

# Pablo Andrés Huijse Heise

## Curriculum Vitae

**Home Address:** Inés Gebhard Paulus 733, Valdivia, Chile

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### I Research interests

Machine Learning, Information Theory, Statistical Signal Processing, Astroinformatics.

### II Education

- PhD in Electrical Engineering, Universidad de Chile 2010-2014
  - Thesis title: Finding Periodicities in astronomical light curves using information theoretic learning.
  - URL: <http://repositorio.uchile.cl/handle/2250/117099>
- 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 2013
- CONICYT travel grant for doctoral students to visit the Institute of Applied Computational Sciences at Harvard university 2012
- CONICYT scholarship for PhD education 2010-2014

## VI Teaching experience

- Simulation, UACH (collaborator) 2020-today  
<https://github.com/phuijse/INF0274/>
- Neural Networks and Bayesian Learning, UACH 2019-today  
<https://github.com/magister-informatica-uach/INF0320/>
- Scientific computing with Python, UACH 2019-today  
<https://magister-informatica-uach.github.io/INF0147/>
- Statistical tools for research (collaborator), UACH 2018-today  
<https://github.com/magister-informatica-uach/INF0337>
- Data mining (collaborator), UACH 2018-today  
<https://github.com/magister-informatica-uach/INF0343-unidad5>
- Artificial Intelligence (collaborator), UACH 2018-today  
<https://github.com/phuijse/INF0257>
- Communication systems (collaborator), UACH 2018-today  
<https://phuijse.github.io/UACH-INF0185/>
- Linear systems analysis, UACH 2018-today  
<https://phuijse.github.io/UACH-INF0183/>
- Neural Networks and Information Theoretic Learning, UChile (assistant) 2013-2015
- Computational Intelligence, UChile (assistant) 2010-2016

## VII Student supervision

- Alfredo Morales, “Capas de adaptación para la clasificación de Curvas de Luz usando Redes Neuronales Artificiales”, Informatics Engineering, UACH, 2021
- Leonardo Bravo, “Learning latent representations for multidimensional and sparse light curves”, MSc on Informatics, UACH, 2021
- Javier Rojas, “Autoencoder Variacional con Covarianza Factorizada para Imágenes Astronómicas”, Informatics Engineering, UACH, 2020

- Gabriela Gonzalez, “Injury prediction on amateur runners using physical activity tracking data”, MSc on Informatics, UACH, 2020
- Carlos Blaña, “Analysis of Astronomical X-ray Time Series using Kernels and Gaussian Processes”, 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 recognition 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, Lluís 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**, Lluís 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 Förster. 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*, Valparaíso, Chile, August 2014
- “Mining periodic variable stars in astronomical light curve Databases 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.