Pablo Huijse Heise

Curriculum Vitae

Name: Pablo Andrés Huijse Heise
Identification number: 16.049.102-7
Date of birth: June 11, 1985
Place of birth: Valdivia, Chile
Marital status: Married
Nationality: Chilean

Home Address: Inés Gebhard Paulus 733, Villa el Bosque Sur , Valdivia, Chile
Work Address: Instituto de Informática, Universidad Austral de Chile, General Lagos 2086, Edificio 10000, Valdivia, Chile
Contact telephone: +56-9-98278979
Email: phuijse (at) inf (dot) uach (dot) cl, pablo (dot) huijse (at) gmail (dot) com
Website: `http://phuijse.github.io`

I **Research interests**

Astroinformatics, computational intelligence, information theory, variational methods, semi-supervised machine learning, transfer learning and active learning. High-performance computing (HPC) and general purpose graphical processing unit (GPGPU) architectures for big data problems in astronomy.

II **Education**

- PhD in Electrical Engineering, Universidad de Chile 2010-2014
  - Thesis title: Finding Periodicities in astronomical light curves using information theoretic learning.
  - Advisor: Pablo A. Estévez, Universidad de Chile
  - Summary: The objective of this research is to develop robust and fully automated methods to analyse astronomical time series (light curves) in order to cope with the next generation astronomical surveys to come. The tools developed combine classical signal processing, machine learning, computational intelligence techniques and Information Theory.
- Summer School in Statistics for Astronomers and Physicists XI, Penn State University 2013
- Electrical Engineering, Universidad de Chile 2004-2010
- Bachelor of Science in Electrical Engineering, Universidad de Chile 2004-2008

III **Academic positions**

- Assistant professor, Informatics Institute, Universidad Austral de Chile, Chile 2018-present

IV Research experience

- Postdoc research "Development of methods for big-data astronomical problems based on Information Theory and Machine Learning", Millennium Institute of Astrophysics, Chile 2014-2017
- Postgraduate research "Design of an overcomplete and sparse decomposition for the correntropy function", Computational Neuro-Engineering Laboratory, University of Florida, Gainesville, USA. Supervisor: Prof. José C. Príncipe 2013
- Postgraduate research "Design of a pipeline for periodic light curve discrimination and its application to the EROS-2 database", Institute of Applied Computational Sciences, Harvard University, Boston, USA. Supervisor: Dr. Pavlos Protopapas 2012
- Doctoral research "Astronomical light curve analysis using information theoretic learning", Universidad de Chile, Chile. Supervisor: Prof. Pablo A. Estévez 2010-2014
- Research assistant "Information theoretic learning functionals programmed in graphical processing units", Universidad de Chile, Chile. Supervisor: Prof. Pablo A. Estévez 2009
- Research assistant "Robotic manipulator control and object recognition", Universidad de Chile, Chile. Supervisor: Prof. Javier Ruiz del Solar 2009

V Grants and scholarships

- FONDECYT grant N 1211374 "Novel Deep Learning Architectures for Astronomical Time Series" 2021-2023
- CONICYT PAI 79170017 "Fortalecimiento de la ciencia de datos en la Universidad Austral de Chile" 2018-2021
- FONDECYT grant N 1170305 "Efficient methods based on information theory and machine learning for astronomical images and time series analysis" 2017-2020
- FONDECYT postdoctoral grant N 3150460 "Métodos eficientes de procesamiento de señales basados en teoría de la información y aprendizaje de máquinas para el análisis de series de tiempo astronómicas" 2014-2016
- CONICYT travel grant for doctoral students to visit the Computational Neuro-Engineering Laboratory at the University of Florida (7 months) 2013
- CONICYT travel grant for doctoral students to visit the Institute of Applied Computational Sciences at Harvard university (8 months) 2012
- CONICYT scholarship for PhD education in Electrical Engineering at the University of Chile 2010-2014

VI Teaching experience

- **Statistical tools for research**
  Institution: Informatics Institute, Universidad Austral de Chile, Chile
  Role: Teacher (2018-to date)
  Topics: Frequentist and Bayesian model fitting, Mixture models, MCMC
- **Scientific computing with Python**
  Institution: Informatics Institute, Universidad Austral de Chile, Chile
  Role: Teacher (2019)
  Topics: Python libraries for data analysis, scientific computing and HPC

