

BILAL AL TAKI

Assistant Professor in Applied Mathematics

 22 March 1991  French and Lebanese  Paris, France

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

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
- Numerical Method
- Analysis and Algebra for the science
- Vectorial analysis and multiple integrals
- Probability
- Financial Econometrics
- Introduction to differential equations
- Calculus I and II

9/2018 - 8/2022 **Sorbonne University**

- Analysis and Algebra for the science
- Vectorial analysis and multiple integrals

12/2018 - 12/2018 **Lebanese University**

- Model and numerical method in geosciences (Master 2)

9/2015 - 8/2016 **Savoie-Mont Blanc University**

- Real Analysis
- Functional analysis
- Statistics
- 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 JMF, 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.	(Q, 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 not based on a dataset about past loans.	(Q, 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.	(Q, 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.