

# Sarah Wassermann

## Personal information

Female  
Born 17<sup>th</sup> April 1993  
Luxembourgish

## Contact

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**Research in Internet measurements and machine learning**  
**4 international internships in France, Austria, and the United States**  
**35 publications**

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## 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.

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## Education

### PhD Electrical Engineering

### Multiple institutions in France and Austria

- Thesis subject: **Machine Learning for Network Traffic Monitoring and Analysis – Application to Internet QoE Assessment and Network Security**  
<https://repositum.tuwien.at/handle/20.500.12708/20297>
- Graduated in **May 2022**
- Supervised by Dr. Pedro Casas (AIT Austria) and Prof. Tanja Zseby (TU Wien)
- In the context of my PhD, my goal was 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. From 2019 to 2022, I continued my PhD with **AIT Austria** affiliated with **Technische Universität Wien**. I was working on several research projects related to QoE and machine learning.
- At **AIT Austria**, I was working on the following projects
  - o **I conceived 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].
  - o **I designed 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 was carried out in collaboration with Julius-Maximilians-Universität Würzburg. The results are presented in [J3, W7, P4, P5, D3].
  - o **I explored Web QoE**. I implemented techniques based on machine learning to infer Web-QoE metrics from encrypted network traffic and aimed at designing new performance metrics. Results are published in [C6, C9, C10, C11, 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 **2022**

### **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 1<sup>st</sup> year, 1 out of 10 2<sup>nd</sup> year, and 3 out of 9 3<sup>rd</sup> 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; **September 2021**
  - o This specialisation includes 5 courses: Introduction to Probability and Data; Inferential Statistics; Linear Regression and Modeling; Bayesian Statistics; Statistics with R Capstone
- Deep Learning specialisation (overall score: **100%**); **March 2018**
  - o 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**

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## **Awards and honours**

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- **Best Paper Award** for our paper "*Mobile Web and App QoE Monitoring for ISPs – from Encrypted Traffic to Speed Index through Machine Learning*" at the 13<sup>th</sup> IFIP Wireless and Mobile Networking Conference (WMNC); October 2021
- **Best Paper Award Runner Up** for our paper "*On the Analysis of YouTube QoE in Cellular Networks through in-Smartphone Measurements*" at the 12<sup>th</sup> IFIP Wireless and Mobile Networking Conference (WMNC); September 2019
- **Inria PhD fellowship** allowing me to carry out a funded PhD at Inria Paris (**ranked 1<sup>st</sup> 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

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## Scientific publications

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### Journal papers

- [J4] ***“Adaptive and Reinforcement Learning Approaches for Online Network Monitoring and Analysis”***  
S. Wassermann, T. Cuvelier, P. Mulinka, P. Casas  
in IEEE Transactions on Network and Service Management (TNSM), vol. 18, no. 2, pp. 1832-1849, 2021  
[Stream-based machine learning, reinforcement learning](https://hal.archives-ouvertes.fr/hal-03110834)  
<https://hal.archives-ouvertes.fr/hal-03110834>
- [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  
in IEEE Transactions on Network and Service Management (TNSM), vol. 17, no. 4, pp. 2007-2023, 2020  
[Supervised learning for video-quality inference](https://hal.archives-ouvertes.fr/hal-03110816)  
<https://hal.archives-ouvertes.fr/hal-03110816>
- [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)  
<https://hal.inria.fr/hal-02114784>
- [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)  
<http://orbi.ulg.ac.be/handle/2268/192775>

### Conference papers

- [C11] ***“Fingerprinting Webpages and Smartphone Apps from Encrypted Network Traffic with WebScanner”***  
P. Casas, N. Wehner, S. Wassermann, M. Seufert  
in 27th IEEE Global Internet (GI) Symposium, Paris, France, 2022  
[Web and app traffic fingerprinting](https://hal.science/hal-03834367)  
<https://hal.science/hal-03834367>

- [C10] ***“Not all Web Pages are Born the Same. Content Tailored Learning for Web QoE Inference”***  
P. Casas, S. Wassermann, N. Wehner, M. Seufert, T. Hoßfeld  
in 6th IEEE International Symposium on Measurements & Networking (M&N), Padua, Italy, 2022  
[Supervised and unsupervised learning for Web-QoE inference](#)  
<https://hal.science/hal-03834407>
  
