Sarah Anne Wassermann

Personal information
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Research in Internet measurements and machine learning
4 international internships in France, Austria, and the United States
30 publications

Research statement

My research lies at the intersection of computer networks and machine learning, and I develop systems which significantly enhance the experience of Internet users. Today, we perform more and more daily tasks and entertaining activities through the Internet and it is thus crucial that we can do so without being hindered by poor performance. My ultimate goal is to conceive intelligent systems which make the Internet smarter and able to face demanding users and an ever-growing amount of heterogeneous network traffic.

Education

PhD Electrical Engineering **Multiple institutions in France and Austria**

- Thesis subject: **Machine Learning for Internet-QoE Monitoring and Analysis**
- Supervised by Dr. Pedro Casas (AIT Austria) and Tanja Zseby (TU Wien)
- In the context of my PhD, my goal is to deliver algorithms and software systems to measure and efficiently retrieve Internet QoE metrics in today's encrypted Internet.
- I was a PhD student at **Inria Paris** affiliated with Sorbonne Université from 2017 until 2019. Since 2019, I continue my PhD with **AIT Austria** affiliated with Technische Universität Wien. I have been working on several research projects related to QoE and machine learning.
- Since I have been at **AIT Austria**, I have been working on the following projects
  - **I am conceiving active-learning techniques based on reinforcement learning** to gather the users' feedback about their experience in an efficient way: asking the users too often for feedback is annoying and discourages them from answering accurately. The results are published in [J4, C5, W6, A4, P3].
  - **I am designing a machine-learning-based framework to infer key video-QoE indicators** from the analysis of the encrypted traffic in real-time, using only network-level features. This project is carried out in collaboration with Julius-Maximilians-Universität Würzburg. The results are presented in [J3, W7, P4, P5, D3].
  - **I am exploring web QoE**. I implement techniques based on machine learning to infer web-QoE metrics from encrypted network traffic and aim at designing new performance metrics. First results are published in [C6, W8, A3].
- While I was at **Inria** in the MiMove group, **I developed techniques to infer video QoE metrics with a novel lightweight system** that analyses traffic generated by DASH on-demand and live video streams while running at the home-network gateway of the users. This project was carried out in collaboration with Princeton University.
- Expected graduation in **2021**

MSc. Computer Science **Université de Liège (ULiège) – Belgium**

- Specialised in **computer systems and networks** with additional electives in **machine learning**
- Master's thesis entitled **"Anycast-based DNS in Mobile Networks"**, supervised by Prof. Fabián E. Bustamante (Northwestern University) and Prof. Benoit Donnet (University of Liège); with **high honours** http://orbi.ulg.ac.be/handle/2268/215008
- **Conducted research** under the supervision of Dr. Pedro Casas, Prof. Fabián E. Bustamante, and Prof. Benoit Donnet in the field of **Internet measurements**. **Topics:** Internet path dynamics and performance, machine learning for networking, anycast in cellular networks, malware detection in smartphones
- Active as a student representative during my whole Master's studies
- Graduated with **honours** in **September 2017**

BSc. Computer Science **Université de Liège (ULiège) – Belgium**

- Ranked among **Top 3 students** every year: 2 out of 50 1st year, 1 out of 10 2nd year, and 3 out of 9 3rd year
- Active as a student representative during the last two years of my Bachelor's degree
- Graduated with **honours** in **June 2015**

General Certificate of Secondary Education **Lycée Michel Rodange – Luxembourg**

- Main subject areas: mathematics and informatics
- Graduated with grade **excellent** in **July 2012**

