# Pol del Aguila Pla, Ph.D.

## Personal data


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|---|---|
| Place and date of birth: | Barcelona, Catalonia, on 13 September 1990 |
| Home address: | Avenue du Léman 31, 1025 St-Sulpice (Vaud), Switzerland |
| Mobile phone: | +46 (0)729429302. +41 (0)767898558 |
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## Research experience

*Current* – 2019 Oct
Research Staff Scientist
*Mathematical Imaging*
**CIBM** Center for Biomedical Imaging, SP EPFL, Switzerland. Advisor: **Prof. Michael Unser**.

*Current* – 2019 Oct
Postdoctoral Researcher
*Biomedical Imaging*
**EPFL**'s Biomedical Imaging Group, Lausanne, Switzerland. Advisor: **Prof. Michael Unser**.

2019 Sept – 2014 Sept
Ph.D. Thesis
*Inverse problems in signal processing: Functional optimization, parameter estimation and machine learning*
Division of Information Science and Engineering, School of Electrical Engineering and Computer Science, **KTH** Royal Institute of Technology, Stockholm, Sweden. Supervisor: **Prof. Joakim Jaldén**. Opponent: **Prof. Yonina Eldar**, Weizmann Institute of Science, Israel. Defense date: 16 Sept 2019.

2014 Sept – 2014 Mar
Research Engineer
*Probability density estimation, a review of the state of the art.*
Department of Signal Processing, School of Electrical Engineering, **KTH** Royal Institute of Technology, Stockholm, Sweden. Supervisor: **Prof. Joakim Jaldén**.

## University education

2014 Mar – 2012 Aug
*Civilingenjör*, 5-year degree in **Electrical Engineering**
**KTH Royal Institute of Technology**, School of Electrical Engineering, Stockholm, Sweden. Heavily specialized in signal processing and its applications to communications and imaging. Double degree program.
**Thesis:** Normalization of remote sensing imagery for automatic information extraction. Department of Communication Theory, School of Electrical Engineering, **KTH** Royal Institute of Technology, Stockholm, Sweden. Supervisors and examiner: **Dr. Felipe Calderero, Prof. Ferran Marqués, and Prof. Markus Flierl**.

2014 Mar – 2008 Sep
*Enginyer de Telecomunicació*, 5-year degree in **Telecommunications Engineering**
**UPC BarcelonaTech**, *Escola Tècnica Superior d'Enginyeria de Telecomunicació de Barcelona*, Barcelona, Catalonia. Specialized in signal processing and its applications to pattern recognition and speech processing. Double degree program.

## Journal papers

[J1] P. Bohra, **P. del Aguila Pla**, J.-F. Giovannelli, and M. Unser, "A statistical framework to investigate the optimality of neural networks for inverse problems," *Under review at the IEEE Transactions on Signal Processing*, 2022. Access at https://arxiv.org/abs/2203.09920

[J2] **P. del Aguila Pla**, S. Neumayer, and M. Unser, "Stability of image-reconstruction algorithms," *IEEE Transactions on Computational Imaging, Early Access*, 2023. Access at http://bigwww.epfl.ch/preprints/delaguilapla2301p.html

[J3] **P. del Aguila Pla**, A. Boquet-Pujadas, and J. Jaldén, "Convex quantization preserves logconcavity," *IEEE Signal Processing Letters*, vol. 29, pp. 2697–2701, 2022. Access at http://bigwww.epfl.ch/publications/delaguilapla2202.html

[J4] **P. del Aguila Pla**, L. Pellaco, S. Dwivedi, P. Händel, and J. Jaldén, "Clock synchronization over networks — Identifiability of the sawtooth model," *IEEE Open Journal of Signal Processing*, vol. 1, pp. 14–27, 2020. Access at http://bigwww.epfl.ch/publications/delaguilapla2002.html

[J5] **P. del Aguila Pla** and J. Jaldén, "Cell detection by functional inverse diffusion and non-negative group sparsity—Part II: Proximal optimization and Performance evaluation," *IEEE Transactions on Signal Processing*, vol. 66, no. 20, pp. 5422–5437, 2018. Access at http://urn.kb.se/resolve?urn=urn:nbn:se:kth:diva-233827

[J6] **P. del Aguila Pla** and J. Jaldén, "Cell detection by functional inverse diffusion and non-negative group sparsity—Part I: Modeling and Inverse problems," *IEEE Transactions on Signal Processing*, vol. 66, no. 20, pp. 5407–5421, 2018. Access at http://urn.kb.se/resolve?urn=urn:nbn:se:kth:diva-233824

## Conference papers

[C1] K. Lächler, H. Lajous, M. Unser, and **P. del Aguila Pla**, "Self-supervised isotropic superresolution fetal brain MRI," *Submitted to ISBI 2023*, 2023. Access at https://arxiv.org/abs/2211.06502

[C2] A. Boquet-Pujadas, **P. del Aguila Pla**, and M. Unser, "PET Rebinning with regularized density splines," *Submitted to ISBI 2023*, 2023.

