

BERTRAND LEBICHOT, POST-DOC RESEARCHER &  
LECTURER

PERSONAL INFORMATION

*email*                      [bertrand.lebichot@gmail.com](mailto:bertrand.lebichot@gmail.com)  
*website*                  <https://b-lebichot.github.io/>  
*phone*                    +32 494 83 77 99

GOAL

I am a post-doc researcher in data mining and machine learning. My research interest are Deep Learning, graph mining, and anomaly detection on concrete Fintech case studies. I am always searching for new challenges.

PROFESSIONAL EXPERIENCE

<i>Part-time Lecturer</i>	<i>2017–Present</i>	UNIVERSITÉ CATHOLIQUE DE LOUVAIN – LSM MLSMM2154 Machine Learning, MLSMM2151 Data Mining, and MQANT1109 Informatique de Gestion.
<i>Researcher associate</i>	<i>2020–Present</i>	UNIVERSITÉ DU LUXEMBOURG – TRUX Study of concrete interpretable machine learning and NLP models in collaboration with BGL BNP Parisbas. Built a Chatbot in Luxembourgish.
<i>Post-doc researcher</i>	<i>2018–2020</i>	UNIVERSITÉ LIBRE DE BRUXELLES – MLG Study of concrete transfer and online learning scenario in collaboration with Worldline. Led to one patent and four papers so far.
<i>Research Assistant</i>	<i>2015–2018</i>	UNIVERSITÉ CATHOLIQUE DE LOUVAIN – ICTEAM Design of various graph-based fraud detection systems in collaboration with Worldline. One of them is currently in production.
<i>Research &amp; Teaching Assistant</i>	<i>2011–2015</i>	UNIVERSITÉ CATHOLIQUE DE LOUVAIN – LOURIM Organize & teach practical sessions at LSM-UCL (list available on my website).
<i>R&amp;D Internship</i>	<i>Summer 2010</i>	GSK-BIO – EPL Setting of a bio-chemical & analytic device to quantify molecules in solutions.

EDUCATION

<i>Doctor of Engineering Science</i>	<i>2011–2018</i>	UNIVERSITÉ CATHOLIQUE DE LOUVAIN – EPL Thesis: <i>Network analysis based on bag-of-paths : classification, node criticality and randomized policies.</i> (Promotor: Prof. Marco SAERENS) The bag-of-paths framework defines a family of graph-based distances interpolating between the shortest path and the commute-time distances, taking into account both node proximity and amount of connectivity. Three applications are proposed. Two others, closely related, are also investigated.
<i>Biomedical Engineer (with honors)</i>	<i>2004–2011</i>	UNIVERSITÉ CATHOLIQUE DE LOUVAIN – EPL Thesis: <i>Traitement automatique du signal ECG pour l'aide au diagnostic de pathologies cardiaques.</i> (Promotor: Prof. Michel VERLEYSEN) Automatically detecting a few abnormal heart beats using ECG is a challenging

problem. We developed an undersampling method based on k-NN to reduce the information loss, balance learning classes and enhance the prediction.

## COMPUTER SKILLS

<i>Software</i>	PYTHON, (Keras/Tensorflow/Torch), R (Shiny, Markdown), MATLAB, HTML, JAVA, JAVASCRIPT, C++, L <sup>A</sup> T <sub>E</sub> X, GPU computing, VBA, SAS, SAS EM, Android App development and security, SQL, SPSS, Containerization (DOCKER)
<i>OS</i>	Linux, Microsoft Office, Microsoft Windows
<i>Data science, Machine learning, Data mining &amp; Big Data</i>	Supervised learning, Unsupervised learning, Semi-supervised learning, Markov decision processes, Fraud detection, Anomaly detection, Clustering, Graph mining, Transfer learning, Multitask learning, Causal inference, Fairness (ML), Explainable AI, Deep learning, GPU computing, Multi-class classification, Incremental learning, Generative adversarial models, Computer vision, Data visualization, Natural language processing.