- [C9] ***“X-Ray Goggles for the ISP: Improving in-Network Web and App QoE Monitoring with Deep Learning”***  
P. Casas, S. Wassermann, M. Seufert, N. Wehner, O. Dinica, T. Hoßfeld  
in 6th IFIP Network Traffic Measurement and Analysis Conference (TMA), Enschede, The Netherlands, 2022  
[Deep learning for Web- and app-QoE inference](#)  
<https://hal.science/hal-03834364>
  
- [C8] ***“DeepCrypt – Deep Learning for QoE Monitoring and Fingerprinting of User Actions in Adaptive Video Streaming”***  
P. Casas, M. Seufert, S. Wassermann, B. Gardlo, N. Wehner, R. Schatz  
in 8th IEEE International Conference on Network Softwarization (NetSoft), Milan, Italy, 2022  
[Deep learning for video-QoE inference](#)  
<https://hal.science/hal-03834408>
  
- [C7] ***“Mobile Web and App QoE Monitoring for ISPs – from Encrypted Traffic to Speed Index through Machine Learning”***  
P. Casas, S. Wassermann, N. Wehner, M. Seufert, J. Schüler, T. Hoßfeld  
in 13<sup>th</sup> IFIP Wireless and Mobile Networking Conference (WMNC), virtual, 2021  
[Supervised learning for Web- and app-QoE inference](#)  
**Best Paper Award**  
<https://hal.archives-ouvertes.fr/hal-03365897>
  
- [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 16<sup>th</sup> International Conference on Network and Service Management (CNSM), virtual, 2020  
[Supervised learning for Web-QoE inference](#)  
<https://hal.archives-ouvertes.fr/hal-02973144>
  
- [C5] ***“ADAM & RAL: Adaptive Memory Learning and Reinforcement Active Learning for Network Monitoring”***  
S. Wassermann, T. Cuvelier, P. Mulinka, P. Casas  
in 15<sup>th</sup> 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>

- [C4] ***“On the Analysis of YouTube QoE in Cellular Networks through in-Smartphone Measurements”***  
 S. Wassermann, P. Casas, M. Seufert, F. Wamser  
 in 12<sup>th</sup> 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>
  
- [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 14<sup>th</sup> 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>
  
- [C2] ***“Anycast on the Move: A Look at Mobile Anycast Performance”***  
 S. Wassermann, J. P. Rula, F. E. Bustamante, P. Casas  
 in Network Traffic Measurement and Analysis Conference (TMA) 2018, Vienna, Austria, 2018  
[Analysis of anycast on mobile connections](#)  
<https://hal.inria.fr/hal-01812440>
  
- [C1] ***“Improving QoE Prediction in Mobile Video through Machine Learning”***  
 P. Casas, S. Wassermann  
 in 8<sup>th</sup> 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>

## Workshop papers

- [W8] ***“Improving Web QoE Monitoring for Encrypted Network Traffic through Time Series Modeling”***  
 N. Wehner, M. Seufert, J. Schöler, S. Wassermann, P. Casas, T. Hoßfeld  
 in IFIP Performance 2020 Workshops, Workshop on AI in Networks (WAIN), virtual, 2020  
[Web-QoE modeling](#)  
<https://hal.archives-ouvertes.fr/hal-02973134>
  
- [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 4<sup>th</sup> 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>
  
- [W6] ***“RAL – Improving Stream-Based Active Learning by Reinforcement Learning”***  
 S. Wassermann, T. Cuvelier, P. Casas  
 in 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>

- [W5] ***“Remember the Good, Forget the Bad, do it Fast: Continuous Learning over Streaming Data”***  
 P. Mulinka, S. Wassermann, G. Marín, P. Casas  
 in Continual Learning Workshop at NeurIPS 2018, Montreal, Canada, 2018  
 Stream-based supervised learning, adaptive learning under concept drifts  
<https://hal.inria.fr/hal-01952211>
  
- [W4] ***“Machine Learning Models for YouTube QoE and User Engagement Prediction in Smartphones”***  
 S. Wassermann, N. Wehner, P. Casas  
 in IFIP Performance 2018 Workshops, Workshop on AI in Networks (WAIN) 2018, Toulouse, France, 2018  
 Supervised learning for QoE and user-engagement prediction  
<https://hal.inria.fr/hal-01898083>
  
