## **METTI 5 Advanced Summer School - Tutorial T6**

## Inverse problems in a microchannel (experimental)

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## Abstract:

The aim of this work is to present new techniques for the estimation of thermophysical properties in microfluidics devices. The estimations are performed from the experimental measurements of the front face temperature fields of microfluidics chips, using InfraRed (IR) thermography. The inverse methods developed are based on a correlation coefficient. It allows to estimate parameters like the thermal diffusivity, the velocity, and also the source term. Different applications will be shown. In the first experiment, we demonstrate how to use our methods for the estimation of Fourier and Peclet numbers in the case of transient flows in microchannels. Then, we will apply those methods for the kinetics characterization of an acid/base chemical reaction. This experiment is realized in co-flow configuration in microchannels and is used to quantify the enthalpy of reaction. Finally, phase change is studied, from freezing of single droplets on free surfaces to crystallization in microchannels. This part of the work focuses on the estimation of source term and its location. All experiments are realized with an IR Camera and rapid image processing using MATLAB software.