

BILAL AL TAKI

Assistant Professor in Applied Mathematics

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SUMMARY

I am a researcher in Applied Mathematics with a Ph.D. from the University of Grenoble-Alpes and the Lebanese University, specializing in partial differential equations (PDEs) and their applications to fluid dynamics. My academic work has focused on degenerate and non-Newtonian models, low-Mach regimes, and numerical methods for Navier–Stokes systems, resulting in publications in leading journals (Journal of Differential Equations, Nonlinearity, Nonlinear Analysis). Currently, I serve as Adjunct Lecturer at Léonard de Vinci Graduate School of Engineering, teaching applied mathematics and engineering courses, while also contributing to research-driven innovation as a Research Scientist in Capgemini’s R&I division, where I define research directions on energy-efficient cooling systems and hydrodynamic stability for floating data centers. This project was recognized as a finalist in the Grand Prix de l’Ingénierie 2025. I am seeking an Assistant Professor position to advance research at the interface of PDE theory, computational modeling, and sustainable technologies, while fostering collaborations that bridge mathematical rigor and real-world applications.

EXPERIENCE

- 9/2023 – Present

Adjunct Professor

Pole Léonard de Vinci, Paris

 - Teach applied mathematics and engineering courses at ESILV and EMLV, delivering instruction to undergraduate and graduate students in an interdisciplinary context.
 - Design and update course materials, integrating real-world applications and computational tools to enhance student engagement.
 - Lead seminars and project-based learning activities, fostering critical thinking and problem-solving skills.
 - Assess student performance through innovative evaluation methods, including applied projects and oral presentations.
- 4/2023 – Present

Lead Research Scientist

Capgemini Engineering, Paris

 - Defined and coordinated research directions for a multidisciplinary program on floating data centers, integrating fluid–structure interaction, energy optimization, and environmental modeling.
 - Supervised hydrodynamic stability analyses and mechanical reliability studies, ensuring robust design under marine conditions.
 - Guided thermofluid modeling strategies for hybrid cooling concepts, contributing to energy-efficient system design.
 - Initiated the development of a digital twin framework for predictive maintenance and renewable energy integration.
 - Produced technical reports and risk assessments aligned with engineering standards, supporting knowledge transfer between academia and industry.
- 8/2022 – 3/2023

Postdoctoral Researcher

TU Kaiserslautern, Germany

 - Conducted theoretical and numerical research on complex fluid flows, with applications in biological systems (e.g., drug transport in tissues) and geophysical systems (e.g., sediment transport).
 - Published findings in peer-reviewed journals, contributing to advancements in computational fluid dynamics and applied mathematics.
- 9/2021 – 8/2022

Research and Teaching Fellow

Sorbonne University, Paris

 - Taught mathematics courses for first- and second-year students, earning consistently high teaching evaluations.
 - Developed new mathematical models to study landslide phenomena, producing results presented at international conferences.
- 10/2019 – 8/2021

Postdoctoral Researcher

Peking University, Beijing

 - Developed mathematical models for snow avalanche phenomena, performing theoretical analysis (existence of solutions) and Python-based numerical simulations.
 - Published research in leading journals and presented findings at international conferences, contributing to the scientific understanding of geophysical flows.
 - Provided instruction in applied mathematics to undergraduate and graduate students, tailoring content to diverse educational backgrounds.
- 1/2019 – 8/2019

Research and Teaching Fellow

Sorbonne University, Paris

 - Presented research results at international conferences, including new findings on coastal and ocean interaction models, with implications for environmental conservation and risk management.
 - Published articles in leading journals, enhancing the field of coastal modeling and geophysical systems.
- 9/2017 – 12/2018

Postdoctoral Researcher

INRIA, Paris

 - Achieved new well-posedness results for equations modeling avalanche phenomena, contributing to the theoretical understanding of natural hazard prediction.
 - Taught introductory and advanced mathematics courses at Sorbonne University, mentoring students from diverse academic backgrounds.

EDUCATION

- 10/2013 -12/2016 **PhD in applied mathematics** **Lebanese University & Grenoble-Alpes University**
Title: On some heterogeneous models in fluid mechanics.
Advisors: Didier Bresch and Raafat Talhouk.
- 9/2012 - 8/2013 **Master degree in mathematics** **Lebanese University & Nantes University**
Title: Hyperbolic boundary problems and numerical schemes.
Advisors: Jean-Francois Coulombel and Ayman Mourad.

TEACHNING ACTIVITIES

For more details about my teaching activities and approach, please refer to my "Teaching Philosophy" document available on my personal webpage.

