SIMION STOILOW INSTITUTE OF MATHEMATICS OF THE ROMANIAN ACADEMY

On a hybrid trilinear Hilbert transform

Victor Lie (Purdue University)

Wednesday, November 11, 2026, 12:00h

IMAR, *Miron Nicolescu* amphitheater

Abstract: In this talk we are going to discuss the boundedness properties of a *hybrid* trilinear Hilbert transform characterized by a *dual regime* which simultaneously exhibits

- *resonant* (zero curvature) features, i.e. modulation invariance properties, and
- *non-resonant* (non-zero curvature) features.

This work is joint with Cristina Benea and Frédéric Bernicot, both at the University of Nantes, France.

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In this talk we are going to discuss the boundedness properties of a *hybrid* trilinear Hilbert transform characterized by a *dual regime* which simultaneously exhibits

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Specifically, given $a \in (0,\infty) \setminus \{1,2\}$ and $\vec{\lambda} := (\lambda_1, \lambda_2, \lambda_3, \lambda_4) \in (\mathbb{R} \setminus \{0\})^4$ with $\lambda_1 \neq \lambda_2$ and $\lambda_3 \neq \lambda_4$, we provide wide-range L^p bounds for the trilinear operator

$$HTHT^a_{\vec{\lambda}}(f_1, f_2, f_3)(x) := p.v. \int_{\mathbb{R}} f_1(x - \lambda_1 t)\, f_2(x - \lambda_2 t - \lambda_3 t^a)\, f_3(x - \lambda_4 t^a)\, \frac{dt}{t}, \quad x \in \mathbb{R}\,.$$

By combining variable multiresolution, multiscale wave-packet analysis, and Rank II LGC method, our present work establishes a common framework where the diverse methodologies of all of the following naturally converge:

- the maximal truncated bilinear Hilbert transform;
- the Biest operator;
- the hybrid bilinear Hilbert-Carleson operator;
- the non-resonant (curved) trilinear Hilbert transform.

Ultimately, this work reveals that the hybrid trilinear transform sits on a critical intermediate scale between the purely non-resonant case and the purely resonant regime—the latter remaining a challenging, poorly understood, major problem in harmonic analysis.

This work is joint with Cristina Benea and Frédéric Bernicot both at University of Nantes, France.

The content of the presentation is part of the paper "On a hybrid trilinear Hilbert transform" by the same authors which was published on ArXiv on November 1st 2026 (see https://arxiv.org/pdf/2611.02167).