PhD and Engineer in Computer Science

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Born in Mouscron, on 8th July 1984
Married

Education

Sept. 2013 — *PhD in Engineering Sciences*, Université catholique de Louvain.

June 2010 — *Master in Higher Education Pedagogy (Master complémentaire en pédagogie universitaire et de l'enseignement supérieur)*, Université catholique de Louvain, obtained with magna cum laude.

June 2007 — *Master in Computer Science Engineer, Artificial Intelligence Option*, Université catholique de Louvain, obtained with magna cum laude.

Certifications

Feb. 2014 — *Qualification pour Maître de Conférence (France), Section 26 "Mathématiques appliquées et applications des mathématiques"*.

Feb. 2014 — *Qualification pour Maître de Conférence (France), Section 27 "Informatique"*.

Stays Abroad

March-Aug. 2014 — Visit the center of excellence on Cognitive Interaction Technology at the Bielefeld University to perfect my skills in large-scale learning with Prof. Barbara Hammer.

Apr.-Jun. 2013 — Staid 3 months at the Radboud University in the team of Pr. Tom Heskes. I acquired new knowledge in Bayesian inference, in particular for variational inference and Gaussian processes with Dr. Perry Groot. This resulted in a work which is planned for submission to the Journal of Machine Learning Research.

Aug.-Sept. 2010 — Staid 6 weeks at the Aalto University, invited by Dr. Amaury Lendasse. I improved my skills in feature selection and extreme learning. This collaboration resulted in two works published in the Neurocomputing journal. I also co-supervised the work of Laura Kainulainen, which resulted in a paper published in the Case Studies in Business, Industry and Government Statistics journal.

Positions

2014-now — Associate professor, Faculty of Computer Science, Université de Namur.
2013-2014 — Post-doc and teaching assistant, EPL, Université catholique de Louvain.
2007-2013 — PhD student and teaching assistant, EPL, Université catholique de Louvain.

Prizes

2014 — Scientific Prize IBM Belgium for Informatics 2014.

Teaching Experience

2014-now — Professor at the Université de Namur for various courses at bachelor and master level, including introduction to programming, machine learning and operations research. In each course, students have the opportunity to apply the theory with small projects. Theoretical concepts are illustrated with practical cases.

2013 and 2014 — Teaching of a machine learning course for 2 weeks at the Institut de la Francophonie pour l'Informatique (IFI) in Hanoï, Vietnam. This course relies on both lectures and exercise sessions which allow students to implement algorithms.

2007-2014 — Teaching assistant for machine learning, physics (problem-based learning) and Bachelor projects with Prof. Piotr Sobieski and Prof. Michel Verleysen:

- ELEC2870: Machine Learning (master level)
- FSAB1202: Physics (electromagnetism in 1st Bachelor)
- FSAB1502: Project (electronics in 1st Bachelor)
- INGE1213: Physics (electromagnetism/theory of circuits in 2nd Bachelor)

I created and taught a MATLAB course for first-year Bachelors with slides, live demonstration and exercices. Also, I completed in 2010 a master in higher education pedagogy (*master complémentaire en pédagogie universitaire et de l'enseignement supérieur*). In that context, I wrote a thesis on the impact of several factors on student motivation: *Apprentissage par problèmes: influence de la perception du contexte et du profil motivationnel sur les approches d'apprentissage en physique*.

Participation in the following events related to teaching:

- spring school "promouvoir la réussite dans vos enseignements"
- matinée "quelle juste place pour les parents dans l'enseignement supérieur"

Representative Experience

2013-2014 — In charge of the organisation of the Machine Learning Group meetings.
2013-2014 — Member of the bachelor commission in engineering (BTCI).
2013-2014 — Member of the UCL scientists council (CORSCI).
2012-2014 — Participated in the AEQES-CTI certification for electrical engineering (ELEC).
2012-2014 — Member of the doctoral commission in engineering (CDD).
2012-2014 — Member of the electrical engineering (ELEC) commission.
2012-2014 — Representative for the École Polytechnique de Louvain scientists (ACSEP).
2012-2014 — Representative for the researchers of the Institute of Information and Communication Technologies, Electronics and Applied Mathematics (ICTEAM) (AsCII).

