

# ANA FERNANDEZ VIDAL

Tygelsjövägen 200, 218 75, Tygelsjö, Malmö, Sweden  
a.fernandez-vidal@hw.ac.uk    +44 7411 911 213    +46 76 848 10 46

## EDUCATION

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- School of Mathematical and Computer Sciences, Heriot-Watt University** 2017.09 - 2020.09  
*PhD in Statistics* - Nominated for best PhD thesis award.
- School of Engineering, Universidad de Buenos Aires** 2011.03 - 2015.03  
*Master's in Electronic Engineering*, GPA: 8.64/10
- Instituto Tecnológico de Buenos Aires** 2008.03 - 2010.12  
*Electrical Engineering*

## WORK EXPERIENCE

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- INVAP** - First company in Latin America certified by NASA to build satellites and ground stations 2015.11 - 2017.08  
*Satellite Software Engineer* - Aerospace industry.
- Designed and implemented some modules for a SAOCOM satellite simulator (C++ and Python).
  - Developed a C++ library for module interconnection which can parse, validate and export many different types of files and formats (JSON, XML, YAML).
  - Worked on a module whose function was to simulate networks and data flow inside the satellite.
- Theia Consulting SRL** 2014.11 - 2015.09  
*Software Engineer* - Aerospace industry.
- Designed and implemented a system for generating, visualizing and editing datasets to be used by different modules of the SAOCOM satellite.
  - Developed a C++ backend which allowed to handle many different types of signals and filters employed by the satellite's SAR radar.
  - Implemented GUIs in Python using PyQt.
  - Created user applications to allow both power and regular users to operate the SAR radar within the SAOCOM satellite. Worked with LAMP infrastructure (Linux, Apache2, PHP and MySQL) and JavaScript.
- InterPROAV** 2014.06 - 2017.08  
*Freelance Programming* - Audio, Video, Multimedia and Domotics.
- AVM Domotia** 2012.02 - 2014.06  
*Project Manager & Developer* - Audio, Video, Multimedia and Domotics.

## RESEARCH EXPERIENCE

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- School of Mathematical & Computer Sciences, Heriot-Watt University** 2020.05 - Present  
*Research Associate*
- Developed a new metric to measure document-topic allocation quality in a topic model.
  - Contributed to a Java pipeline that produces topic map visualisations, focusing on improving the convergence of a collapsed Gibbs sampler that presented some erratic behaviour.
  - Research Areas: Topic modelling and mapping, stochastic optimisation in high-dimensional inverse problems, explainable machine learning, mixed membership models.
- Mathematical Imaging Group, Heriot-Watt University** 2017.09 - 2020.09  
*PhD Thesis*
- Title: Bayesian computation in imaging inverse problems with partially unknown models.

- Developed a new Bayesian stochastic optimisation algorithm for estimating unknown model parameters, that combines modern convex optimisation and stochastic sampling techniques.
- Proposed a new empirical Bayesian method for model selection.
- Research Areas: Mathematical imaging, inverse problems, high-dimensional Bayesian statistical analysis and computation, stochastic optimisation, Markov chain Monte Carlo methods.

**Material Optics and Electromagnetic Applications Group, UBA** 2015.12 - 2017.03  
*MEng Thesis*

- Title: Study of piezoelectric broadband sensors for optoacoustic applications.
- Developed a mathematical model for broadband piezoelectric polymer sensors and validated it with experimental data. Implemented an interactive tool to model and simulate such sensors.

**Centro de Investigación y Desarrollo de Electrónica Industrial, ITBA** 2010.03 - 2011.02  
*Research Assistant*

- Industrial R&D - Mathematical modeling of a multilevel current converter.

**Instituto Tecnológico de Buenos Aires** 2009.03 - 2010.03  
*Research Project*

- ITBA R&D 2009 project “Linking Alternative Energy to the Electrical Network”.

## SCHOLARSHIPS

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**James Watt Scholarship** 2017 - 2020  
 Competitive PhD scholarship awarded by Heriot-Watt University.

**Becas Jóvenes Profesionales TIC 2015** 2016  
 Competitive MSc scholarship awarded by FONSOFT.

**Electrical Engineering Full Scholarship at ITBA** 2008 - 2010  
 Competitive BSc scholarship awarded by AES Corporation.

## PUBLICATIONS - JOURNALS AND CONFERENCE PROCEEDINGS

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A. F. Vidal, M. Pereyra, A. Durmus and J.F. Giovannelli, “Fast Bayesian model selection in imaging inverse problems using residuals”. To appear in *Proc. 2021 IEEE Statistical Signal Processing Workshop (SSP)*, Jul. 2021.