Online courses **Coursera**

- Statistics with R specialisation (in progress)
  - This specialisation includes 5 courses: Introduction to Probability and Data; Inferential Statistics; Linear Regression and Modeling; Bayesian Statistics; Statistics with R Capstone
- Big Data for Data Engineers specialisation (in progress)
  - This specialisation includes 5 courses: Big Data Essentials: HDFS, MapReduce and Spark RDD; Big Data Analysis: Hive, Spark SQL, DataFrames and GraphFrames; Big Data Applications: Machine Learning at Scale; Big Data Applications: Real-Time Streaming; Big Data Services: Capstone Project
- Deep Learning specialisation (overall score: **100%**); **March 2018**
  - This specialisation includes 5 courses: Neural Networks and Deep Learning; Improving Deep Neural Networks: Hyperparameter tuning, Regularization and Optimization; Structuring Machine Learning Projects; Convolutional Neural Networks; Sequence Models
- Machine Learning (score: **100%**); **September 2014**
- Image and video processing: From Mars to Hollywood with a stop at the hospital (score: **100%**); **March 2014**
- Einführung in Computer Vision (score: **65.5%**); **February 2014**
- An Introduction to Interactive Programming in Python (score: **99.6%**); **January 2014**

Awards and honours

- **Best Paper Award Runner Up** for our paper "*On the Analysis of YouTube QoE in Cellular Networks through in-Smartphone Measurements*" at the 12th IFIP Wireless and Mobile Networking Conference (WMNC); September 2019
- **Inria PhD fellowship** allowing me to carry out a PhD at Inria Paris (**ranked 1st among all applicants by the admission committee**); October 2017
- **Travel grants** to attend ACM CoNEXT 2015, TMA PhD School 2016, IEEE LCN 2016, ACM CoNEXT 2016, ACM SIGCOMM 2017 (N2Women fellowship and SIGCOMM travel grant), TMA PhD School 2018, ACM SIGCOMM 2018 (Netflix Diversity travel grant)
- **Pisart Grant** as a teaching assistant at Université de Liège; fall 2014

- **Best student prize** for graduating as the best high-school student of my class (grade: **excellent**, ranked in **Top 1.3% of the Grand Duchy of Luxembourg**); July 2012
- **Best student prize** for having the highest GPA of my class in all the academic years from 2005 to 2009

Scientific publications

Journal papers

- [J1] "***Unveiling Network and Service Performance Degradation in the Wild with mPlane***"
  P. Casas, P. Fiadino, S. Wassermann, S. Traverso, A. D'Alconzo, E. Tego, F. Matera, M. Mellia
  in IEEE Communications Magazine, Network Testing Series, vol. 54, no. 3, pp. 71-79, 2016.
  Internet-paths monitoring
  http://orbi.ulg.ac.be/handle/2268/192775

- [J2] "***Considering User Behavior in the Quality of Experience Cycle: Towards Proactive QoE-aware Traffic Management***"
  M. Seufert, S. Wassermann, P. Casas
  in IEEE Communications Letters, vol. 23, no. 7, pp. 1145-1148, 2019.
  Proactive QoE-aware traffic management, supervised learning for user-interaction prediction
  https://hal.inria.fr/hal-02114784

- [J3] "***ViCrypt to the Rescue: Real-time, Machine Learning-driven Video QoE Monitoring for Encrypted Streaming Traffic***"
  S. Wassermann, M. Seufert, P. Casas, L. Gang, K. Li
  accepted to IEEE Transactions on Network and Service Management (TNSM), 2020.
  Supervised learning for video-quality inference

- [J4] "***Adaptive and Reinforcement Learning Approaches for Online Network Monitoring and Analysis***"
  S. Wassermann, T. Cuvelier, P. Mulinka, P. Casas
  accepted to IEEE Transactions on Network and Service Management (TNSM), 2020.
  Stream-based machine learning, reinforcement learning

Conference papers

- [C1] "***Improving QoE Prediction in Mobile Video through Machine Learning***"
  P. Casas, S. Wassermann
  in Proceedings of the 8th International Conference on Network of the Future (NoF), London, United Kingdom, 2017.
  Supervised learning for video-QoE prediction
  Best Paper Award candidate
  http://orbi.ulg.ac.be/handle/2268/214928

- [C2] "***Anycast on the Move: A Look at Mobile Anycast Performance***"
  S. Wassermann, J. P. Rula, F. E. Bustamante, P. Casas
  in Proceedings of the Network Traffic Measurement and Analysis Conference (TMA) 2018, Vienna, Austria, 2018.
  Analysis of anycast on mobile connections
  https://hal.inria.fr/hal-01812440

