

# Borjan Geshkovski

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CONTACT INFORMATION	Chair of Computational Mathematics Universidad de Deusto Bilbao, 48009 Spain	(+34) 94 413 9003 Ext: 3282 <a href="mailto:geshkovskiborjan@gmail.com">geshkovskiborjan@gmail.com</a> <a href="https://borjanG.github.io">https://borjanG.github.io</a>
PERSONAL INFORMATION	Born 9th of August, 1994 (26 years old). Citizenship: Macedonian.	
EXPERTISE	Machine learning and data science (deep neural networks, generative modeling), applied mathematics (control theory, partial differential equations)	
EDUCATION	<b>PhD, Applied Mathematics</b> Universidad Autónoma de Madrid	july 2018 - may 2021
	Title: <i>Control in moving interfaces and deep learning</i> Advisor: <i>Enrique Zuazua</i> .	
	<b>MSc, Applied Mathematics</b> Université de Bordeaux	2018
	Summa Cum Laude (Mention Très Bien), Ranked 1st.	
PROFESSIONAL EXPERIENCE	<b>BSc, Applied Mathematics and Computer Science</b> Université de Bordeaux	2016
	Cum Laude (Mention Assez Bien) Minor in Cognitive Science.	
	<b>Early Stage Researcher</b> Universidad Autónoma de Madrid	july 2018 - july 2021
	I am an Early Stage Researcher within the Marie Skłodowska-Curie H2020 project " <a href="#">Control of flexible structures and fluid-structure interaction – ConFlex</a> ". I am also affiliated with the <a href="#">Chair of Computational Mathematics</a> in Fundación Deusto, Bilbao.	
	<b>Internship</b> DeustoTech, Universidad de Deusto, Bilbao (Spain).	february - april 2018
	Research internship in optimal control and numerics of partial differential equations, variational inequalities in elasticity, and finite element discretizations ( <a href="#">blog</a> , <a href="#">report</a> ). Supervisor: <i>Enrique Zuazua</i> .	
	<b>Internship</b> Institut de Mathématiques de Bordeaux, CNRS (France).	may - august 2017
	Research internship in analysis and partial differential equations, strongly continuous and analytic operator semigroups, and their application to control theory. I participated in the organization of the international workshop <i>Control of Distributed Parameter Systems 2017</i> . Supervisor: <i>Marius Tucsnak</i> .	
	<b>Internship</b> INRIA & Université de Bordeaux (France).	may - july 2015
	Research internship in signal processing. Working in a team of two, we improved an existing software	

and developed a new graphical user interface for the analysis of EEG signals. Programming was done in **Matlab**. ([link](#), [report](#))  
 Supervisor: *Pierrick Legrand*.

## HONORS AND AWARDS

- **Best Presentation Prize** february 2019  
 I was awarded the "Best Presentation Prize" (500€) as the best among 15 presenters during the [2nd. workshop of the ConFlex consortium](#).  
 I finished in second place for the same award during the [3rd. workshop of the ConFlex consortium](#).
- **Marie Skłodowska-Curie Fellowship** july 2018 - july 2021  
 My PhD was financed by the Marie Skłodowska-Curie H2020 grant [Control of flexible structures and fluid-structure interaction - ConFlex](#).
- **Bourse du gouvernement français** september 2016 - may 2017  
 A scholarship awarded on merit by the French government to top foreign MSc students in France.

## PUBLICATIONS

<sup>†</sup> denotes first author, \* denotes equal main contributors (authors listed in alphabetical order).

1. Sparse approximation in learning via neural ODEs. Esteve C.\*, Geshkovski B.\*. *In review in SIAM Journal on Mathematics of Data Science* (2021).  
[Preprint](#).
2. Large-time asymptotics in deep learning. Esteve C.\*, Geshkovski B.\*, Pighin D., Zuazua E. *In review in Journal of Machine Learning Research* (2021)  
[Preprint](#).
3. Controllability of one-dimensional viscous free boundary flows. B. Geshkovski<sup>†</sup>, E. Zuazua. *To appear in SIAM Journal on Control and Optimization* (2021).  
[Preprint](#).
4. Turnpike in Lipschitz-nonlinear optimal control Esteve C.\*, Geshkovski G.\*, Pighin D.\*, Zuazua E. *In review in Nonlinearity* (2020).  
[Preprint](#).
5. Null-controllability of perturbed porous medium gas flow. B. Geshkovski<sup>†</sup>, ESAIM Control, Optimisation and Calculus of Variations, vol. 26, No. 85 (2020).  
[Published](#), [Preprint](#).

