BIP - IMTF

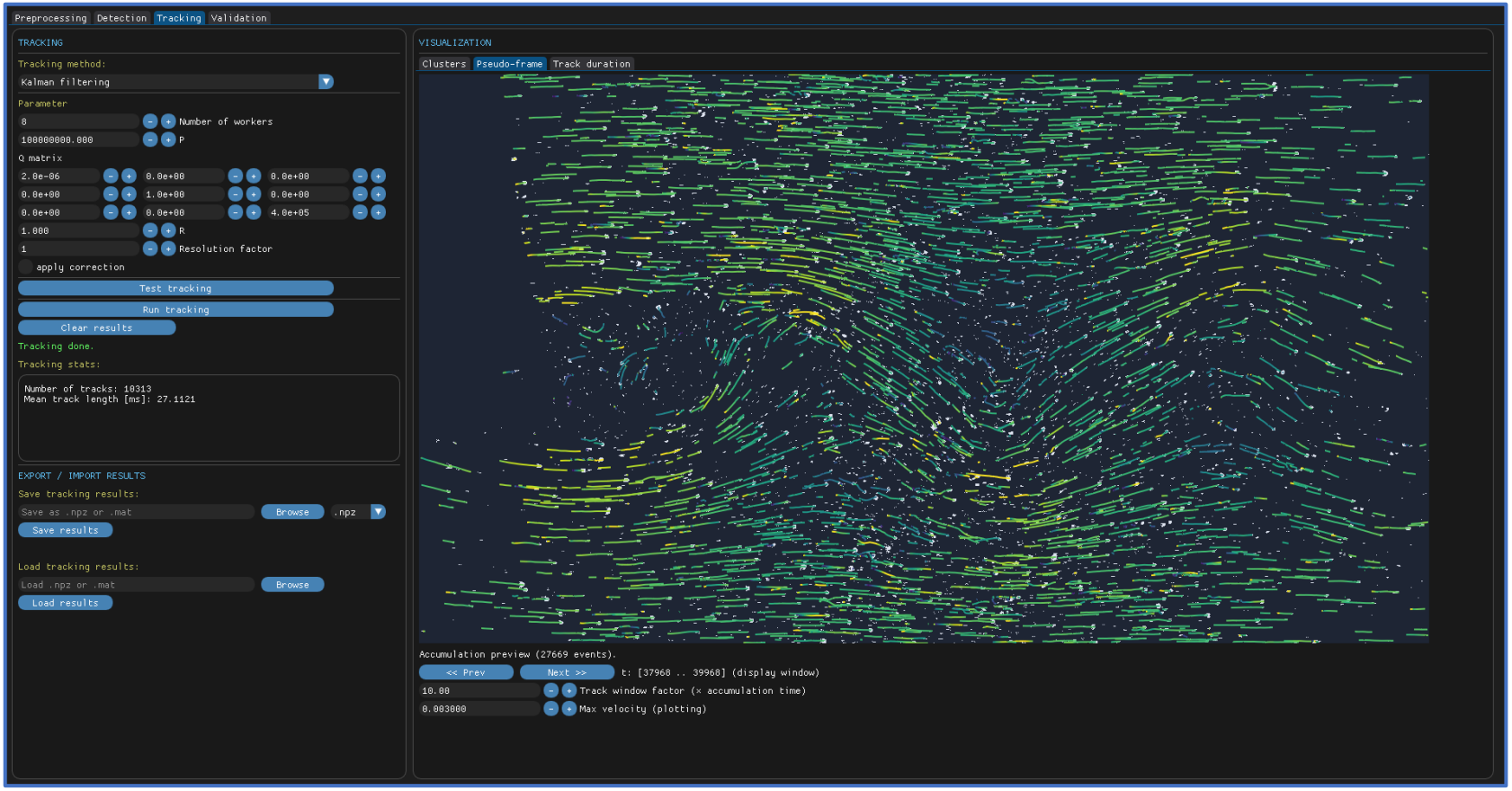
Imaging methods for turbulent flows

Erasmus+
Enriching lives, opening minds.

SUN RISE
SMALLER (STRATEGIC) UNIVERSITIES NETWORK FOR REGIONAL INNOVATIVE AND SUSTAINABLE EVOLUTION

Erasmus+ Blended Intensive Program: Imaging methods for turbulent flows

Content: In this small workshop we aim to introduce different imaging-based methods for the characterization of turbulent flows. These include particle image velocimetry, particle tracking velocimetry and event-based imaging.