- **Data mining**
  Institution: Informatics Institute, Universidad Austral de Chile, Chile
  Role: Teacher (2018-to-date)
  Topics: Neural networks for classification, regression and feature extraction. Tensorflow, pytorch
- **Communications**
  Institution: Informatics Institute, Universidad Austral de Chile, Chile
  Role: Teacher (2018-to date)
  Topics: Fourier transform, Time series analysis, Image processing
- **Computational Intelligence**
  Institution: Department of Electrical Engineering, Universidad de Chile, Chile
  Role: Teacher (2016-2017), Assistant teacher (2010-2013)
  Topics: Machine learning methods for classification, regression and clustering.
- **Neural Networks and Information Theoretic Learning**
  Institution: Department of Electrical Engineering, Universidad de Chile, Chile
  Role: Assistant teacher (2013-2015)
  Topics: Information theoretic training criteria for machine learning
- **INPUT-OUTPUT**, Physical Computing program, Graduate
  Institution: Universidad del Desarrollo, Chile
  Role: Responsable (2013)
  Topics: Introduction to electronics and circuit design, microcontrollers, sensors and actuators, communication and interfacing, C++ programming (Openframeworks)

VII **Student supervision**

- Carlos Blaña, "Analysis of Astronomical X-ray Time Series using Kernels and Gaussian Processes", MSc on Informatics, UACh, 2019
- Gabriela Gonzalez, "Injury prediction on amateur runners using physical activity tracking data", MSc on Informatics, UACh, 2019
- Leonardo Bravo, "Learning latent representations for multidimensional and sparse light curves", MSc on Informatics, UACh, 2019
- Fabian Ruíz, "Characterizing gender bias in communication media by using dynamic topic models", MSc on Informatics, UACh, 2019 (co-supervisor)
- Victor Vargas, "Automatic gesture recongition for chilean sign language translation", Informatics engineering, UACh, 2019
- Javiera Astudillo, "An Information Theory Approach on Deciding Spectroscopic Follow Ups", MSc on Computer Science, PUC, 2019 (co-supervisor)
- Pablo Saavedra, "Estudio de la utilización del potencial de información cruzado en el aprendizaje con ensamble de redes neuronales", Department of Electrical Engineering, Universidad de Chile, 2017 (co-supervisor)
- Joaquín Sanchez, "Análisis morfológico utilizando matching pursuit para detección de husos sigma en registros polisomnográficos", Department of Electrical Engineering, Universidad de Chile, 2016 (co-supervisor)
- Emanuel Berrocal, "Métodos de detección de estrellas variables en imágenes astronómicas basados en factorización no-negative de matrices", Department of Mathematical Engineering, Universidad de Chile, 2015 (co-supervisor)

- Marianne Fiedler, "Optimización de la detección de periodos de estrellas variables en la nube de magallanes", Universidad de los Andes, 2015 (co-supervisor)

VIII Publications - ISI Journals

- P Sánchez-Sáez, I Reyes, C Valenzuela, F Förster, S Eyheramendy, F Elorrieta, FE Bauer, G Cabrera-Vives, PA Estévez, M Catelan, et al. Alert classification for the alerce broker system: The light curve classifier. *The Astronomical Journal*, volume 161, page 141. IOP Publishing, 2021.
- F Pérez-Galarce, K Pichara, **P. Huijse**, M Catelan, and D Mery. Informative bayesian model selection for rr lyrae star classifiers. *Monthly Notices of the Royal Astronomical Society*, volume 503, pages 484–497. Oxford University Press, 2021.
- F Förster, G Cabrera-Vives, E Castillo-Navarrete, PA Estévez, P Sánchez-Sáez, J Arredondo, FE Bauer, R Carrasco-Davis, M Catelan, F Elorrieta, et al. The automatic learning for the rapid classification of events (alerce) alert broker. *The Astronomical Journal*, volume 161, page 242. IOP Publishing, 2021.
- Felipe Tobar, Lerko Araya-Hernández, **Pablo Huijse**, and Petar M Djurić. Bayesian reconstruction of fourier pairs. *IEEE Transactions on Signal Processing*, volume 69, pages 73–87. IEEE, 2020.
- J Peña, C Fuentes, F Förster, J Martínez-Palomera, G Cabrera-Vives, JC Maureira, **P. Huijse**, PA Estévez, L Galbany, S González-Gaitán, et al. Asteroids' size distribution and colors from hits. *The Astronomical Journal*, volume 159, page 148. IOP Publishing, 2020.
- Rodrigo Carrasco-Davis, Guillermo Cabrera-Vives, Francisco Förster, Pablo A Estevez, **Pablo Huijse**, Pavlos Protopapas, Ignacio Reyes, Jorge Martínez-Palomera, and Cristóbal Donoso. Deep learning for image sequence classification of astronomical events. *Publications of the Astronomical Society of the Pacific*, volume 131, page 108006. IOP Publishing, 2019.
- Javiera Astudillo, Pavlos Protopapas, Karim Pichara, and **Pablo Huijse**. An information theory approach on deciding spectroscopic follow-ups. *The Astronomical Journal*, volume 159, page 16. IOP Publishing, 2019.
- **Pablo Huijse**, Pablo A Estévez, Francisco Förster, Scott F Daniel, Andrew J Connolly, Pavlos Protopapas, Rodrigo Carrasco, and José C Príncipe. Robust period estimation using mutual information for multiband light curves in the synoptic survey era. *The Astrophysical Journal Supplement Series*, volume 236, page 12. IOP Publishing, 2018.
- Rodrigo Contreras Ramos, Dante Minniti, Felipe Gran, Manuela Zoccali, Javier Alonso-García, **Pablo Huijse**, María Gabriela Navarro, Álvaro Rojas-Arriagada, and Elena Valenti. The vvv survey rr lyrae population in the galactic center region. *The Astrophysical Journal*, volume 863, page 79. IOP Publishing, 2018.
- J Peña, C Fuentes, F Förster, Juan Carlos Maureira, J San Martín, J Littín, **P. Huijse**, Guillermo Cabrera-Vives, PA Estévez, Lluis Galbany, et al. Asteroids in the high cadence transient survey. *The Astronomical Journal*, volume 155, page 135. IOP Publishing, 2018.
- Jorge Martínez-Palomera, Francisco Förster, Pavlos Protopapas, Juan Carlos Maureira, Paulina Lira, Guillermo Cabrera-Vives, **Pablo Huijse**, Lluis Galbany, Thomas De Jaeger,