- [C3] "**Beauty is in the Eye of the Smartphone Holder – A Data Driven Analysis of YouTube Mobile QoE**"
  N. Wehner, S. Wassermann, P. Casas, M. Seufert, F. Wamser
  in Proceedings of the 14th International Conference on Network and Service Management (CNSM), Rome, Italy, 2018.
  Analysis of the evolution of quality metrics for YouTube Mobile
  https://hal.inria.fr/hal-01898082

- [C4] "***On the Analysis of YouTube QoE in Cellular Networks through in-Smartphone Measurements***"
  S. Wassermann, P. Casas, M. Seufert, F. Wamser
  in Proceedings of the 12th IFIP Wireless and Mobile Networking Conference (WMNC), Paris, France, 2019.
  Analysis and prediction of quality metrics for YouTube Mobile
  Best Paper Award runner up
  https://hal.archives-ouvertes.fr/hal-02159716

- [C5] "***ADAM & RAL: Adaptive Memory Learning and Reinforcement Active Learning for Network Monitoring***"
  S. Wassermann, T. Cuvelier, P. Mulinka, P. Casas
  in Proceedings of the 15th International Conference on Network and Service Management (CNSM), Halifax, Canada, 2019.
  Stream-based machine learning, reinforcement learning
  Fast-tracked to IEEE Transactions on Network and Service Management (TNSM)
  https://hal.archives-ouvertes.fr/hal-02301393

- [C6] "***Are you on Mobile or Desktop? On the Impact of End-User Device on Web QoE Inference from Encrypted Traffic***"
  S. Wassermann, P. Casas, Z. Ben Houidi, A. Huet, M. Seufert, N. Wehner, J. Schuler, S. Cai, H. Shi, J. Xu, T. Hoßfeld, D. Rossi
  in Proceedings of the 16th International Conference on Network and Service Management (CNSM), virtual, 2020.
  Supervised learning for Web-QoE inference
  https://hal.archives-ouvertes.fr/hal-02973144

Workshop papers

- [W1] "***On the Analysis of Internet Paths with DisNETPerf, a Distributed Paths Performance Analyzer***"
  S. Wassermann, P. Casas, B. Donnet, G. Leduc, M. Mellia
  in Proceedings of the 10th IEEE Workshop on Network Measurements (WNM), Dubai, United Arab Emirates, 2016.
  Internet-paths monitoring
  http://orbi.ulg.ac.be/handle/2268/200967

- [W2] "***NETPerfTrace – Predicting Internet Path Dynamics and Performance with Machine Learning***"
  S. Wassermann, P. Casas, T. Cuvelier, B. Donnet
  in Proceedings of the ACM SIGCOMM 2017 Workshop on Big Data Analytics and Machine Learning for Data Communication (Big-DAMA), Los Angeles (CA), United States, 2017.
  Supervised learning for Internet-path-performance prediction
  http://orbi.ulg.ac.be/handle/2268/211667

- [W3] "***BIGMOMAL – Big Data Analytics for Mobile Malware Detection***"
  S. Wassermann, P. Casas
  in Proceedings of the ACM SIGCOMM 2018 Workshop on Traffic Measurements for Cybersecurity (WTMC), Budapest, Hungary, 2018.
  Supervised learning for malware detection
  https://hal.inria.fr/hal-01812448

- [W4] "***Machine Learning Models for YouTube QoE and User Engagement Prediction in Smartphones***"
  S. Wassermann, N. Wehner, P. Casas
  in Proceedings of the Workshop on AI in Networks (WAIN) 2018, Toulouse, France, 2018.
  Supervised learning for QoE and user-engagement prediction
  https://hal.inria.fr/hal-01898083

