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Amaury HAYAT

Researcher in Applied Mathematics

Research experience

Nov. 2019 - Present	**Rutgers University - Research associate (on leave from Ecole des Ponts)** > Work on modeling and control of vehicular traffic (PI : Benedetto Piccoli)
Sept. 2019 - Present	**Ecole des Ponts Paristech - Assistant professor** > Member of the CERMICS
Sept. 2018	**Tongji University – Academic guest** > Work on density-velocity systems
Mar. - Dec. 2017	**ETH Zurich – Academic guest** > Member of the institute for research in Mathematics (FIM)
Avr.-Sep. 2014	**Harvard University, Capasso Group - Research fellow** > Work in optics at nanoscale. > Work awarded by the French Academy of Sciences and Ecole Polytechnique.

Other professional experience

Fev. - Juin 2016	**Agence Française de Développement – Short term consulting** > Work in the digital strategy team. > Consultations, making and presenting the digital strategy. > Propective mission in Benin on digital technologies deployment.
Sept. 2014 - Present	**Corps des Ponts des Eaux et Forêts - IPEF** (Senior civil servant) > Trainee 2014-2016 ; appointed permanently 2016
Jui.-Aoû. 2012	**SAFRAN Aircraft Engines, Progress strategy direction – Intern** > Diffusion of the leadership model among young managers, under budget constraints.
2011-2012	**Gendarmerie Nationale, Commanding Group of Belfort – Officer** > Coordinate actions of 20 people team. > Participate in patrols, support operations and investigations.

Other: Ecole Polytechnique's gala –VP Sponsors, Swiss Snow League – Ski teacher

Education

2016-2019	**Sorbonne Université, LJLL –** PhD candidate Dissert. title: Stabilization of 1D nonlinear hyperbolic systems by boundary controls (Advisor : Jean-Michel Coron, co-advisor: Sébastien Boyaval)

2014-2016	**Corps des Ponts, des Eaux et Forêts** – Master of Public Policy in sustainable development.
2014-2015	**University of Cambridge, Queens' College** – MASt in applied mathematics (with First Class Degree and Foundation Scholarship award)
2011-2014	**Ecole Polytechnique** – Class X2011, Bsc 2013, Eng. degree 2014, MSc. 2016.
2009-2011	**Lycée Sainte-Geneviève** – High level undergraduate program in Mathematics, Physics and Chemistry

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Associative experience

2018-2019	Representative of PhD candidates at the board of Laboratoire Jacques Louis-Lions.
2014-2016	Representative of the IEPEF (senior civil servant trainees) class of 2016, board member of the UnIPEF (a major senior civil servants' union)
2014-2015	Member of the student government (First year rep.) – Queens' College Cambridge
2012-2013	Cinéph'X , student association - Founder and Chairman > Organising conferences and prestigious dinners with celebrities, 15 people team.
2012-2013	Federation of Cinema related associations of Ecole Polytechnique – President > Head of Ecole Polytechnique's delegation to Cannes Film Festival.
2012-2013	Ecole Polytechnique's TV show – Vice-Chairman > 20 people team, 14.000€ of annual budget, followed by 80% of students.
2011-2012	President of the 64th class of X-IETA in Gendarmerie Nationale

Swimming (Ecole Polytechnique) – Chorus (Ecole Polytechnique) – Rowing (Queens'College)

Languages and computer skills

English: Fluent TOEFL 116/120, IELTS 8/9   *German:* basic

Office Suite, Adobe Premiere, Adobe Photoshop, Java, Latex, Matlab

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Honors and awards

2020	PhD Award of the Chancellerie des Universités de Paris
2020	2019 PhD award of the European Embedded Control Institute
2014	Medal L.E. Rivot awarded by the French Academy of Sciences
2012	Medal of National Defence – awarded exceptionally
2008	Olympiades of geoscience – 1st Prize for Paris, Silver medal for France

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Teaching

2018	Optimization, control and variational methods, Ecole des Ponts Paristech, first year master, practical exercises and tutoring.
2018	Differential calculus and measure theory, Ecole des Ponts Paristech, last year undergraduate, course and tutorials.
2017	Complex analysis, Sorbonne Université, last year undergraduate, tutorials.