Co-supervision of Students

2013-now — PhD thesis of Alexandra Degeest on concept drift: *Amélioration de l'apprentissage en présence de concept drift grâce au transfert de connaissances*.
2013-2014 — Co-supervision of the master student Thanh Binh (IFI, Hanoï) for her work on density estimation: *Estimation de densité avec des transformées en ondelettes*.
Jul.-Aug. 2013 — Internship of Shreyas Seshadri on extreme learning for high-dimensional data.
2010-2011 — Master's thesis of Guy de la Vallée Poussin on feature selection with extreme learning: *La sélection de variables pour la régression par extreme learning machine*.
Aug.-Sept. 2010 — Co-supervision of the experiments and the writing of a journal paper with the master student Laura Kainulainen at the Aalto University in Finland.

Other Academic and Editorial Experience

2014-now PC member for the European Symposium on Artificial Neural Networks, Computational Intelligence and Machine Learning (ESANN).

2014-now PC member for the New Challenges in Neural Computation workshop.

2013-2015 Member of the reviewer board of the Applied Intelligence journal.

2013-2015 Editor for Neurocomputing special issue on *Advances in Learning with Label Noise*.

2013-2014 Chair of the BENELEARN 2014 conference.

2013-2014 Organiser of the special session on *Label noise in classification* at ESANN 2014.

Mar. 2014 Invited seminar at the CITEC center for excellence at Bielefeld University.

Feb. 2014 Invited seminar at Institute of Statistics, Biostatistics and Actuarial Sciences, UCL.

Nov. 2013 Invited seminar at the Statistique, Analyse, Modélisation Multidisciplinaire (SAmos-Marin Mersenne) team of the University Paris 1 Panthéon-Sorbonne.

May 2013 Invited seminar at the Machine Learning Group in the Institute for Computing and Information Sciences at the Radboud University Nijmegen.

May 2009 Attendance of the COST Spring Training School "Reasoning and Decision Making under Uncertainty and Imprecision" in Mieres, Spain, COST Action IC0702.

Reviewer for the following international journals:

- Advances in Data Analysis and Classification
- Applied Mathematical Modelling
- Entropy
- Expert Systems With Applications
- IEEE Computational Intelligence Magazine
- IEEE Transactions on Cybernetics
- IEEE Transactions on Neural Networks and Learning Systems
- IEEE Transactions on Systems, Man and Cybernetics - Part B
- Information Sciences
- Int. Journal of Machine Learning and Cybernetics
- Int. Journal of Uncertainty, Fuzziness and Knowledge-Based Systems
- Inverse Problems & Imaging
- Knowledge and Information Systems
- Machine Learning
- Neural Computing & Applications
- Neural Processing Letters
- Neurocomputing

Reviewer for the following international conferences:

- European Conference on Machine Learning and Principles and Practice of Knowledge Discovery in Databases (ECML PKDD)
- European Symposium on Artificial Neural Networks, Computational Intelligence and Machine Learning (ESANN)
- IEEE Int. Conference on Systems, Man, and Cybernetics (IEEE SMC)
- IEEE Symposium on Communications and Vehicular Technology in the Benelux (IEEE SCVT)

PhD Thesis

Title: Uncertainty and Label Noise in Machine Learning.
Supervisor: Pr Michel VERLEYSEN, ICTEAM, UCL.
Description:
Information-theoretic feature selection:
- analysis of the suitability of mutual information for feature selection.

Learning when label noise pollutes data:
- survey of existing algorithms in a coherent framework,
- development of new algorithms for learning with label noise.

Learning with extreme learning machines:
- behaviour of large neural networks and links with kernels.