## OTHER INFORMATION

<i>Languages</i>	FRENCH · Mother tongue
	ENGLISH · English TOEFL iBT Certificate (equivalent to C1 CEFR level)
	DUTCH · Intermediate (B1 CEFR level)
	GERMAN · Basic (A1 CEFR level)

## PUBLICATIONS

<i>IEEE Transactions on Neural Networks and Learning Systems</i>	<p><i>June 2014</i>      Semi-Supervised Classification through the Bag-of-Paths Group Betweenness</p> <p>We introduce a new betweenness and a group betweenness measure, for semi-supervised classification on weighted graphs. Experiments on real-world data sets show that it out-performs all compared state-of-the-art methods. Authors: B. LEBICHOT, I. KIVIMAKI, K. FRANCOISSE AND M. SAERENS</p>
<i>Nature Scientific Reports</i>	<p><i>Feb. 2016</i>      Two Betweenness Centrality Measures based on Randomized Shortest Paths</p> <p>Two new betweenness centrality measures are introduced and tested on real world examples. They combine the ideas of using the shortest path and/or random paths for analyzing network nodes. Authors: I. KIVIMAKI, B. LEBICHOT, J. SARMAKI AND M. SAERENS</p>
<i>International Conference on Complex Networks and their Applications</i>	<p><i>Dec. 2016</i>      A Graph-Based, Semi-Supervised, Credit Card Fraud Detection System</p> <p>We propose several improvements to APATE, a graph-based fraud detection system, to fit to e-commerce field reality. This grandly improves the fraudulent cards detection, on a three months real-life e-commerce transactions dataset. This algorithm is being used for years by a major transactional company. Authors: B. LEBICHOT AND M. SAERENS</p>
<i>International Conference on Industrial, Engineering &amp; Other Applications of Applied Intelligent Systems</i>	<p><i>June 2017</i>      Improving Card Fraud Detection through Suspicious Pattern Discovery</p>

Can we find compromised credit cards by looking at shops appearing in their recent transaction records? We show that suspicious patterns can be identified and help to improve state-of-the-art aggregated transaction features.

Authors: F. BRAUN, O. CAELEN, E. SMIRNOV, S. KELK, B. LEBICHOT AND M. SAERENS

*Neurocomputing*

*Jan. 2018*

### A Bag-of-Paths Node Criticality Measure

To what extend is a node critical for a network? We introduce a new criticality measure (and a faster approximation) based on the Bag-of-Paths framework.

Simulations show that it outperforms all other measures on generated graphs.

Authors: B. LEBICHOT AND M. SAERENS

*INNS Big Data  
and Deep Learning  
conference*

*Apr. 2019*

### Deep-Learning Domain Adaptation Techniques for Credit Cards Fraud Detection

Fraud behavior strongly differs according to payment systems, countries,...

Given the high cost of data-driven fraud detection system design, transactional companies want to reuse existing pipelines and adapt them to other domains.

Authors: B. LEBICHOT, Y-A. LE BROGNE, L. HE-GUELTON, F. OBLÉ AND G.

BONTEMPI

*Belgian Dutch  
Conference on  
Machine Learning*

*Nov. 2019*

### Understanding telecom customer churn with machine learning: from prediction to causal inference

Telecom companies want to prevent customer churn. In collaboration with Orange, we design an accurate prediction model, discuss data-driven causal inference and compare the impact of causally relevant variables.

Authors: T. VERHELST, O. CAELEN, J-C. DEWITTE, B. LEBICHOT AND G. BONTEMPI

*International  
Conference on  
Complex Networks  
and their  
Applications*

*Dec. 2019*

### Graph-based fraud detection with the free energy distance

A real-world application of the free energy distance for e-commerce fraud detection. We divide the computation time by two while maintaining state-of-the art performance in term of fraudulent cards prediction.

Authors: S. COURTAINE, B. LEBICHOT AND M. SAERENS

*Post-proceedings of  
the Belgian Dutch  
Conference on  
Machine Learning  
conference*

*March 2020*

### Understanding telecom customer churn with machine learning: from prediction to causal inference

In this extended version, we goes deeper into data-driven causal inference and compare the impact of causally relevant variables. In collaboration with Orange.

Authors: T. VERHELST, O. CAELEN, J-C. DEWITTE, B. LEBICHOT AND G. BONTEMPI

*Knowledge And  
Information  
Systems*

*Oct. 2020*

### An experimental study of Graph-based Semi-Supervised Classification with Additional Nodes Information

This paper focuses on classification using both regular plain data and structural information coming from graph structures. Thirteen techniques are investigated and compared. Furthermore, usage of dimensionality reduction is also studied.

Authors: B. LEBICHOT AND M. SAERENS

*IEEE access*

*March 2021*

### AST-MTL : An Attention-based Multi-Task Learning Strategy for Traffic Forecasting

Road traffic forecasting is crucial in Intelligent Transportation Systems. We propose a new Deep Learning model to predict multiple traffic variables on the Belgian freeway system and on streets, in collaboration with Bruxelles Mobilité.