- [W5] "***Remember the Good, Forget the Bad, do it Fast: Continuous Learning over Streaming Data***"
  P. Mulinka, S. Wassermann, G. Marín, P. Casas
  in Proceedings of the Continual Learning Workshop at NeurIPS 2018, Montreal, Canada, 2018.
  Stream-based supervised learning, adaptive learning under concept drifts
  https://hal.inria.fr/hal-01952211

- [W6] "***RAL – Improving Stream-Based Active Learning by Reinforcement Learning***"
  S. Wassermann, T. Cuvelier, P. Casas
  in Proceedings of the European Conference on Machine Learning and Principles and Practice of Knowledge Discovery in Databases (ECML-PKDD), Workshop on Interactive Adaptive Learning (IAL), Würzburg, Germany, 2019.
  Stream-based active learning, reinforcement learning
  https://hal.archives-ouvertes.fr/hal-02265426

- [W7] "***I See What you See: Real Time Prediction of Video Quality from Encrypted Streaming Traffic***"
  S. Wassermann, M. Seufert, P. Casas, L. Gang, K. Li
  in Proceedings of the 4th ACM MOBICOM Workshop on QoE-based Analysis and Management of Data Communication Networks (Internet-QoE), Los Cabos, Mexico, 2019.
  Supervised learning for video-quality inference
  https://hal.archives-ouvertes.fr/hal-02268814

- [W8] "***Improving Web QoE Monitoring for Encrypted Network Traffic through Time Series Modeling***"
  N. Wehner, M. Seufert, J. Schüler, S. Wassermann, P. Casas, T. Hoßfeld
  in Proceedings of the IFIP Performance 2020 Workshops, Workshop on AI in Networks (WAIN), virtual, 2020.
  Web-QoE modeling
  https://hal.archives-ouvertes.fr/hal-02973134

Extended abstracts

- [A1] "***Towards DisNETPerf: a Distributed Internet Paths Performance Analyzer***"
  S. Wassermann, P. Casas, B. Donnet
  in Proceedings of the ACM CoNEXT Student Workshop, Heidelberg, Germany, 2015.
  Internet-paths monitoring
  http://orbi.ulg.ac.be/handle/2268/187290

- [A2] "***Machine Learning based Prediction of Internet Path Dynamics***"
  S. Wassermann, P. Casas, B. Donnet
  in Proceedings of the ACM CoNEXT Student Workshop, Irvine (CA), United States, 2016.
  Supervised learning for Internet-path-performance prediction
  http://orbi.ulg.ac.be/handle/2268/203086

- [A3] "***How Good is your Mobile (Web) Surfing? Speed Index Inference from Encrypted Traffic***"
  S. Wassermann, P. Casas, M. Seufert, N. Wehner, J. Schüler, T. Hoßfeld
  in Proceedings of the ACM SIGCOMM 2020 Posters, Demos, and Student Research Competition, virtual, 2020.
  Web-QoE inference with supervised learning
  https://hal.inria.fr/hal-02932838

- [A4] "***RAL – Reinforcement Active Learning for Network Traffic Monitoring and Analysis***"
  S. Wassermann, T. Cuvelier, P. Casas
  in Proceedings of the ACM SIGCOMM 2020 Posters, Demos, and Student Research Competition, virtual, 2020.
  Stream-based active learning, reinforcement learning
  https://hal.inria.fr/hal-02932839

Demo sessions

- [D1] "***Reverse Traceroute with DisNETPerf, a Distributed Internet Paths Performance Analyzer***"
  S. Wassermann, P. Casas
  in Proceedings of the Demonstrations of the 41th Annual IEEE Conference on Local Computer Networks (LCN-Demos 2016), Dubai, United Arab Emirates, 2016.
  Internet-paths monitoring
  http://orbi.ulg.ac.be/handle/2268/201059

- [D2] "***Distributed Internet Paths Performance Analysis through Machine Learning***"
  S. Wassermann, P. Casas
  in Proceedings of the Demonstrations of the Network Traffic Measurement and Analysis Conference (TMA) 2018, Vienna, Austria, 2018.
  Internet-paths monitoring with supervised learning
  Best Demo Award candidate
  https://hal.inria.fr/hal-01883815

