Benoît Legat

Curriculum Vitae

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Education

2016–Present **F.R.S.-FNRS Research Fellow**, *UCLouvain*, Louvain-la-Neuve, *supervised by Raphaël Jungers and Pablo Parrilo.*

2014–2016 **Master's Degree in Applied Mathematics**, *UCLouvain*, Louvain-la-Neuve, *Summa Cum Laude.*

2011–2014 **Bachelor's Degree in Engineering**, *UCLouvain*, Louvain-la-Neuve, *Summa Cum Laude.*
Specialized in Computer Science and Mathematics

2005–2011 **Secondary education**, *Lycée Martin V*, Louvain-la-Neuve.
Specialized in Science and Mathematics

Massive Open Online Courses

2014 **Coursera: Cryptography I**, *Stanford University*, *grade A.*

2014 **LFS101x: Introduction to Linux**, *LinuxFoundationX*, *grade A.*

2014 **UT.9.01x: Effective Thinking Through Mathematics**, *UTAustinX*, *grade A.*

2014 **Astro2290x: Relativity and Astrophysics**, *CornellX*, *grade A.*

2013 **CS191x: Quantum Mechanics and Quantum Computation**, *BerkeleyX*, *grade A.*

2012 **CS188.1x: Artificial Intelligence**, *BerkeleyX*, *grade A.*

2012 **6.002x: Circuits and Electronics**, *MITx*, *grade A.*

Awards

2015 **Bronze Medal at NWERC[1] 2015** *Leiden, Netherlands*

2015 **3rd team at BAPC[2] 2015** *Eindhoven, Netherlands*

2015 **5th team at Cyber Security Challenge 2015** *Brussels, Belgium*

2014 **Bronze Medal at NWERC[1] 2014** *Linköping, Sweden*

2014 **3rd team at BAPC[2] 2014** *Eindhoven, Netherlands*

2013 **4th team at BAPC[2] 2013** *Utrecht, Netherlands*

2012 **2nd at Prologin 2012 final** *Paris, France*

2011 **Bronze Medal at IOI[3] 2011** *Pattaya, Thaïland*

2011 **Bronze Medal at IMO[4] 2011** *Amsterdam, Netherlands*

2011 **1st prize at OMB[5] 2011** *Brussels, Belgium*

2011 **Bronze medal at BxMO[6] 2011** *Mersch, Luxembourg*

2011 **1st at be-OI[7] 2011** *Louvain-la-Neuve, Belgium*

2010 **1st Belgian at IOI[3] 2010** *Waterloo, Canada*

2010 **3rd at be-OI[7] 2010** *Louvain-la-Neuve, Belgium*

2010 **Bronze medal at BxMO[6] 2010** *Amsterdan, Netherlands*

2009 **4th prize at OMB[5] 2009** *Brussels, Belgium*

Research experience

2016 **Master's thesis**, *UCLouvain*, Louvain-la-Neuve.
Master's thesis "Sum-Of-Squares programming on Path-complete graphs for switching systems" with Prof. Raphaël Jungers.

2015 **Summer Internship**, *Massachusetts Institute of Technology (MIT)*, Boston.
Research with Prof. Pablo Parrilo.

2014 **Summer student job**, *Université de Liège*, Liège.
Design of a R library for H-NMR pretreatments in Metabolomics.

2011 **Summer student developer**, *Keemotion*, Louvain-la-Neuve.
Improvement, testing, benchmarking and documenting existing code at Keemotion.

Reviewing experience

2018–Present **Reviewer**, *Society for Industrial and Applied Mathematics (SIAM)*.
Journal on Control and Optimization

2018–Present **Reviewer**, *International Federation of Automatic Control (IFAC)*.
Automatica, Nonlinear Analysis: Hybrid Systems

2017–Present **Reviewer**, *Institute of Electrical and Electronics Engineers (IEEE)*.
Transactions on Automatic Control, American Control Conference, Conference on Decision and Control

2012 **Jury member**, *Belgium Society of Mathematics Professors*, La Marlagne.
Grading of solutions for participants to the Benelux Mathematical Olympiad 2012.