Santiago González-Gaitán, et al. The high cadence transit survey (hits): Compilation and characterization of light-curve catalogs. *The Astronomical Journal*, volume 156, page 186. IOP Publishing, 2018.

- F Förster, TJ Moriya, JC Maureira, JP Anderson, S Blinnikov, F Bufano, G Cabrera-Vives, Alejandro Clocchiatti, T De Jaeger, PA Estévez, et al. The delay of shock breakout due to circumstellar material evident in most type ii supernovae. *Nature Astronomy*, volume 2, pages 808–818. Nature Publishing Group, 2018.
- R Contreras Ramos, Manuela Zoccali, F Rojas, A Rojas-Arriagada, M Gárate, **P. Huijse**, F Gran, M Soto, AAR Valcarce, PA Estévez, et al. Proper motions in the vvv survey: Results for more than 15 million stars across ngc 6544. *Astronomy & Astrophysics*, volume 608, page A140. EDP Sciences, 2017.
- Francisco Förster, Juan C Maureira, J San Martín, Mario Hamuy, Jorge Martínez, **Pablo Huijse**, Guillermo Cabrera, Lluís Galbany, Th De Jaeger, Santiago González-Gaitán, et al. The high cadence transient survey (hits). i. survey design and supernova shock breakout constraints. *The Astrophysical Journal*, volume 832, page 155. IOP Publishing, 2016.
- Pavlos Protopapas, **Pablo Huijse**, Pablo A Estevez, Pablo Zegers, Jose C Principe, and Jean-Baptiste Marquette. A novel, fully automated pipeline for period estimation in the eros 2 data set. *The Astrophysical Journal Supplement Series*, volume 216, page 25. IOP Publishing, 2015.
- **Pablo Huijse**, Pablo A Estevez, Pavlos Protopapas, Jose C Principe, and Pablo Zegers. Computational intelligence challenges and applications on large-scale astronomical time series databases. *IEEE Computational Intelligence Magazine*, volume 9, pages 27–39. IEEE, 2014.
- **Pablo Huijse**, Pablo A Estevez, Pavlos Protopapas, Pablo Zegers, and Jose C Principe. An information theoretic algorithm for finding periodicities in stellar light curves. *IEEE Transactions on Signal Processing*, volume 60, pages 5135–5145. IEEE, 2012.
- **Pablo Huijse**, Pablo A Estévez, Pablo Zegers, José C Príncipe, and Pavlos Protopapas. Period estimation in astronomical time series using slotted correntropy. *IEEE Signal Processing Letters*, volume 18, pages 371–374. IEEE, 2011.

IX Publications - Conference Proceedings

- Nicolás Astorga, **Pablo Huijse**, Pavlos Protopapas, and Pablo Estévez. Mpcc: Matching priors and conditionals for clustering. In *European Conference on Computer Vision*, pages 658–677. Springer, Cham, 2020.
- **Pablo Huijse**, Nicolas Astorga, Pablo Estévez, and Giuliano Pignata. Latent representations of transient candidates from an astronomical image difference pipeline using variational autoencoders. In *26th European Symposium on Artificial Neural Networks, Computational Intelligence and Machine Learning, ESANN 2018*, pages 321–326. i6doc. com publication, 2018.
- Esteban Reyes, Pablo A Estévez, Ignacio Reyes, Guillermo Cabrera-Vives, **Pablo Huijse**, Rodrigo Carrasco, and Francisco Forster. Enhanced rotational invariant convolutional neural network for supernovae detection. In *2018 International Joint Conference on Neural Networks (IJCNN)*, pages 1–8. IEEE, 2018.