A. F. Vidal, V. De Bortoli, M. Pereyra and A. Durmus, “Maximum likelihood estimation of regularisation parameters in high-dimensional inverse problems: an empirical Bayesian approach. Part I: Methodology and Experiments”, *SIAM Journal on Imaging Sciences*, 13(4), 1945-1989, Nov. 2020.

V. De Bortoli, A. Durmus, M. Pereyra, and A. F. Vidal, “Maximum likelihood estimation of regularisation parameters in high-dimensional inverse problems: an empirical Bayesian approach. Part II: Theoretical Analysis”, *SIAM Journal on Imaging Sciences*, 13(4), 1990-2028, Nov. 2020.

V. De Bortoli, A. Durmus, M. Pereyra and A. F. Vidal, “Efficient stochastic optimisation by unadjusted Langevin Monte Carlo. Application to maximum marginal likelihood and empirical Bayesian estimation”, submitted to *Statistics and Computing*. Pre-print at arXiv:1906.12281, Jun. 2019.

A. F. Vidal and M. Pereyra, “Maximum likelihood estimation of regularization parameters”, In *Proc. 2018 25th IEEE International Conference on Image Processing (ICIP)*, pp. 1742-1746. IEEE, Oct. 2018.

A. F. Vidal, L. Ciocci Brazzano, C. L. Matteo, P. A. Sorichetti and M. G. González, “Parametric modeling of wideband piezoelectric polymer sensors: Design for optoacoustic applications”. *Review of Scientific Instruments*, 88(9), 095004, Sep. 2017.

A. F. Vidal, M. G. González and P. Sorichetti, “Sensores piezoeléctricos para aplicaciones optoacústicas: Efectos de los procesos de relajación”. In *Proc. Biennial Congress of Argentina (ARGENCON), 2016 IEEE* (pp. 1-5). IEEE, Jun. 2016.

**Oral presentation** “Maximum likelihood estimation of regularisation parameters in high-dimensional inverse problems: an empirical Bayesian approach”. Presented at the *Probability in the North-East (PiNE) Meeting*, ICMS, Edinburgh, UK, Jan. 2020.

**Oral presentation** “Maximum likelihood estimation of regularisation parameters: an empirical Bayesian approach”. Presented at the *2nd IMA Conference On Inverse Problems From Theory To Application*, University College London, London, UK, Sep. 2019.

**Poster** “Maximum likelihood estimation of regularisation parameters in imaging problems - an empirical Bayesian approach”. Poster presented at *Annual PhD Poster Session*, School of Mathematical and Computer Sciences, Heriot-Watt University, Edinburgh, UK, Jun. 2019. *Best poster award*.

**Poster** “Maximum likelihood estimation of regularisation parameters in imaging problems”. Poster presented at *The Mathematics of Imaging - Winter school poster event*, Centre International de Rencontres Mathématiques, Marseille, France, Jan. 2019.

**Oral presentation** “Maximum likelihood estimation of regularisation parameters”. Presented at the *Statistical Signal Processing (SSP) Workshop 2018*, STOR-i Centre for Doctoral Training, Lancaster University, Lancaster, UK, Apr. 2018.

**Seminar** “Maximum likelihood estimation of regularisation parameters in imaging inverse problems”. *Actuarial Mathematics and Statistics Seminar*, School of Mathematical and Computer Sciences, Heriot-Watt University, Edinburgh, UK, Apr. 2018.

**Poster** “Parametric modeling of wideband piezoelectric polymer sensors for optoacoustic applications”. Poster presented at *SIPLab Winter poster event*, Institute of Sensors, Signals and Systems, School of Engineering and Physical Sciences (EPS), Heriot-Watt University, Edinburgh, UK, Dec. 2017.

**Oral presentation** A. F. Vidal, M. G. González, and P. Sorichetti, “Sensores piezoeléctricos para aplicaciones optoacústicas: Efectos de los procesos de relajación”. In *Proc. Biennial Congress of Argentina (ARGENCON), 2016 IEEE* (pp. 1-5). IEEE, Buenos Aires, Argentina, Jun. 2016.

## REFERENCES

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**Dr. Marcelo Pereyra**

PhD Supervisor

*Associate Professor*

School of Mathematical and Computer Sciences, Heriot-Watt University

m.pereyra@hw.ac.uk

+44 (0) 131 451 3211

**Dr. Patricio Sorichetti**

MEng Thesis Supervisor

*Associate Professor*

School of Engineering, Universidad de Buenos Aires

psorich@fi.uba.ar

+54 9 11 3604 0054