[C3] **P. del Aguila Pla** and M. Unser, "Bona fide Riesz projections for density estimation," in *2022 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*, May 2022, pp. 5613–5616. Access at https://arxiv.org/abs/2204.13606

[C4] Q. Denoyelle, T. an Pham, **P. del Aguila Pla**, D. Sage, and M. Unser, "Optimal-transport-based metric for smlm," in *2021 IEEE 18th International Symposium on Biomedical Imaging (ISBI 2021)*, April 2021, pp. 797–801. Access at http://bigwww.epfl.ch/publications/denoyelle2101.html

[C5] **P. del Aguila Pla**, L. Pellaco, S. Dwivedi, P. Händel, and J. Jaldén, "Clock synchronization over networks using sawtooth models," in *2020 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*, May 2020, pp. 5945–5949. Access at http://bigwww.epfl.ch/publications/delaguilapla2001.html

[C6] **P. del Aguila Pla**, V. Saxena, and J. Jaldén, "Spotnet – Learned iterations for cell detection in image-based immunoassays," in *2019 IEEE 16th International Symposium on Biomedical Imaging (ISBI 2019)*, April 2019, pp. 1023–1027. Access at http://urn.kb.se/resolve?urn=urn:nbn:se:kth:diva-250464

[C7] **P. del Aguila Pla** and J. Jaldén, "Convolutional group-sparse coding and source localization," in *2018 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*, April 2018, pp. 2776–2780. Access at http://urn.kb.se/resolve?urn=urn:nbn:se:kth:diva-224253

[C8] **P. del Aguila Pla** and J. Jaldén, "Cell detection on image-based immunoassays," in *2018 IEEE 15th International Symposium on Biomedical Imaging (ISBI 2018)*, April 2018, pp. 431–435. Access at http://urn.kb.se/resolve?urn=urn:nbn:se:kth:diva-223933

[C9] **P. del Aguila Pla**, F. Calderero, F. Marqués, J. Marcello, and F. Eugenio, "Fast generation of LULC maps for temporal studies in North-Western Africa," in *2014 IEEE International Geoscience and Remote Sensing Symposium (IGARSS 2014)*, 2014, pp. 4280–4283. Access at http://urn.kb.se/resolve?urn=urn:nbn:se:kth:diva-157117

## Patents

[P1] C. Smedman, J. Jaldén, D. Pelikan, **P. del Aguila Pla**, and K. Magnusson, "Method and system for analysing fluorospot assays," Swedish Patent SE 543 211 C2, 2017.

[P2] C. Smedman, J. Jaldén, D. Pelikan, **P. del Aguila Pla**, and K. Magnusson, "Method and system for analysing fluorospot assays," International Patent Application, 2018. Access at https://patents.google.com/patent/WO2019004913A1

## Impact of my research: Patent and products

The technology developed in [J6, J5], protected by [P1], was implemented by Mabtech AB and Quamcom Research & Technology AB, resulting in two very successful tools for immunology researchers. The FluoroSpot and ELISpot readers Mabtech IRIS (`https://www.mabtech.com/iris`) and Mabtech ASTOR (`https://www.mabtech.com/astor`). Up to the end of 2022, 200+ of these machines are deployed, and many scientific papers relying on them have been published. References at Mabtech AB: **Dr. Christian Smedman** and **Prof. Staffan Paulie**.

## Grants and awards

2021 Jun | EPFL DRIL Fund CHF $44'000 \approx$ **46** k$.

2020 Jun | **EPFL Digital Resources for Instruction and Learning** grant, awarded to me and Dr. Daniel Sage for the development of **breakthrough pedagogical resources** to teach image-processing programming remotely.

2019 Mar | Travel grants during my Ph.D. studies. Total of $\approx 78$ kSEK $\approx$ **8.4** k$.

2017 Sep | Gålöstiftelsen study **travel grant**, Malme's foundation **travel grant** through the EECS school at KTH, KTH Opportunities Fund **project scholarship**, Knut and Alice Wallenberg Jubilee appropriation **travel grant**, Åforsk Foundation **travel grant**, and Engineering Sciences 2017 call from The Royal Swedish Academy of Sciences (KVA, call ES2017-0011) **project and travel grant.**

2009 Jun | Promotion's top-10 award. Ranked $4^{\text{th}}$.

2008 Sep | Receiver of the UPC BarcelonaTech award for **first year students with top-10 grades** in Telecommunications Engineering.

