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Using Machine-Learning to Speed-Up Optimisation in CFD: designing a micromixer.[1] JOAQUIN ORTEGA-CASANOVA, FRANCISCO-JAVIER GRANADOS-ORTIZ, University of Málaga — In fluid dynamics applications, the use of Computational Fluid Dynamics (CFD) for design optimization is the recommended approach par excellence. Although Reynolds Averaged Navier Stokes simulations in CFD represent a lower cost option for prototyping, the number of computational simulations to achieve an optimal design may be time consuming. This process may speed-up by means of Machine Learning techniques. This presentation aims at showing an optimisation framework for the optimal design of a micromixer. This device consists of a rectangular pillar in a microchannel, which promotes vortex-shedding phenomenon to mix two fluids moving in parallel to each other. Since in the search of new configurations (longitudinal aspect ratio, blockage ratio and Reynolds number) an uncontrolled sampling may lead to undesired devices which do not lead to vortex-shedding, these are simulated and important computational resources may be wasted. By means of Machine-Learning classifiers, one can know prior simulation whether this new design is worth for simulation to achieve a final solution. This allows us to perform efficiently a multi-objective optimization of the micromixer device. This approach is extendable to other applications.

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