- [D3] "***Let me Decrypt your Beauty: Real-time Prediction of Video Resolution and Bitrate for Encrypted Video Streaming***"
  S. Wassermann, M. Seufert, P. Casas, L. Gang, K. Li
  in Proceedings of the Demonstrations of the Network Traffic Measurement and Analysis Conference (TMA) 2019, Paris, France, 2019.
  Video-quality-metric estimation with supervised learning
  https://hal.archives-ouvertes.fr/hal-02134851

Posters

- [P1] "***Anycast on the Move – A First Look at Mobile Anycast Performance***"
  S. Wassermann, J. P. Rula, F. E. Bustamante
  presented during the poster session at the ACM Internet Measurement Conference (IMC) 2017, London, United Kingdom, 2017.
  Analysis of anycast on mobile connections
  http://orbi.ulg.ac.be/handle/2268/215141

- [P2] "***BIGMOMAL – Big Data Analytics for Mobile Malware Detection***"
  S. Wassermann, P. Casas
  presented during the poster session at the ACM Internet Measurement Conference (IMC) 2017, London, United Kingdom, 2017.
  Supervised learning for malware detection
  http://orbi.ulg.ac.be/handle/2268/215139

- [P3] "***Improving Stream-Based Active Learning with Reinforcement Learning***"
  S. Wassermann, T. Cuvelier, P. Casas
  presented during the poster session at the Women in Machine Learning (WiML) Workshop co-located with NeurIPS, Vancouver, Canada, 2019.
  Stream-based active learning, reinforcement learning
  https://hal.archives-ouvertes.fr/hal-02375296

- [P4] "***Decrypting Video Quality from Encrypted Streaming Traffic***"
  S. Wassermann, P. Casas
  accepted to the poster session at the Women in Machine Learning (WiML) Workshop co-located with NeurIPS, Vancouver, Canada, 2019.
  Supervised learning for video-quality inference
  https://hal.archives-ouvertes.fr/hal-02375298

- [P5] "***ViCrypt: Real-time, Fine-grained Prediction of Video Quality from Encrypted Streaming Traffic***"
  S. Wassermann, M. Seufert, P. Casas
  presented during the poster session at the Internet Measurement Conference (IMC), Early Work, Tools, and Datasets Track, Amsterdam, Netherlands, 2019.
  Supervised learning for video-quality inference
  https://hal.archives-ouvertes.fr/hal-02375301

Technical reports

- [R1] "***Predicting Internet Path Dynamics and Performance with Machine Learning***"
  S. Wassermann, P. Casas, T. Cuvelier, B. Donnet
  AIT-Big-DAMA Tech. Rep. A3215, 2017.
  Supervised learning for Internet-path-performance prediction
  http://orbi.ulg.ac.be/handle/2268/209422

Talks

- [T1] "***Decrypting QoE in an Encrypted Internet – AI to the Rescue***"
  RIPE 79, Rotterdam, Netherlands, October 2019.
  Video-quality-metric estimation with supervised learning
  https://sawassermann.github.io/talks/ripe79_2019.pptx

- [T2] "***Active Measurements for Path Performance Diagnosis with DisNETPerf, a Distributed Internet Paths Performance Analyzer***"
  Luxembourg Internet Days, Luxembourg, Grand Duchy of Luxembourg, November 2019.
  Internet-paths monitoring
  https://sawassermann.github.io/talks/luxInternetDays_2019.pptx

Research experience

Junior investigator **Austrian Institute of Technology (AIT) – Austria**

- Research internship in the context of the ICT15-129 project Big-DAMA under the supervision of Dr. Pedro Casas; **March 2017**
- The subject of this research stay was "***Mobile Malware Detection using Machine Learning and Big-Data Analytics***". I worked in the **analysis of a large-scale dataset of smartphone measurements**, with the aim of automatically discovering malware activity. I developed different machine-learning-based approaches for both **supervised and unsupervised detection of malware applications**, using the scikit-learn machine-learning library. Our first results are presented in [W3, P2].