## Invited Talks and Tutorials

2021 Jun | **Invited talk** at the *IEEE Finland Joint Chapter of the Signal Processing and Circuits and Systems Societies*
Lecture presentation, titled **Remote and interactive image processing programming laboratories with Jupyter**.
Webinar, access at https://youtu.be/AF18wN37B6Q.

2020 Aug | **Tutorial** at the *European Molecular Imaging Meeting* (**EMIM 2020**)
Lecture, titled **Biomedical imaging as an inverse problem**.
Webinar, access at https://youtu.be/JEQKCYyl9wg.

2020 May | **Tutorial** at the *IEEE International Conference on Acoustics, Speech and Signal Processing* (**ICASSP 2020**)
Lecture, titled **Biomedical image reconstruction—From foundations to deep neural networks**, jointly with Prof. Michael Unser.
Webinar, access at https://youtu.be/J6_5rPYnr_s.

## Regular talks at international research events

2022 May | Lecture presentation at the *IEEE International Conference on Acoustics, Speech and Signal Processing* (**ICASSP 2022**), titled **Bona fide Riesz projections for density estimation**.
Marina Bay Sands Convention Centre, Singapore, Singapore. Access at https://youtu.be/Lc1zASwhngQ.

2020 May | Lecture presentation at the *IEEE International Conference on Acoustics, Speech and Signal Processing* (**ICASSP 2020**), titled **Clock synchronization over networks using sawtooth models**.
Webinar, access at https://youtu.be/Lc1zASwhngQ.

2019 Apr | Lecture presentation at the *2019 IEEE* $16^{\text{th}}$ *International Symposium on Biomedical Imaging* (**ISBI 2019**), titled **SpotNet — Learned iterations for cell detection in image-based immunoassays**, access programme at https://embs.papercept.net.
Hilton Molino Stucky, Venice, Italy.

2018 Jun | Poster presentation within the *SIAM Conference on Imaging Science* (**SIAM-IS 2018**), titled **Source localization by spatially variant blind deconvolution**.
**University of Bologna**, Bologna, Italy.

2018 Apr | Poster presentation within the *IEEE International Conference on Acoustics, Speech and Signal Processing* (**ICASSP 2018**), titled **Convolutional group-sparse coding and source localization**, access at sigport.org.
Calgary Talus Convention Centre, Calgary, Alberta, Canada.

Poster presentation within the *2018 IEEE* $15^{\text{th}}$ *International Symposium on Biomedical Imaging* (**ISBI 2018**), titled **Cell detection on image-based immunoassays**.
Omni Shoreham Hotel, Washington, D.C., United States of America.

2017 Nov | Lecture presentation within the workshop *Generative models, parameter learning, and sparsity* (VMVW02), titled **Cell detection by functional inverse diffusion and group sparsity**, access at downloads.sms.cam.ac.uk.
**Isaac Newton Institute for Mathematical Sciences**, **University of Cambridge**, Cambridge, United Kingdom. Within the programme *Variational methods and effective algorithms for imaging and vision*.

## Teaching experience

2022 Jul<br>2020 Jan | Course development and teaching assistance in the **EPFL** courses **MICRO-511/512 Image Processing 1/2**
Taught on alternate semesters by Prof. Michael Unser, Prof. Dimitri Van De Ville, and 10 to 15 assistants. Development of **breakthrough pedagogical resources** to teach image-processing programming remotely: 40 Jupyter-notebook-based auto-graded image-processing programming laboratory exercises. **Funded and highlighted by the EPFL Center for Digital Education** (see https://go.epfl.ch/JupyterEPFL).

*Current*<br>2017 Feb | Supervision of Master's and Bachelor's thesis and projects (**EPFL** and **KTH**)
**Project design and supervision** of M.Sc. thesis [ST1, ST2, ST3]. Project design and supervision of M.Sc. semester projects [ST4]. Project design and supervision of B.Sc. thesis [ST5, ST6, ST7, ST8, ST9, ST10, ST11, ST12].

2018 Dec<br>2014 Sep | Teaching assistance in the **KTH** course **EQ2300: Digital Signal Processing**
Taught every year Nov – Dec by Prof. Joakim Jaldén and one to three assistants. Replacement lecturing, guidance of exercise sessions, course material development (exercise collection), grading of projects and exams, and private tutoring.

