

Friedrich-Alexander-Universität Research Center for Mathematics of Data | MoD

FAU MoD Lecture Series



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From Alan Turing to contact geometry: Towards a "Fluid computer" Speaker: Prof. Dr. **Eva Miranda**, UPC Universitat Politècnica de Catalunya · BarcelonaTech

Organized by: **FAU MoD**, Research Center for Mathematics of Data at FAU Friedrich-Alexander-Universität Erlangen-Nürnberg (Germany)

Abstract. Is hydrodynamics capable of performing computations? (Moore, 1991). Can a mechanical system (including a fluid flow) simulate a universal Turing machine? (Tao, 2016). Etnyre and Ghrist unveiled a mirror between contact geometry and fluid dynamics reflecting Reeb vector fields as Beltrami vector fields.

With the aid of this mirror, we can answer in the positive the questions raised by Moore and Tao. This is done by combining techniques from Alan Turing with modern Geometry (contact geometry) to construct a "Fluid computer" in dimension 3.

This construction shows, in particular, the existence of undecidable fluid paths. Tao's question was motivated by a research program to address the Navier-Stokes existence and smoothness problem. Could such a Fluid computer be used to address this Millennium prize problem? We will end up the talk with some speculative ideas of a Fluid computer construction à la Feynman.

WHEN?

Wednesday **April 19, 2023** 16:00H



WHERE?

On-site **Room H13. Johann-Radon-Hörsaal.** Department Mathematik. Friedrich-Alexander-Universität Erlangen-Nürnberg. Cauerstrasse 11, 91058 Erlangen.

Online Zoom meeting link: shorturl.at/hmDQU Meeting ID: **614 4658 1599** | PIN: **914397**