- [W3] ***“BIGMOMAL – Big Data Analytics for Mobile Malware Detection”***  
 S. Wassermann, P. Casas  
 in ACM SIGCOMM 2018 Workshop on Traffic Measurements for Cybersecurity (WTMC), Budapest, Hungary, 2018  
 Supervised learning for malware detection  
<https://hal.inria.fr/hal-01812448>
  
- [W2] ***“NETPerfTrace – Predicting Internet Path Dynamics and Performance with Machine Learning”***  
 S. Wassermann, P. Casas, T. Cuvelier, B. Donnet  
 in 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>
  
- [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 10<sup>th</sup> IEEE Workshop on Network Measurements (WNM), Dubai, United Arab Emirates, 2016  
 Internet-paths monitoring  
<http://orbi.ulg.ac.be/handle/2268/200967>

## Extended abstracts

- [A4] ***“RAL – Reinforcement Active Learning for Network Traffic Monitoring and Analysis”***  
 S. Wassermann, T. Cuvelier, P. Casas  
 in ACM SIGCOMM 2020 Posters, Demos, and Student Research Competition, virtual, 2020  
 Stream-based active learning, reinforcement learning  
<https://hal.inria.fr/hal-02932839>
  
- [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 ACM SIGCOMM 2020 Posters, Demos, and Student Research Competition, virtual, 2020  
 Web-QoE inference with supervised learning  
<https://hal.inria.fr/hal-02932838>

- [A2] ***“Machine Learning based Prediction of Internet Path Dynamics”***  
S. Wassermann, P. Casas, B. Donnet  
in ACM CoNEXT Student Workshop, Irvine (CA), United States, 2016  
[Supervised learning for Internet-path-performance prediction](#)  
<http://orbi.ulg.ac.be/handle/2268/203086>
- [A1] ***“Towards DisNETPerf: a Distributed Internet Paths Performance Analyzer”***  
S. Wassermann, P. Casas, B. Donnet  
in ACM CoNEXT Student Workshop, Heidelberg, Germany, 2015  
[Internet-paths monitoring](#)  
<http://orbi.ulg.ac.be/handle/2268/187290>

## Demo sessions

- [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 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>
- [D2] ***“Distributed Internet Paths Performance Analysis through Machine Learning”***  
S. Wassermann, P. Casas  
in 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>
- [D1] ***“Reverse Traceroute with DisNETPerf, a Distributed Internet Paths Performance Analyzer”***  
S. Wassermann, P. Casas  
in Demonstrations of the 41<sup>st</sup> 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>

## Posters

- [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 ACM 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>



- [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>
- [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>
- [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), London, United Kingdom, 2017  
[Supervised learning for malware detection](#)  
<http://orbi.ulg.ac.be/handle/2268/215139>
- [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), London, United Kingdom, 2017  
[Analysis of anycast on mobile connections](#)  
<http://orbi.ulg.ac.be/handle/2268/215141>

## 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>

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## Talks

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- [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](https://sawassermann.github.io/talks/luxInternetDays_2019.pptx)
- [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](https://sawassermann.github.io/talks/ripe79_2019.pptx)



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## Research experience

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### Research scientist

Vade – France

- Member of the research lab since **August 2022**.
- I am working on various research projects in the domain of **spear phishing** and **business-email compromise (BEC)**. They allow me to deepen my knowledge of **email security** and **natural language processing (NLP)**.

### 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.

March 2023

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.

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## Editorial boards

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### Reviewer

- Passive and Active Measurement (PAM) Conference, 2023
- Elsevier Computer Communications, 2022
- IEEE Transactions on Network and Service Management; 2019, 2020, and 2021
- IEEE Access, 2020
- IEEE/ACM Transactions on Networking; 2019
- Women in Machine Learning (WiML) Workshop, co-located with NeurIPS; 2019
- IEEE Communications Letters; 2016

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## Open-source projects

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### 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>

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## 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** (1<sup>st</sup> year BSc. course in Computer Science, taught by Prof. Benoit Donnet); **fall 2013 and 2014**

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## 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 IEEEExtreme 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**

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## Technical skills

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

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## Languages

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

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## Personality and interests

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### 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)

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## References

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