- 01/2026 - 2 days **Fromagerie Henri Hutin (Groupe Hochland)**
- Professional training : "Fundamentals of Applied Statistics"
- 1/2023 - present **The Leonard de Vinci Engineering School**
- Introduction to Statistic with R
 - Probability
- 9/2018 - 8/2022 **Sorbonne University**
- Numerical Method
 - Financial Econometrics
 - Analysis and Algebra for the science
 - Introduction to differential equations
 - Vectorial analysis and multiple integrals
 - Calculus I and II
- 12/2018 - 12/2018 **Lebanese University**
- Model and numerical method in geosciences (Master 2)
- 9/2015 - 8/2016 **Savoie-Mont Blanc University**
- Real Analysis
 - Statistics
 - Functional analysis
 - Linear Algebra

INTERNAL RESEARCH PUBLICATIONS (NON-PUBLIC)

- B. Al-Taki, S. SALDARRIAGA, Buoyancy and Long-Term Stability Analysis of an Offshore Floating Data Center, Capgemini Engineering, Internal Technical Report, 2024.
In-depth mathematical and numerical study of the static and dynamic stability of a large offshore floating structure designed to host data-center infrastructure; includes long-term behavior modelling and sensitivity analysis.
- B. Al Taki, M. IBRAHIM, Thermal Management of a Floating Data Center Using a Hybrid Air–Water Cooling System, Capgemini Engineering, Internal Technical Report, 2025.
Development and evaluation of a thermo-fluid model for a combined air–water cooling architecture applied to floating data centers; includes energy balance, heat-exchange modelling, and performance simulations.

PUBLICATIONS

- Al Baba, H., Al Taki, B., Hussein, A. (2023). Remark on the local well-posedness of compressible non-newtonian fluids with initial vacuum. Accepted for publication in JMFM, 2024.
- Al Taki, B. (2023). Well-posedness for a class of compressible non-newtonian fluids equations. Journal of Differential Equations, 349, 138–175.
- Al Taki, B. (2022). A note on functional inequalities and entropies estimates for some higher-order nonlinear PDEs. Methods Appl. Anal., 29(2), 161–178.
- Al Taki, B., Lacave, C. (2022). Degenerate lake equations: Classical solutions and vanishing viscosity limit. Nonlinearity, 36(1), 653. doi:10.1088/1361-6544/aca865.
- Al Taki, B., Atsou, K., Casanova, J.-J., Goudon, T., Lafitte, P., Lagoutière, F., Minjeaud, S. (2021a). Numerical investigations of the compressible navier-stokes system. In Esaim: Proceedings and surveys (Vol. 70, pp. 1–13).
- Al Taki, B., Msheik, K., Sainte-Marie, J. (2021b). On the rigid-lid approximation of shallow water Bingham. Discrete Contin. Dyn. Syst., Ser. B, 26(2), 875–905.
- Al Taki, B. (2017a). Global well posedness for the ghost effect system. Commun. Pure Appl. Anal., 16(1), 345–368.
- Al Taki, B. (2017b). Viscosity effect on the degenerate lake equations. Nonlinear Anal., Theory Methods Appl., Ser. A, Theory Methods, 148,

RESPONSABILITIES

- Co-Supervision of Internships: Co-supervised internships for over 4 students from Sorbonne University, Lebanese University, Centrale Nantes, and University of Rouen, covering topics such as PDEs, Numerical simulations for PDEs, and Hydrodynamics Stability for floating structure.
- Advance Competition: Participation in the jury of "Advance Concours" at EPITA.
- Supervised ESILV's pedagogical project focused on hydrodynamic stability analysis of large offshore structures.
- Oversaw ENSAE's pedagogical project aimed at predicting sea-level rise resulting from climate change.

PERSONAL PROJECTS

Data Science	Data Science with Python The aim of this project is to fit a linear regression or a Ridge Regression model to predict the price using the list of features given on a dataset that contains house sale prices for King County.	(📄, 2022)
Machine Learning	Machine Learning with Python In this project, we use classification models such as K Nearest Neighbor(KNN), Decision Tree, Support Vector Machine, or Logistic Regression to determine whether a loan is paid off or in based on a dataset about past loans.	(📄, 2022)
Data Science	Car's generation detection The aim of this project is to predict the generation (I or II) of some unknown generation cars based on the features of each generation.	(📄, 2022)

CERTIFICATIONS

- Exin Agile Scrum Foundation (Exin, Online)
- Machine Learning Specialization (Stanford, Online)
- Google Project Management (Google, Online)

REFEREES

- Prof. Alain Miranville (University of Poitiers, France)
- Prof. Francisco Guillen-Gonzalez (Univ. of Sevilla, Spain)
- Prof. Pingwen Zhang (Peking University, China)
- Prof. Christophe Lacave (Grenoble-Alpes University, France)

LANGUAGES

English - Professional French - Professional Arabic - Native

SKILLS

Software:	Python, Ansys, OpenFoam, Git, R.
Strengths:	Management, Adaptability, Leadership.

STAY ABROAD

- Germany, Sept-Dec 2022: Stay at TU Kaiserslautern; invitation from Prof. A. Hussein.
- Lebanon, January 2020: Stay at Lebanese University; invitation from Prof. R. Talhouk.
- China, October-December 2019: Stay at BICMR; invitation from Prof P. Zhang.
- Germany, January 2019: Stay at Darmstadt University; invitation from Prof. M. Hieber.