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EDUCATION, DEGREES AND POSITIONS

- **Technische Universität Clausthal : Post-Doc, Research Assistant**
  Supervisor: Dominic BREIT

  Clausthal-Zellerfeld (38), Germany
  August 2024 - (on going)

- **Aix-Marseille Université : Temporary Lecturer and Research Assistant**
  One year only. French acronym is A.T.E.R. : Teaching various lectures ($\sim$ 192 hours).

  Marseille (13), France
  September 2023 - August 2024

- **Aix-Marseille Université : PhD Thesis**
  PhD Thesis in Mathematics. **PhD Advisor :** *Sylvie MONNIAUX.*

  Marseille (13), France
  September 2020 - August 2023

  Title : *Homogeneous Sobolev and Besov spaces on half-spaces.*
  PhD Defense : 11$^{\text{th}}$ July 2023.

- **Université de Rennes 1 : Master Degree**
  Complementary Master degree in Mathematical Analysis. Graduation with High Honors.

  Rennes (35), France
  September 2019 - June 2020

- **Agrégation Externe de Mathématiques, Session 2019**
  Competitive teaching examination. Received rank 125/308.

  France
  July 2019

- **Université de Caen Normandie : Undergraduate and Graduate years**
  Bachelor and Master degrees in general mathematics, with Honors.

  Caen (14), France
  September 2016 - June 2019

- **Lycée Henri Bergson**
  Classe Préparatoire Scientifique. Filières : MPSI-MP.

  Angers (49), France
  September 2014 - June 2016

- **Baccalauréat Général, Session 2014**
  Highschool Graduation in Sciences.

  France
  June 2014

SCIENTIFIC INTERESTS

- **Key words**

  - Partial Differential Equations ; Functional and Harmonic Analysis; Interpolation Theory (of normed vector spaces); Homogeneous Sobolev and Besov spaces; Traces; Semigroup Theory; L^q-maximal regularity; Fluid dynamics; Stokes-like evolutionary systems; Hodge-Helmholtz decompositions in bent half-spaces; Bent half-spaces; rough domains.

  My scientific interests are between functional analysis, harmonic analysis, (Euclidean) Fourier analysis and partial differential equations that arise from fluid dynamics (mainly Navier-Stokes-like systems).

  My main purpose is about building appropriate tools and function spaces to investigate functional analytic properties of various Stokes and related operators in unbounded and rough domains in order to obtain appropriate global-in-time estimates for the generated semigroups. In some cases, this allows to recover global-in-time well-posedness for the corresponding Navier-Stokes (and related) equations for small initial datas.

  The case of unbounded (bent half-spaces) domains, motivated by free boundary problems, requires investigating the appropriate construction of homogeneous Sobolev and Besov spaces, in order to obtain meaningful product laws and traces, which is of new interest. We have to investigate the proper meaning of boundary conditions, as well as the behavior of the Hodge-Helmholtz decomposition. The investigation of the Hodge-Helmholtz decomposition on such function spaces is investigated for any degree of differential forms instead of vector fields only. Such point of view allows to open the investigation of a wide class of fluid dynamic problems in arbitrary dimension preserving the underlying geometric structure, whereas the usual formalism restricted them to the 3-dimensional Euclidean setting (mainly, magnetohydrodynamics-like systems and vorticity formulation problems for Navier-Stokes and related equations).

ACCEPTED OR SUBMITTED (PRE)PUBLICATIONS

[1] A. Gaudin. "Hodge decompositions and maximal regularities for Hodge Laplacians in homogeneous function spaces on the half-space". In: *arXiv e-prints*, arXiv:2303.04026 (Mar. 2023). **To appear in** *Annales Henri Lebesgue*, arXiv:2303.04026. arXiv: 2303.04026 [math.AP].

[2] A. Gaudin. "Homogeneous Sobolev and Besov spaces on half-spaces". PhD Dissertation. Aix-Marseille Université, July 2023. URL: https://hal.science/tel-04169055.

[3] A. Gaudin. "Homogeneous Sobolev and Besov spaces on special Lipschitz domains and their traces". In: *arXiv e-prints*, arXiv:2305.01441 (May 2023). **SUBMITTED**, arXiv:2305.01441. arXiv: 2305.01441 [math.AP,math.CA,math.FA].

[4] A. Gaudin. "Homogeneous Sobolev global-in-time maximal regularity and related trace estimates". English. In: *J. Evol. Equ.* 24.1 (2024). Id/No 15, p. 30. ISSN: 1424-3199. DOI: 10.1007/s00028-024-00946-x.

[5] A. Gaudin. "On homogeneous Sobolev and Besov spaces on the whole and the half space". English. In: *Tunis. J. Math.* 6.2 (2024), pp. 343–404. ISSN: 2576-7658. DOI: 10.2140/tunis.2024.6.343.

MEMBERSHIP

- **Scientific network of the DFG**
  Funded network made of 20 international researchers on evolution equations in fluid dynamics.