Master Thesis (Pedagogy)

Title: Apprentissage par problèmes: influence de la perception du contexte et du profil motivationnel sur les approches d'apprentissage en physique
Supervisor: Pr Marianne FRENAY, PSP, UCL.
Co-supervisor: Mme Nathalie KRUYTS, IPM, UCL.
Description:
- survey of motivation, goals and approaches in (problem-based) learning,
- analysis of my teaching activities and questioning,
- conception of a questionnaire about student motivation,
- analysis and conclusion from collected responses.

Master Thesis (Computer Science)

Title: Development and comparison of algorithms for reinforcement learning applied to Markov decision processes and Markov games.
Supervisor: Pr Marco SAERENS, ISYS, UCL.
Description:
Automatic learning in Markov processes and Markov games:
- survey of existing algorithms in a coherent framework,
- development of new algorithms using constrained optimisation,
- implementation of a generic framework,
- test and comparison of implemented algorihtms.

Skills

As machine learning research products have to be experimentally validated, I developed a Python framework with about 50 modules and 10,000 lines of code. I like to design and write clean, modular and well-documented code. I also intensively use the CISM super-computers to obtain experimental results.

Programming: Python, MATLAB, bash, Java, C/C++, Oz, COMET, PHP/MySQL, HTML.
Computer skills: Linux, Windows, LaTeX, LibreOffice, MS Office.
Created websites: `http://bfrenay.wordpress.com` `http://smmouscron.be` `http://symbioses.net`
Languages: French (mother tongue), English (fluent), Dutch (basic).

Professional Interests

My interests in machine learning include large-scale learning (big data), feature selection, support vector machines, label noise (robust inference in classification), visualisation, graphical models, classification, clustering and density estimation. I like to collaborate and I am open to new topics. I worked on biological data and in collaboration with geographers and experts in microsystems.

Writing

I published a collection of science-fiction short stories (*Symbiose*,Chloé des Lys).

Hobbies

Cooking, reading, writing, guitar, running.

Citations

Google Scholar citations: 287. Google Scholar h index: 9.

Publications in International Journals

B. Frénay, A. Kaban. Special issue on advances in learning with label noise. Neurocomputing, 160, 2015, pp. 1–2.

B. Frénay, M. Verleysen. Classification in the Presence of Label Noise: a Survey. IEEE Transactions on Neural Networks and Learning Systems, 25(5), 2014, pp. 845-869.

B. Frénay, M. Verleysen. Pointwise Probability Reinforcements for Robust Statistical Inference. Neural Networks, 50, 2014, pp. 124–141.

B. Frénay, G. Doquire, M. Verleysen. Estimating Mutual Information for Feature Selection in the Presence of Label Noise. Computational Statistics & Data Analysis, 71, 2014, pp. 832–848.

B. Frénay, G. Doquire, M. Verleysen, Is Mutual Information Adequate for Feature Selection in Regression ? Neural Networks, 48, 2013, pp. 1–7.

B. Frénay, G. Doquire, M. Verleysen. Theoretical and Empirical Study on the Potential Inadequacy of Mutual Information for Feature Selection in Classification. Neurocomputing, 112, 18, 2013, pp. 64–78.

B. Frénay, M. van Heeswijk, Y. Miche, M. Verleysen and A. Lendasse. Feature Selection for Nonlinear Models using Extreme Learning Machines. Neurocomputing, 102, 2013, pp. 111–124.

L. Kainulainen, Y. Miche, E. Eirola, Q. Yu Yu, B. Frénay, E. Séverin and A. Lendasse. Ensembles of Local Linear Models for Bankruptcy Analysis and Prediction. Case Studies in Business, Industry and Government Statistics, 4(2), 2011, pp. 116–133.

B. Frénay, M. Verleysen. Parameter-Insensitive Kernel in Extreme Learning for Non-Linear Support Vector Regression. Neurocomputing, 74(16), 2011, pp. 2526–2531.

I. Thomas, P. Frankhauser, B. Frénay, M. Verleysen. Clustering Patterns of Urban Built-Up Areas with Curves of Fractal Scaling Behaviour. Environment and Planning B: Planning and Design, 37(5), 2010, pp. 942–954.