--------------- **Talks in conferences**

2019	KI-net, Young Researchers Workshop: Kinetic descriptions in theory and applications, College Park, MA. (Invited speaker)
2019	International Congress on Industrial and Applied Mathematics, Valencia. (Oral communication)
2019	Congrès SMAI, Guidel. (Oral communication with financial support).
2018	Analysis, Control and Inverse Problems for PDEs of French-German-Italian LIA, Napoli. (Invited junior speaker)
2018	International Congress of Mathematicians, Rio, August 2018. (Oral communication)
2018	First Franco-Moroccan Congress of Applied Mathematics, Marrakech. (Oral communication)
2017	Congrès SMAI, Ronces-les-bains. (Oral communication)

--------------- **Publications**

In preparation :

- J-M. Coron, A. Hayat, C. Zhang, S. Xiang[*], Internal stabilization of a water tank (working title).

- A. Hayat, B. Piccoli, S. Truong[*], Traffic stabilization using autonomous vehicles.

- A. Hayat, T. Liard, B. Piccoli[*], Existence of solutions to GARZ equations with moving bottleneck (working title).

*Authors by alphabetical order.

Submitted :

- F. Charton, A. Hayat, G. Lample[*], [Learning advanced mathematical computations from examples](#),
preprint, 2020

- G. Bastin, J-M. Coron, A. Hayat[*], [Input-to-State Stability in sup norms for hyperbolic systems with boundary disturbances](#), preprint, 2020.

- A. Hayat, P. Shang[*], [Exponential stability of density-velocity systems with boundary conditions and source term for the H^2 norm](#), preprint, 2019

- A. Hayat, [PI Controller for the general Saint-Venant equations](#), preprint, 2019

Published :

- A. Hayat, [Global exponential stability and Input-to-State Stability of semilinear hyperbolic systems for the L^2 norm](#), accepted in *Syst. Contr. Lett.*, 2020.

- G. Bastin, J-M. Coron, A. Hayat[*], [Feedforward boundary control of 2×2 nonlinear hyperbolic systems with application to Saint Venant equations](#), accepted in *European Journal of Control* 2020.

- N. Kardous*, A. Hayat*, S. McQuade, X. Gong, S. Truong, P. Arnold, A. Bayen, B. Piccoli, "A rigorous multi-population multi-lane hybrid traffic model and its mean-field limit for dissipation of waves via autonomous vehicles", accepted for *Transportation Research Board Annual Meeting,* 2021.

- Z. An, N. J. Merrill, K. Lee, R. Robin, A. Hayat, O. Zapfe, B. Piccoli, A Two-Step Model of Human Entrainment: A Quantitative Study of Circadian Period and Phase of Entrainment, accepted in *Bulletin of Mathematical Biology*, 2020.

- J-M. Coron et A. Hayat[*], [PI controllers for 1D nonlinear transport equation](#), 2019, *IEEE Trans. Automat. Contr.,* vol. 64, no 11, p. 4570-4582.

- G. Bastin, J-M. Coron, A. Hayat, P. Shang[*], [Boundary feedback stabilization of hydraulic jumps](#), 2019, *IFAC J. of Systems and Control,* vol. 7, p. 100026.

- G. Bastin, J-M. Coron, A. Hayat, P. Shang[*], [Exponential boundary feedback stabilization of a shock steady state for the inviscid Burgers equation](#), 2019, *Math. Models Meth. Appl. Sci.*, vol. 29, no 2, p. 271-316.

- A. Hayat, [On boundary stability of inhomogeneous 2 × 2 1-D hyperbolic systems for the C^1 norm](#), 2019, *ESAIM: Cont. Optim. Calc. Var.*, vol. 25, p. 82.

- A. Hayat, [Exponential stability of general 1-D quasilinear systems with source terms for the C^1 norm under boundary conditions](#), 2019, *SIAM J. Control Optim.*, vol. 57, no 6, p. 3603-3638.

- A.Hayat et P. Shang[*], [A quadratic Lyapunov function for Saint-Venant equations with arbitrary friction and space-varying slope](#), 2019, *Automatica,* Vol. 100, p. 52-60.

*Authors by alphabetical order.

- A. Hayat, A.J. Hacket-Pain, H. Pretzsch, T.T. Rademacher, A.D. Friend, [Modelling tree growth taking into account source and sink limitations](#), 2017, *Front. Plant Sci.* 8:182. doi: 10.3389/fpls.2017.00182.

- A.Hayat, J.P.B. Mueller, F. Capasso, [Lateral chirality sorting optical forces](#), 2015, *PNAS*, vol.112no.43, 13190-13194

*Authors in alphabetical order