Aims:
- Students know different advanced imaging methods for turbulent flows
- Students are aware of benefits/limitations of either technique and are able to choose a suitable approach
- Students have practical experiences in applying the techniques and evaluating the raw data
- Students are able to discuss their decisions and results in the group

Format: Introductory lectures will be given online and in person. Afterwards, group discussions on different measurement tasks will deepen the understanding of the advantages of the different approaches. Later, the students will get hands-on experience working on experiments in small groups. They will set up the experiments, perform measurements and evaluate them with different open software tools. They will write a short report in form of a protocol and present their findings among all participants in a final session.

Credits: 3 ECTS points

Language: English

Participants (25 max):

- ✓ should have a basic understanding of fluid mechanics
- ✓ are open for experimental work
- ✓ are open for programming
- ✓ should have a basic understanding of image and data analysis
- ✓ are performing experiments in groups of max. 5 persons (2 × water tunnel. 2 × bubbly flow, 1 × acoustofluidics)

Applications:

- ✓ for full funding by Erasmus+ contact your local International Office before application
- ✓ send your applications to bip@tu-ilmenau.de (name, university, type of study, contact details, contact details International Office Coordinator, **proof of Erasmus+ funding by your International Office**, one sentence motivation)
- ✓ applications from the Sunrise Alliance will be preferred
- ✓ students from German Universities or non-Erasmus Universities please contact bip@tu-ilmenau.de for additional information

Lecturer (alphabetical):

- ✓ Prof. Christian Cierpka, Institute of Thermodynamics and Fluid Mechanics, Technische Universität Ilmenau, Ilmenau, Germany
- ✓ Dr. Paweł Magryta, Department of Thermodynamics, Fluid Mechanics and Aviation Propulsion Systems, Lublin University of Technology, Lublin, Poland
- ✓ Prof. Massimiliano Rossi, Department of Industrial Engineering, University of Bologna, Forli, Italy
- ✓ Dr. Sebastian Sachs, Institute of Thermodynamics and Fluid Mechanics, TU Ilmenau, Germany
- ✓ Dr. Valentin Scheiff, Department of Engineering Science, Multiphase flow and Computer vision, Mälardalen University, Västeras, Sweden
- ✓ Technicians/PhD candidates at University in Ilmenau will support the practical parts

Introductory online lectures (Webex, date will be announced in February):

“Fundamentals of aerodynamics”, Dr. Pawel Magryta, LUT

“Fundamentals of two-phase flow”, Dr. Valentin Scheiff, MDU

Tentative program at TU Ilmenau (15.3.-19.03.2027)

Monday 15.03.2027	09.00 am Registration and Welcome coffee	IBZ, Ehrenbergstr. 38, 98693 Ilmenau
	09.15 am Welcome by head of IO and introduction of the aims	
	09.45 am "Introduction ITFD and optical flow measurement techniques" (Prof. C. Cierpka, TU Ilmenau	Mensa building (canteen), Max-Planck-Ring 1, 98693 Ilmenau
	11.00 am "Introduction to EB-PTV and the STELLA Software" (Dr. S. Sachs, TU Ilmenau)	Meeting point: in front of Mensa
	01.00 pm Lunch	
	02.00 pm Lab Visit wind / water tunnel	Newton Building, Ehrenberg
	03.30 – 05.00 pm Guided city-tour Ilmenau ends at Café Makan	City centre
	Free time	
Tuesday 16.03.2027	09.00 Introduction to the experimental facilities and lab work (defining the experiments, printing flow objects, performing experiments)	Newton Building 2010, Ehrenberg
	09.30 am Lab work (definition, set-up, plan, first tests and calibration)	Newton Building 2010 and experimental facilities, Ehrenberg
	12.30 pm Lunch	Meeting point: in front of Mensa
	01.30 pm Lab work (experiments and first data processing)	Newton Building 2010 and experimental facilities, Ehrenberg
	04.30 pm end of lab work	
	Optional relaxed hike to Kickelhahn mountain and visit of Goethe-Haus / free time	
Wednesday 17.03.2027	Excursion to Erfurt and local company	
	To be announced	

Thursday 18.03.2027	09.30 am Lab Time: all groups together (Getting flow quantities from raw velocity data – Prof. M. Rossi, University of Bologna)	IBZ, Ehrenbergstr. 38, 98693 Ilmenau
	12.30 pm Lunch	Mensa building (canteen), Max-Planck-Ring 1, 98693 Ilmenau Meeting point: in front of Mensa
	01.30 pm Finalising the reports, preparation of the presentations *Free time*	IBZ, Ehrenbergstr. 38, 98693 Ilmenau
Friday 19.03.2027	09.00 am Presentation of the results by all groups and feedback by the lecturer	IBZ, Ehrenbergstr. 38, 98693 Ilmenau
	12.00 am Feedback everybody and farewell	
	12.30 am Lunch/individual departure	Mensa building (canteen), Max-Planck-Ring 1, 98693 Ilmenau