  Germany
  2024-2027

  - **Coordinators :** Patrick TOLKSDORF (KIT, Germany) and Amru HUSSEIN (TUK, Germany)

TALKS AS AN INVITED SPEAKER

- **Espaces de fonctions adaptés à des semi-groupes pour la mécanique des fluides en temps long** — Caen (14), France
  Séminaire d'Analyse Harm. N.C. du Lab. de Mathématiques Nicolas Oresme (LMNO, Caen). 50 min. talk. — 8th February 2024

- **Espaces de fonctions homogènes et régularité maximale L^q globale en temps** — Nantes (44), France
  Séminaire d'Analyse du Laboratoire de Mathématiques Jean Leray (LMJL, Nantes). 50 min. talk. — 6th November 2023

- **Homogeneous function spaces on half-spaces and L^q-maximal regularities** — Karlsruhe (76), Germany
  Research Seminar, Funktional Analysis Workgroup, Karlsruhe Inst. of Tech. (KIT). 50 min. talk. — 18th July 2023

- **Homogeneous frac. Sobolev global-in-time max. reg. and traces estimates.** — Bordeaux (33), France
  Meeting of the ANR 'RAGE' project (Real Analysis and Geometry). 50 min. talk. — 26th January 2023

- **Hodge decomposition and Maximal Regularities for the Hodge Laplacian on $\mathbb{R}^n_+$.** — Marseille (13), France
  MathFlows 7th Edition, CIRM, 30 min. talk. — 5th December 2022

MORE TALKS

- **Le lien entre la mécanique des fluides, l'analyse de Fourier et la cohomologie.** — Marseille (13), France
  Séminaire Doctorant Aix-Marseille Université (St-Charles). 90 min. talk. — 3rd March 2023

- **On the molecular decomposition of operator-adapted Hardy Spaces** — Oberwolfach (77), Allemagne
  Oberwolfach Sem.: Operator-Adapted Spaces in Harm. Anal. and PDEs. 30 min. pres. — 22 Novembre 2022
  Comment : This talk has been presented with *Sebastian Bechtel* and *Angelo Zenni*. It turns out that it has been worth enough to be chosen as the 3rd best (out of 9) talk of the seminar, and has been awarded by a bottle of wine Saint-Emilion.

- **Func. Analytic prop. and Max. Reg. for the Hodge-Stokes operator on $\mathbb{R}^n_+$.** — Marseille (13), France
  Jean Morlet Chair, CIRM, Nonlinear PDEs in Fluid Dynamics (Week 3). 8 min. talk. — 10th May 2022

- **Traces in homogeneous Besov spaces and Interpolation** — Besançon (25), France
  Journées du Groupe de Recherche d'Analyse Fonctionnelle, Harmonique et Probabilités. 30 min. talk. — 27th September 2021

- **Maximal L^q-regularity for the Hodge Laplacian in Homogeneous Besov Spaces on $\mathbb{R}^d_+$** — MSRI - Online
  Graduate Student Working Group, MSRI, Semester of Mathematical problems in fluid dynamics. 30 min. talk. — 26th May 2021

CONFERENCES AND SEMINAR

*The asterisk ***** denotes conferences participations as an invited speaker.*

- **Master Class 2023 Centre Henri Lebesgue.** — Angers (49), France
  Lectures on semi-classical analysis and Bloch-Floquet theory, by Clotilde FERMANIAN KAMMERER. — December 2023

- **Workshop ANR 'RAGE'** — Marseille (13), France
  Closure Workshop for the end of Real Analysis and Geometry (RAGE) ANR Project. — June 2023

- **Rencontre du projet ANR 'RAGE'.*** — Bordeaux (33), France
  Meeting on advances in Real Analysis and Geometry, and related areas. — January 2023

- **MathFlows 7th Edition.*** — Marseille (13), France
  Conference on mathematical aspects of fluid mechanics and related PDEs at the CIRM. — December 2022

- **Oberwolfach Seminar: Operator-Adapted Spaces in Harm. Anal. and PDEs.** — Oberwolfach (77), Germany
  Several lectures by the organizers on Operator-Adapted Spaces. — November 2022

- **Journées Équations aux Dérivées Partielles.** — Obernai (67), France
  Conference on general PDEs, which includes several lectures, renewed (almost) every year. — June 2021, June 2022

- **Jean-Morlet Chair : Nonlinear Partial Differential Equations in Fluid Dynamics.** — Marseille (13), France
  Semester of research, dedicated to non-linear PDEs and fluid dynamics. — January - May 2022
  - **Conferences :** - Mathematical Advances in Geophysical Flows (Week 1)
    - Analysis of Nematic Liquid Crystals Flows (Week 2)
    - Nonlinear PDEs in Fluid Dynamics (Week 3)

- **Journées du GDR Analyse Fonctionnelle, Harmonique et Probabilités.** — Besançon (25), France
  Conference on Probability, Harmonic and Functional Analysis. — September 2021

- **Mécanique des fluides : étude qual. et comportement asympt. des solutions.** — Peyresq (04), France
  Conference on asymptotical behavior of solutions of PDEs that come from fluid mechanics. — August 2021

- **Master Class 2019 Centre Henri Lebesgue.** — Angers (49), France
  Lectures on Weyl's Law for the Dirichlet Laplacian by Nicolas RAYMOND. — December 2019

LECTURES-TEACHING

- **Lectures at Aix-Marseille Univ. Analysis for 1st year undergraduate students.** — Marseille (13), France
  Mathematics : Analysis for 1st year undergraduate students. Math.-Phy.-CS. majors (Sem. 2). 28 hours — Year 2022-2023

- **Lectures at Aix-Marseille Univ. Mathematics for 3rd year engineering students.** — Marseille (13), France
  General mathematics for 3rd year (undergraduate) engineering students (Sem. 5). 36 hours — Years 2022-2023, 2023-2024

- **Lectures at Aix-Marseille Univ. General Mathematics for 1st year undergrade.** — Marseille (13), France
  General mathematics for 1st year students. Phy.-Chim.-Eng. majors (Sem. 1). 60 hours — Years 2020-2021, 2021-2022, 2023-2024

- **Lectures at Aix-Marseille Univ. General Mathematics for pre-undergraduate students.** — Marseille (13), France
  General mathematics for students that resume their studies in S.T.E.M. (Sem. 1). 84 hours — Year 2023-2024