and Systems I/II** EPFL (École Polytechnique Fédérale de Lausanne), Lausanne, Switzerland. Taught by Prof. Michael Unser to the *Life Sciences* and *Microenginneering* sections.
Current 2020 Sep	**Supervision of Master semester projects** EPFL (École Polytechnique Fédérale de Lausanne), Lausanne, Switzerland. Co-supervisor of two Master semester projects on lipschitz-constrained GANs.

Skills

Expertise:	Theoretical and practical aspects of machine learning, deep learning, and signal processing; Python development.
DevOps Experience:	Python, C, FastAPI, Pytest, PyTorch, CI/CD, Bash, Linux, MongoDB, Docker, Github Actions, Codecov, AWS, Fly.io, Better Stack.
Other skills:	During my academic years, I developed valuable presentation, writing, and teaching skills, much of which I owe to Prof. Michael Unser.

Languages

Mother tongue:	Portuguese
Professional (C1):	English
Advanced (B2):	Spanish
Conversational (B1):	French

The publications can be consulted here.

Publications: Science

[1] A. Goujon, J. Campos, and M. Unser, "Stable parameterization of continuous and piecewise-linear functions," *Applied and Computational Harmonic Analysis*, vol. 67, p. 101581, Nov. 2023.

[2] S. Aziznejad, J. Campos, and M. Unser, "Measuring Complexity of Learning Schemes Using Hessian-Schatten Total Variation," *SIAM Journal on Mathematics of Data Science*, vol. 5, no. 2, pp. 422–445, Jun. 2023.

[3] J. Campos, S. Aziznejad, and M. Unser, "Learning of Continuous and Piecewise-Linear Functions With Hessian Total-Variation Regularization," *IEEE Open Journal of Signal Processing*, vol. 3, pp. 36–48, Dec. 2021.

[4] P. Bohra, J. Campos, H. Gupta, S. Aziznejad, and M. Unser, "Learning Activation Functions in Deep (Spline) Neural Networks," *IEEE Open Journal of Signal Processing*, vol. 1, pp. 295–309, Nov. 2020.

[5] S. Aziznejad, H. Gupta, J. Campos, and M. Unser, "Deep Neural Networks With Trainable Activations and Controlled Lipschitz Constant," *IEEE Transactions on Signal Processing*, vol. 68, pp. 4688–4699, Aug. 2020.

[6] A. Djelouah, J. Campos, S. Schaub-Meyer, and C. Schroers, "Neural Inter-Frame Compression for Video Coding," in *Proceedings of the Proceedings of the 2019 IEEE/CVF International Conference on Computer Vision (ICCV)*, Oct. 2019.

[7] J. Campos, S. Meierhans, A. Djelouah, and C. Schroers, "Content Adaptive Optimization for Neural Image Compression," in *Proceedings of the 2019 IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR) Workshops*, Jun. 2019.

Publications: Philosophy

[1] J. Campos, "Mahayana Buddhist Ethics: Deontological, Virtue-Based or Consequentialist? An Optimization Theory Perspective."

[2] J. Campos, "On the Wrongness of Killing Non-Human Animals," Course Thesis, École Polytéchnique Fédérale de Lausanne, May 2018.

Patents

[1] C. Schroers, S. Meierhans, J. Campos, J. Mcphillen, A. Djelouah, E. Varis Doggett, S. Labrozzi, and Y. Xue, "Content Adaptive Optimization for Neural Data Compression," US Patent 11,057,634, Nov., 2020.

[2] C. Schroers, J. Campos, A. Djelouah, Y. Xue, E. Varis Doggett, J. Mcphillen, and S. Labrozzi, "Systems and Methods for Reconstructing Frames," US Patent 10,972,749, Mar., 2021.

[3] C. Schroers, J. Campos, A. Djelouah, Y. Xue, E. Varis Doggett, J. Mcphillen, and S. Labrozzi, "Systems and Methods for Generating a Latent Space Residual," US Patent 11,012,718, Mar., 2021.