Teaching experience

2016–Present **Teaching Assistant**, *UCLouvain*, Louvain-la-Neuve.
Game theory (LINMA2345), Modelling and analysis of dynamical systems (LINMA2370), Advanced control and applications (LINMA2671), Scientific computing (LINMA2710)

2013–Present **Mathematics Instructor**, *Belgium Society of Mathematics Professors*, La Marlagne.
Training of secondary school students for the International Mathematical Olympiad.

[1] ACM ICPC Northwestern Europe Regional Contest
[2] ACM ICPC Benelux Algorithm Programming Contest
[3] International Olympiad in Informatics
[4] International Mathematical Olympiad
[5] Olymiade Mathématique Belge (Belgium Mathematical Olympiad)
[6] Benelux Mathematical Olympiad
[7] Belgium Olympiad in in Informatics

2013–Present **Computer Science Instructor**, *beOI: Belgium Olympiad in Informatics*.
Training of secondary school students in Algorithms and Competitive Programming for the International Olympiad in Informatics.

2012–2016 **Academic Tutor**, *UCLouvain*, Louvain-la-Neuve.
Coaching of first years student for the two first Mathematics courses (LFSAB1101 and LFSAB1102) and for the first Physics course (LFSAB1201). I gave exercises classes and corrected homeworks for students in second year twice for the course LFSAB1104 (numerical methods), twice for the course LSINF1252 (Operating Systems) and once for the course LINMA1702 (Optimization models and methods).

2014 **Student job**, *UCLouvain*, Louvain-la-Neuve.
Introduction of high school students to Artificial Intelligence.

2013 **Summer student job**, *UCLouvain*, Louvain-la-Neuve.
Development of benchmarking exercises to mesure differences in system calls performances and a part of the syllabus about Git for the course LSINF1252.

Miscellaneous experience

2016 **Engineer**, *Louvain Coopération*, Bénin.
Design of a Rocket Stove and Agricultural Waste briquettes for the Ets MAHOULÉ in Klouékanmé, Bénin.

2013–2016 **Member**, *Louvain-li-Nux project*, Louvain-la-Neuve.
Promotion of Free Softwares including GNU/Linux amoung student of the UCL.

2013 **Developer**, *Mathraining*.
Co-development of the website Mathraining to help secondary students in their training for IMO (International Mathematical Olympiad).

Publications

Legat B., Parrilo P. A. and Jungers R. M.. *An entropy-based bound for the computational complexity of a switched system*. IEEE Transactions on Automatic Control (TAC), 2019. `https://doi.org/10.1109/TAC.2019.2902625`

Gomes C., Jungers R. M., Legat B., and Hans Vangheluwe H.. *Minimally, Constrained Stable Switched Systems and Application to Co-Simulation*, IEEE Conference on Decision and Control (CDC), 2018, pp. 5676-5681. `https://doi.org/10.1109/CDC.2018.8619223` `https://doi.org/10.1109/CDC.2018.8619223`

Legat, B. and Tabuada, P. and Jungers, R. M., *Computing controlled invariant sets for hybrid systems with applications to model-predictive control*, Proceedings of the IFAC Conference on Analysis and Design of Hybrid Systems, 2018. `https://doi.org/10.1016/j.ifacol.2018.08.033`

Gomes, C. and Legat, B. and Jungers, R. M., Vangheluwe, H. *Stable Adaptive Co-simulation: A Switched Systems Approach*, IUTAM Symposium on Co-Simulation and Solver Coupling, 2017. `https://doi.org/10.1007/978-3-030-14883-6_5`

Martin, M. and Legat, B., Leenders, Justine, et al., *PepsNMR for the 1H-NMR metabolomic data pre-processing*, Analytica Chimica Acta 1019, 2017. `https://doi.org/10.1016/j.aca.2018.02.067`

Legat, B. and Jungers, R. M., *Parallel optimization on the Entropic Cone*, Proceedings of the 37rd Symposium on Information Theory in the Benelux, 2016, pp. 206–211.

Legat, B. and Jungers, R. M. and Parrilo, P. A., *Generating unstable trajectories for Switched Systems via Dual Sum-Of-Squares techniques*, Proceedings of the 19th International Conference on Hybrid Systems: Computation and Control, 2016, pp. 51–60, ACM. https://doi.org/10.1145/2883817.2883821