

ERCIM fellowship Programme

Final scientific report



ERCIM Alain Bensoussan Fellowship Programme



Fellow

Sabri Bahrouni

Host Organisation

Faculty of Mathematics, Informatics, and Mechanics,
University of Warsaw

Scientific coordinator

Iwona Chlebicka



I – SCIENTIFIC ACTIVITY DURING YOUR FELLOWSHIP

During my fellowship at the Faculty of Mathematics, Informatics, and Mechanics, University of Warsaw, under the supervision of Prof. Iwona Chlebicka, I worked on problems related to nonlinear potential theory and partial differential equations with generalized and anisotropic Orlicz growth.

The research focused on three interconnected directions:

Wolff potential estimates for solutions to measure data equations in the generalized Orlicz setting, in collaboration with Prof. Iwona Chlebicka and Dr. Arttu Karppinen.

Fully anisotropic measure data problems, where I investigated the development of an A-harmonic approximation lemma adapted to anisotropic growth conditions.

Nonlocal problems, particularly Sobolev-type embeddings in fractional Musielak-Sobolev spaces, which led to a collaboration with Prof. Angela Alberico during my research stay at the IAC – Istituto per le Applicazioni del Calcolo “Mauro Picone”.

Prof. Iwona Chlebicka also created a very stimulating research group environment, where each week one of the members delivered a presentation on their ongoing work. I am proud to have been part of this group and had the opportunity to participate in discussions. These weekly meetings, along with frequent exchanges with other postdocs and PhD students, significantly enriched my understanding and helped shape new research ideas.

Although no publications have resulted from this work so far, parts of the research are still ongoing. The fellowship provide a starting point for further developments and expected to lead to future publications.

II – PUBLICATION(S) DURING YOUR FELLOWSHIP

Still in progress. *The research conducted is expected to lead to future publications.*

III – ATTENDED SEMINARS, WORKSHOPS, CONFERENCES

During the fellowship, I participated in several scientific events, including:

1. Workshop: Novel Methods of PDEs and Function Spaces – Warsaw, June 23–27, 2025.
2. Conference: Recent Advances and Challenges in PDEs – Institute of Mathematics, Polish Academy of Sciences, Warsaw, September 2–5, 2025.
3. Warsaw Summer School on Evolutionary PDEs – Warsaw, July 13–18, 2025.
4. Workshop: Diffusion in Warsaw – Warsaw, September 9–13, 2025.
5. Workshop: Hydrodynamic Models and Multi-Scale Analysis in PDEs – Warsaw, September 21–24, 2025.



IV – RESEARCH EXCHANGE PROGRAMME (REP)

I visited the IAC – Istituto per le Applicazioni del Calcolo “Mauro Picone” from June 29 to July 4, 2025, under the supervision of Prof. Angela Alberico. During my stay, I worked on research related to nonlocal differential problems, with a particular focus on Sobolev-type embeddings in fractional Musielak-Sobolev spaces. This visit marked the beginning of a promising collaboration, and we plan to continue working together to develop new results in this area.