Authors: BURONI, G., LEBICHOT, B., & BONTEMPI, G.

*International  
Journal of Data  
Science and  
Analytics*

*June 2021*

### Incremental learning strategies for credit cards fraud detection

Training fraud detection systems in a batch setting is under-optimal for architectural and computational reasons, but also to avoid storing sensitive data (due to the GDPR). This paper designs and assesses incremental learning solutions. Authors: B. LEBICHOT, G-M. PALDINO, W. SIBLINI, L. HE-GUELTON, F. OBLÉ AND G. BONTEMPI

*International  
Conference on  
Applications of  
Natural Language  
to Information  
Systems*

*June 2021*      **Comparing MultiLingual and Multiple  
MonoLingual Models for Intent Classification and Slot Filling**

In this work, we discuss chatbots design in multilingual countries. In particular, we assess intent classification and slot filling in banking domain and assess the performance of multilingual models vs multiple monolingual models.

Authors: LOTHRTZ, C., ALLIX, K., LEBICHOT, B., VEIBER, L., BISSYANDÉ, T. F., & KLEIN, J.

*IEEE access*

*August 2021*      **Transfer learning strategies for credit cards fraud  
detection**

A case study on transferring e-commerce fraud detection models learned on a specific country to another with lacking data. We present and discuss various transfer learning techniques, taking 15 realistic settings into account.

Authors: B. LEBICHOT, Y-A. LE BROGNE, L. HE-GUELTON, F. OBLÉ AND G. BONTEMPI

*Data Science and  
Advanced  
Analytics  
conference*

*Sept. 2021*      **Transfer learning for credit card fraud detection :  
A journey from research to production**

In this paper, we give a wider vision of the research process about fraud detection systems. We discussed business formulation, data collection data, and practical integration: from business to research, and back to business.

Authors: W. SIBLINI, G. COTER, R. FABRY, L. HE-GUELTON, F. OBLÉ, B. LEBICHOT, Y.-A. LE BORGNE, G. BON-TEMPI

-

*In preparation*      **Optimally Randomized Markov Decision  
Processes**

Extending the randomized shortest-path, an optimal, mixed, policy for solving Markov decision is obtained and allows to balance exploitation and exploration. Simulation results on simple, illustrative, examples are included.

Authors: B. LEBICHOT, G. GUERX AND M. SAERENS

## RESEARCH SUPERVISION

*PhD committee*

*S. Courtain*      **Exploration of graph theory through the  
bag-of-paths framework.**

*Master Thesis*

*P.-F. De Plaen*      **Study of Convolutional Models for  
Semi-Supervised Classification on Graph-Structured Data.**

*Master Thesis*

*A. Seghers*      **Tire retreading prediction (with Bridgeston  
Aircraft).**

*Master Thesis*

*R. Hautecourt*      **Graph-based tools for churn prediction with  
Orange).**

*Master Thesis*

*M. Marchena*      **Generative Adversarial Networks for Dealing  
with Fraud**

*Master Thesis*

*G.M. Paldino*      **Incremental Learning for Credit Card Fraud  
Detection (2020, with Worldline).**

*Master Thesis*

*Y. Bouharaoua*      **Analysis and Anomaly detection on EMIR  
derivatives (2020, with Banque Nationale Belge).**

<i>Master Thesis</i>	<i>S. Calbert</i>	Study of semi-supervised classification algorithms on a graph, based on convolutional neural networks and kernels on graph (2020).
<i>Master Thesis</i>	<i>H. Borgi</i>	E-commerce Card Fraud Detection Using Big Data/Deep Learning Tools (2019, with Worldline).
<i>Master Thesis</i>	<i>M. Desausoi</i>	Transfer Learning – An Application of Unsupervised Domain Adaptation (2019, with IQVIA).
<i>Master Thesis</i>	<i>T. Verhelst</i>	Churn Prediction and Causal Analysis on Telecom Customer Data (2019, with Orange).

#### PATENT

<i>Apr. 2020</i>	# 20315097.4	Entrainement de modèles prédictifs pour la détection automatique de fraudes à partir d'ensembles d'apprentissage construits dans des contextes distincts (WORLDLINE / UNIVERSITE LIBRE DE BRUXELLES).
------------------	--------------	---

#### FUNDING

<i>June 2021</i>	<i>FNR-Bridge</i>	LuxemBERT: Multilingual NLP coping with Luxembourg Specificities for the Financial Industry.
------------------	-------------------	--