BILAL AL TAKI

Assistant Professor in Applied Mathematics
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SUMMARY

I am a Lead Research Scientist in the Research and Innovation department at Capgemini, where I lead multidisciplinary teams developing a floating data center powered by renewable energy. Concurrently, I serve as a Part-Time Lecturer at Léonard de Vinci Graduate School of Engineering, teaching applied mathematics and engineering courses.
With a PhD in Applied Mathematics, my research focuses on the application of partial differential equations (PDEs) to fluid mechanics systems, with a growing interest in the intersection of PDEs and artificial intelligence (AI). I am now seeking an Assistant Professor position to further pursue innovative research and contribute to teaching in these cutting-edge fields. My aim is to bridge theoretical advancements with practical applications, fostering impactful collaborations and advancing knowledge in applied mathematics and computational science.

EXPERIENCE

4/2023 – Present **Lead Research Scientist** — **Capgemini Engineering, Paris**

- Coordinated and managed multidisciplinary research projects, driving the development of floating data center infrastructure powered by renewable energy, reducing environmental impact by 25%.
- Led hydrodynamic stability studies and advanced mechanical calculations to address complex design and maintenance challenges in offshore systems.
- Directed thermodynamic studies, achieving a 30% improvement in cooling efficiency through the design of a hybrid air-seawater cooling system.
- Developed and implemented a digital twin platform, optimizing renewable energy usage and maintenance costs by 15%.
- Authored technical reports and risk analyses in compliance with industry standards, ensuring safety and regulatory adherence.

9/2023 – Present **Adjunct Professor** — **Pole Léonard de Vinci, Paris**

- Teach applied mathematics and engineering courses at ESILV and EMLV, providing advanced instruction to undergraduate and graduate students.
- Design engaging course content, lead seminars, and evaluate student performance through project-based assessments.

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.

1/2023 - 6/2023 **The Leonard de Vinci Engineering School**
- Introduction to Statistic with R
- Probability
- Numerical Method
- Financial Econometrics

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

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** **(, 2022)**
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.

Machine Learning **Machine Learning with Python** **(, 2022)**
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.

Data Science **Car's generation detection** **(, 2022)**

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.

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)

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.

LANGUAGES

English - Professional **French** - Professional **Arabic** - Native