B. Frénay, M. Saerens. QL2, a Simple Reinforcement Learning Scheme for Two-Player Zero-Sum Markov Games. Neurocomputing, 72, 2009, pp. 1494–1507.

Publications in Conference Proceedings

A. Degeest, M. Verleysen, B. Frénay. Feature Ranking in Changing Environments where New Features are Introduced, Accepted for presentation at IJCNN, Killarney, Ireland, July 2015.

S. Branders, B. Frénay and P. Dupont. Survival Analysis with Cox Regression and Random Non-linear Projections. ESANN, Bruges, Belgium, April 2015, pp. 119–124.

B. Frénay, D. Hofmann, A. Schulz, M. Biehl, B. Hammer. Valid Interpretation of Feature Relevance for Linear Data Mappings. IEEE CIDM, Orlando, Florida, USA, December 2014, p. 149–156.

B. Frénay, A. Kaban. A comprehensive introduction to label noise. ESANN, Bruges, Belgium, April 2014, pp. 667-676.

A. Degeest, B. Frénay, M. Verleysen. Automatic Correction of SVM for Drifted Data Classification. EGC, Rennes, France, January 2014, pp. 311-316.

B. Frénay, G. Doquire, M. Verleysen. Mutual Information: an Adequate Tool for Feature Selection. BENELEARN, Nijmegen, the Netherlands, June 2013, p. 89.

G. Doquire, B. Frénay, M. Verleysen. Risk Estimation and Feature Selection. ESANN, Bruges, Belgium, April 2013, pp. 161–166.

B. Frénay, G. Doquire, M. Verleysen. On the Potential Inadequacy of Mutual Information for Feature Selection. ESANN, Bruges, Belgium, April 2012, pp. 501–506.

B. Frénay, G. de Lannoy, M. Verleysen. Label Noise-Tolerant Hidden Markov Models for Segmentation: Application to ECGs. ECML-PKDD, Athens, Greece, September 2011, pp. 455–470.

B. Frénay, M.Verleysen. Using SVMs with Randomised Feature Spaces: an Extreme Learning Approach. ESANN, Bruges, Belgium, April 2010, pp. 315–320.

I. Thomas, P. Frankhauser, B. Frénay, M. Verleysen. Clustering Fractal Urban Patterns with Curves of Scaling Behavior. ERSA, Lodz, Poland, August 2009.

I. Thomas, P. Frankhauser, B. Frénay, M. Verleysen. Clustering Patterns of Urban Builtup Areas with Curves of Fractal Scaling Behavior. ASRDLF, Clermont-Ferrand, France, July 2009.

B. Frénay, G. de Lannoy, M. Verleysen. Improving the Transition Modelling in Hidden Markov Models for ECG Segmentation. ESANN, Bruges, Belgium, April 2009, pp. 141–146.

G. de Lannoy, B. Frénay, M. Verleysen, J. Delbeke. Supervised ECG Delineation using the Wavelet Transform and Hidden Markov Models. MBEC, Anvers, Belgium, November 2008, pp 22–25.

B. Frénay, M. Saerens. QL2, a Simple Reinforcement Learning Scheme for Two-Player Zero-Sum Markov Games. ESANN, Bruges, Belgium, April 2008, pp. 137–142.

B. Frénay, G. de Lannoy, M. Verleysen. Emission Modelling for Supervised ECG Segmentation using Finite Differences. MBEC, Anvers, Belgium, November 2008, pp. 1212–1216.

Talks at Conferences without Proceedings

B. Frénay. Curve Alignment: Theory and Applications. MASHS, Paris, France, June 2012.

I. Thomas, P. Frankhauser, B. Frénay, M. Verleysen. Clustering Patterns of Urban Built-Up Areas with Curves of Fractal Scaling Behaviour. MASHS, Paris, France, June 2012.

B. Frénay. Use of the Python Package on BEgrid. OGF30/Grid2010, Brussels, Belgium, October 2010.

B. Frénay. Development and comparison of algorithms for reinforcement learning applied to Markov decision processes and Markov games. Second Research Contact Day of the CIL Doctoral School, Leuven, Belgium, August 2007.