## COMPUTER SKILLS

- Proficient in **Python**: machine learning and neural networks ([code](#) in PyTorch, scikit-learn), object oriented programming, simulation of partial differential equations ([code](#) in FEniCS).
- Proficient in **Matlab**: simulation and control of differential equations (Casadi), digital image processing (wavelet transformations).
- Proficient in markup languages (HTML, L<sup>A</sup>T<sub>E</sub>X).
- Operating Systems: Proficient in Mac OS, Linux. Familiar with Windows.

## LANGUAGES

English (fluent), French (fluent), Spanish (beginner), Slavic languages (basic), Macedonian (native).

## INVITED TALKS AT CONFERENCES

- "The interplay of deep learning and control theory", [SIAM Conference on Control and its Applications](#), Spokane WA, USA (virtual, july 19-21, 2021).
- "Turnpike control and deep learning", [2nd. Symposium on Machine Learning and Dynamical Systems at Fields Institute](#), Toronto, Canada (virtual, 24.08.2020). [YouTube video](#).
- "Control in interfaces and deep learning", 3rd. workshop of the ConFlex consortium, Imperial College London, UK (virtual, 30.06.2020).
- "Control of perturbed porous medium gas flow", [8th Workshop on PDE, Optimal Design and Numerics](#), Centro de Ciencias "Pedro Pascual" Benasque, Spain (23.08.2019)
- "Control of linearized porous medium gas flow", [Workshop on homogenization, spectral theory and other topics in PDEs](#), ICMAT Madrid, Spain (06.05.2019).

- "Control of free boundary problems", 2nd. workshop of the ConFlex consortium, Bilbao, Spain (20.02.2019).  
I was awarded the **Best review and presentation prize**.

#### INVITED TALKS AT SEMINARS

- "The interplay of deep learning and control theory", Machine Learning in Madrid, CSIC Madrid Spain (virtual, 22.02.2021). **Video**.
- "The interplay of deep learning and control theory", AG Mathematics of Deep Learning, FAU Erlangen-Nürnberg, Germany (virtual, 09.12.2020). **Video**.
- "Large-time asymptotics in deep learning", Seminario de Estadísticas, UAM, Spain (virtual 23.10.2020).
- "Mathematical control and deep learning", CAA Seminar, Friedrich Alexander Universität Erlangen-Nürnberg, Germany (21.01.2020).
- "Control and free boundaries", Chair in Applied Mathematics 2 Seminar, Friedrich Alexander Universität Erlangen-Nürnberg, Germany (20.01.2019).

#### RESEARCH VISITS

- Chair in Applied Analysis, Friedrich Alexander Universität Erlangen-Nürnberg (Germany), january 2020 – february 2020 (1 month). Invited by M. Gugat.
- Chair in Applied Mathematics 2, Friedrich Alexander Universität Erlangen-Nürnberg (Germany) november 2018 – january 2019 (2 months). Invited by G. Leugering.

#### TEACHING EXPERIENCE

##### **Peer tutoring**

october 2015 - may 2016

Université de Bordeaux.

I tutored a group of first year undergraduate students in mathematics and computer science.

#### REFERENCES

Enrique Zuazua  
Alexander von Humboldt  
Professor  
FAU Erlangen-Nürnberg  
[enrique.zuazua@fau.de](mailto:enrique.zuazua@fau.de)

Marius Tucsnak  
Professor of Mathematics  
Université de Bordeaux  
[marius.tucsnak@u-bordeaux.fr](mailto:marius.tucsnak@u-bordeaux.fr)

Antonio Cuevas  
Catedrático de Matemáticas  
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