Visiting pre-doctoral fellow **Northwestern University (NU) – United States**

- Research stay in the Aqualab group under the supervision of Prof. Fabián Bustamante and Dr. John Rula; **July – September 2016**
- My research topic was entitled "***Analysis of Anycast-based Content Distribution in Cellular Networks".*** I studied the **performance of anycast routing for cellular clients**. I conducted and analysed the **measurements from distributed mobile vantage points to a live anycast service-**, measuring the latencies and routes to server deployments, and investigated the causes of poor performance for cellular clients. This internship lead to my Master's thesis, and we discuss the outcome of our study in [C2, P1].

Research intern **Forschungszentrum Telekommunikation Wien (FTW) – Austria**

- Research internship in the context of the of the FP7 ICT European Research Project mPlane under the supervision of Dr. Pedro Casas; **July – September 2015**
- The subject of this internship was "***Tracking the Performance of CDN Servers-to-Customers Internet Paths with Distributed Active Measurements*"**. I worked in the field of **geo- and topology-based location of active probes** – devices capable of launching active measurements – **at the Internet scale**, relying on the well-known **RIPE Atlas** distributed active-measurement platform. I designed and developed **DisNETPerf**, an Internet-scale measurement framework to track the performance of Internet paths, relying on distributed probes' location and active measurements. In a nutshell, DisNETPerf can measure path performance using standard traceroute measurements, but can do so for paths connecting arbitrarily selected nodes. I developed different techniques to find the optimal probe – in terms of network topology and path latency – closest to a desired server, which is then used to masquerade this server and to collect active network-path measurements. DisNETPerf thus allows users to accurately monitor servers through active

measurements, even if they do not have access to these servers. An in-depth description and evaluation of my tool can be found in [W1, A1, D1, D2].

Summer intern **Laboratoire d'Informatique de Paris 6 (LIP6) – France**

- Internship at the Laboratory of Information, Networking and Communication Sciences (LINCS) under the supervision of Prof. Timur Friedman, Dr. Marc-Olivier Buob, and Dr. Jordan Augé; **July 2014**
- I was involved in the **Paris Traceroute** and **libparistraceroute** projects. I developed **Paris Ping**, a generic ping tool based on the libparistraceroute library which can handle IPv4, IPv6, and TCP, UDP, ICMP probes. Contrary to the standard ping tool, the flow IDs of each sent packet remain constant in order to avoid flow-based load balancing, which enhances the accuracy of the latency measurements. In addition to the implementation of Paris Ping, I also extended the libparistraceroute library.

Editorial boards

Reviewer

- IEEE Communications Letters, 2016
- IEEE/ACM Transactions on Networking, 2019
- Women in Machine Learning (WiML) Workshop, co-located with NeurIPS, 2019
- IEEE Transactions on Network and Service Management, 2019 and 2020
- IEEE Access, 2020

Open-source projects

DisNETPerf

I designed and implemented DisNETPerf – a Distributed Internet Paths Performance Analyzer – during my internship at FTW, with the collaboration of Dr. Pedro Casas and Dr. Pierdomenico Fiadino.
DisNETPerf is a tool that allows one to **locate the closest RIPE Atlas box** (in terms of minimum RTT) to a given IP address. Once the closest RIPE Atlas box has been located, DisNETPerf permits to **launch traceroutes** from this box to a destination IP address provided by the user.
More details about the tool and how the closest probe is actually chosen are explained in [W1, A1, D1, D2].
DisNETPerf is freely available on GitHub: https://github.com/SAWassermann/DisNETPerf

NETPerfTrace

I developed NETPerfTrace — an Internet Path Tracking System — while working on a research project about the prediction of Internet path dynamics and performance, in collaboration with Dr. Pedro Casas.
NETPerfTrace is a tool capable of **forecasting path changes and path latency variations**. It aims at predicting **three metrics**:

- the residual life time of a route (i.e. the remaining life time of the route before it actually changes)
- the number of route changes in the next time window
- the average RTT of the next traceroute sample

The overall idea of this tool and preliminary results are presented in [W2, A2, D2, R1].
NETPerfTrace is freely available on GitHub: https://github.com/SAWassermann/NETPerfTrace

RAL

I conceived RAL – Reinforced stream-based Active Learning –, which is an active-learning technique relying on reinforcement-learning principles, using rewards and bandit-like algorithms.