- Nicolás Astorga, **Pablo Huijse**, Pablo A Estévez, and Francisco Förster. Clustering of astronomical transient candidates using deep variational embedding. In *2018 International Joint Conference on Neural Networks (IJCNN)*, pages 1–8. IEEE, 2018.
- Sebastián Ulloa, Pablo A Estevez, **Pablo Huijse**, Claudio M Held, Claudio A Perez, Rodrigo Chamorro, Marcelo Garrido, Cecilia Algarin, and Patricio Peirano. Sleep-spindle identification on eeg signals from polysomnographie recordings using correntropy. In *2016 38th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC)*, pages 3736–3739. IEEE, 2016.
- **Pablo Huijse**, Pablo A Estévez, Francisco Förster, and Emanuel Berrocal. Discriminating variable star candidates in large image databases from the hits survey using nmf. *Procedia Computer Science*, volume 53, pages 29–38. Elsevier, 2015.
- David Nova, Pablo A Estévez, and **Pablo Huijse**. K-nearest neighbor nonnegative matrix factorization for learning a mixture of local som models. In *Advances in Self-Organizing Maps and Learning Vector Quantization*, pages 229–238. Springer, Cham, 2014.
- **Pablo Huijse**, Pablo A Estévez, Pavlos Protopapas, Pablo Zegers, and Jose C Príncipe. Computational challenges in processing very large astronomical survey databases. In *2012 9th Asia-Pacific Symposium on Information and Telecommunication Technologies (APSITT)*, pages 1–6. IEEE, 2012.
- Pablo A Estévez, **Pablo Huijse**, Pablo Zegers, Jose C Principe, and Pavlos Protopapas. Period detection in light curves from astronomical objects using correntropy. In *The 2010 International Joint Conference on Neural Networks (IJCNN)*, pages 1–7. IEEE, 2010.

X **Talks, presentations and posters**

- "Oportunidades para científicos de datos e ingenieros en la era de big-data en astronomía", *Seminar series at UACH*, April, 2018 and 2019
- "Representation learning for astronomical data using neural networks", *LSST Chile Workshop 2019*, La Serena, March, 2019
- "Learning representations using Variational Autoencoders", *EVIC 2019*, Santiago, December, 2018
- "Tutorial on astronomical data analysis using machine learning", *Schools on Systems and Networks 2018*, Valdivia, October, 2018
- "Robust period estimation using mutual information for multi-band light curves", *CMM Pucón Symposium*, Puerto Varas, Chile, August 2017
- "Information theory and semi supervised machine learning with applications in Astronomy", *Summer School on Computational Intelligence and Robotics (EVIC)*, Universidad de los Andes, Chile, December 2016
- "Astronomical time series analysis using information theoretic criteria", *Astroinformatics 2016 conference*, Sorrento, Italy, October 2016
- "Machine learning classification of multi-band supernovae light curves", *Supernovae through the Ages conference*, Easter Island, Chile, August 2016
- "Semi-supervised classification of HiTS candidates using active learning", *Pucón Symposium*, Puerto Varas, Chile, August 2015

- "Using information theoretic tools and GPGPU to mine periodic variable stars from the EROS-2 survey", *NOAO: Tools for Astronomical Big Data workshop*, Tucson, USA, March 2015
- "Time-frequency analysis using information theory and non-negative matrix factorization", *Summer School on Computational Intelligence and Robotics (EVIC)*, Universidad de Chile, Chile, December 2014
- "A high resolution periodogram using correntropy and non-negative matrix Factorization", *Astroinformatics 2014 conference*, Valparaiso, Chile, August 2014
- "Mining periodic variable stars in astronomical light curve Ddatabases using information theoretic criteria", *The 5th VVV meeting*, Concon, Chile, April 2014
- "Finding periodicities in astronomical light curves using information theoretic learning", *Digging deeper and faster: algorithms for computationally limited problems in time-domain astronomy*, Caltech, Pasadena, USA, December 2011

XI **Technical skills**

- **Programming languages:** Proficient in C, C++, Python and Cython, experienced with C#, CUDA, OpenMP and GNU bash, familiar with R, basic knowledge of Javascript, Verilog, SQL, GTK+ and QT
- **Operating systems and platforms:** Proficient with GNU Linux, Arduino/AVR, Raspberry PI, Olimexino and Teensy (ARM), experienced with MS Windows
- **Software:** Proficient with Matlab, Unity, Openframeworks, Blender, familiar with Processing
- **Publishing:** Experienced with Latex, Beamer and Inkscape

XII **Languages**

Spanish (native), English (fluent).

XIII **Other interests**

Interactive design, 3D printing, augmented reality, physical interfaces, music synthesis, generative art and computational creativity, fractals, embedded systems, video game design and game engines, karate-do, transverse flute and saxophone, cooking, japanese animation and culture, hiking.