## Supervised student theses

[ST1] K. Lächler, "Advanced machine learning for single-acquisition isotropic fetal mri," Master's thesis, École polytechnique fédérale de Lausanne (EPFL), Lausanne, Switzerland, 2022. Access at https://poldap.github.io/data/pubs/laechler2022.pdf

[ST2] J. Anguera Peris, "Deep learning for differential privacy and density estimation," Master's thesis, KTH Royal Institute of Technology, Stockholm, Sweden, 2019. Access at http://urn.kb.se/resolve?urn=urn:nbn:se:kth:diva-265666

[ST3] D. Jones, "Automated rodent sleep analysis with modern machine learning methods," Master's thesis, KTH Royal Institute of Technology, Stockholm, Sweden, 2018. Access at http://urn.kb.se/resolve?urn=urn:nbn:se:kth:diva-229398

[ST4] A. Noguerón Aramburu, "Proximal operators for nonnegative inverse problems," Semester Project, École polytechnique fédérale de Lausanne (EPFL), Lausanne, Switzerland, 2021. Access at https://poldap.github.io/data/pubs/nogueron2021.pdf

[ST5] A. J. Tauste and N. Rydberg, "Area of interest identification using circle Hough transform and outlier removal for ELISpot and Fluorospot images," Bachelor's Thesis, KTH Royal Institute of Technology, Stockholm, Sweden, 2019. Access at http://urn.kb.se/resolve?urn=urn:nbn:se:kth:diva-254256

[ST6] Y. Modahl and C. Skoglund, "Lokalisering av brunnar i ELISpot," Bachelor's Thesis, KTH Royal Institute of Technology, Stockholm, Sweden, 2019. Access at http://urn.kb.se/resolve?urn=urn:nbn:se:kth:diva-254257

[ST7] S. Vestergren and N. Zandpour, "Automatic image segmentation for hair masking: Two methods," Bachelor's Thesis, KTH Royal Institute of Technology, Stockholm, Sweden, 2019. Access at http://urn.kb.se/resolve?urn=urn:nbn:se:kth:diva-254258

[ST8] G. Bengtsson and J. Larsson, "Source localization by inverse diffusion and convex optimization," Bachelor's Thesis, KTH Royal Institute of Technology, Stockholm, Sweden, 2018. Access at http://urn.kb.se/resolve?urn=urn:nbn:se:kth:diva-230738

[ST9] J. Sörell and E. Ågeby, "Inverse diffusion by proximal optimization with TensorFlow," Bachelor's Thesis, KTH Royal Institute of Technology, Stockholm, Sweden, 2018. Access at http://urn.kb.se/resolve?urn=urn:nbn:se:kth:diva-239369

[ST10] L. Colérus and K. Rehn, "Automatic sleep scoring using Keras," Bachelor's Thesis, KTH Royal Institute of Technology, Stockholm, Sweden, 2018. Access at http://urn.kb.se/resolve?urn=urn:nbn:se:kth:diva-230905

[ST11] J. Malmström and N. Yavari, "Power spectral density based sleep scoring using artificial neural networks," Bachelor's Thesis, KTH Royal Institute of Technology, Stockholm, Sweden, 2018. Access at http://urn.kb.se/resolve?urn=urn:nbn:se:kth:diva-239371

[ST12] D. Ekvall and R. Winqvist, "Machine learning for sleep scoring," Bachelor's Thesis, KTH Royal Institute of Technology, Stockholm, Sweden, 2018. Access at http://urn.kb.se/resolve?urn=urn:nbn:se:kth:diva-239372

## General skills

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| Programming: | Python, Matlab, Julia, C/C++, Java, JavaScript, R, TensorFlow, PyTorch, Bash, and LaTeX. |
| Open-source projects: | Lead open-source projects `interactive-kit` (PyPI, see https://go.epfl.ch/interactive-kit), `image-access` (Node.js, see https://go.epfl.ch/image-access). Contributed to `Pycsou` (see https://go.epfl.ch/Pycsou). |
| Languages: | Mother tongue (C2+): Catalan and Spanish, Professional (C2): English, Conversational (B2): Swedish and French, Basic (A1-A2): Italian. |
| Technical skills: | Experienced administor of GPU-enabled Linux computational servers (KTH and EPFL). Experienced in the maintenance of academic (group/individual) websites. |
| Soft skills: | Social and friendly collaborator. Praised supervisor of student theses and teacher of exercise sessions. Very attentive to detail and reliable. Experienced in academia–industry collaborations. |

## Other information

Catalan and Swedish citizen. Father of one (Hans, 2019.12.24). 10 days of Swiss parental leave in Jan 2019. Worked from home for 2 years due to EPFL regulations with regards to the COVID-19 pandemic.