In particular, the rewards are based on the usefulness of RAL's querying behaviour. The intuition behind the different reward values is that we attribute a positive reward in case RAL asks the oracle for ground truth and it was necessary (i.e. the underlying models would have predicted the wrong label), and a negative one otherwise (i.e. querying the oracle was unnecessary as the models predicted the right label anyway).
The system additionally makes use of the prediction certainty of the classification models. We combine the aforementioned reward mechanism with the model's uncertainty to tune the sample-informativeness heuristic to better guide the query decisions.
The technique is described in detail in [W6, C5, A4, P3].
RAL is freely available on GitHub: https://github.com/SAWassermann/RAL

libparistraceroute

I contributed to the libparistraceroute project (which includes the well-known Paris Traceroute) during my internship at LIP6.
My main contribution was the development of **Paris Ping**. I also extended the libparistraceroute library itself by adding probe matching. More precisely, I implemented functions to check whether a probe corresponds to the reply to a given probe (for the IPv4/6, ICMPv4/6, and TCP protocols).
libparistraceroute is freely available on GitHub: https://github.com/libparistraceroute/libparistraceroute

Teaching activities

Undergraduate teaching assistant **Université de Liège (ULiège) – Belgium**

I was hired as an undergraduate teaching assistant to supervise and help students during the exercise sessions for the course **Introduction to Computer Programming** (1st year BSc. course in Computer Science, taught by Prof. Benoit Donnet); **fall 2013 and 2014**

Work experience

Active member **IEEE Student Branch Liège**

I designed flyers and posters for the events organised by the student branch. I also actively participated in the organisation of conferences. I have been the main organiser for the talk entitled "*Practical Internet-of-Things: the reality between people, process, data and things*" given by Emmanuel Tychon (Cisco) at the University of Liège in November 2016. I participated in IEEEXtreme 8.0 as a competitor; **2013 – 2017**

IT coordinator **Board of European Students of Technology (BEST)**

I was responsible for redesigning and reworking the website of the local BEST group of the University of Liège; **2013 – 2015**

Event organiser **Board of European Students of Technology (BEST)**

I was in charge of organising events in collaboration with the IEEE student branch at the University of Liège. I helped organising the conference about photonic quantum computers given by Dr. André Hautot in February 2014; **2013 – 2015**

Technical skills

Programming languages	Python, Java, C, C++
Data analytics	scikit-learn, pandas, Weka, Hive
Query languages	SQL
Web publishing	HTML, CSS
Software development kits	Android SDK (Java)
Operating systems	Microsoft Windows, Linux
Development environments	Microsoft Visual Studio, PyCharm, IntelliJ IDEA, MathWorks MATLAB
Other software	Adobe Photoshop, Maxon Cinema 4D

Languages

Luxembourgish	native proficiency
French	bilingual proficiency
English	full professional proficiency
German	full professional proficiency

Personality and interests

Personality

hard worker, results-driven, detail-minded, creative

Interests

Travelling, reading (mostly novels), photography, listening to music (particularly electronica), playing the piano, graphic design, video games (especially action-adventure and strategy games)

References

Dr. Pedro Casas — **Austrian Institute of Technology (AIT) – Austria**
- Email: pedro.casas@ait.ac.at
- Homepage: http://pcasas.info/

Prof. Dr. Fabián E. Bustamante — **Northwestern University (NU) – United States**
- Email: fabianb@cs.northwestern.edu
- Homepage: http://www.cs.northwestern.edu/~fabianb/

Prof. Dr. Benoit Donnet — **Université de Liège (ULiège) – Belgium**
- Email: benoit.donnet@ulg.ac.be
- Homepage: http://www.montefiore.ulg.ac.be/personnel.php?op=detail&id=1077

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