# Fluid dynamics of the human nose: An overview of clinical perspectives enabled by CFD

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The airflow within the human nose is a scantly known, yet challenging fluid dynamical problem, with major importance in terms of incidence of pathologies and social impact. Breathing has a rich flow physics (a particle-laden multi-phase flow within non-rigid boundaries, with heat exchange and other thermodynamic processes), and takes place in an extremely intricate anatomy, with huge inter-subject variations, so that the concept of "functionally normal nose" remains elusive.

In this talk, after a intnroduction to the problem and its medical, social and economical relevance, I will describe the approaches we are pursuing for surgery planning. They span from an unconventional use of Machine Learning augmented by CFD to optimization techniques. They are all designed to be usable in a clinical setting, and start from routinely available CT scans. This is happening within OpenNOSE, an informal multi-disciplinary community that is gathering around the attempt to add CFD to the toolbox of the Ear, Nose and Throat (ENT) doctors.

The talk will emphasize how we are leveraging our experience in turbulent flow control to transform the patient-specific surgery planning into a problem that can be realistically managed and solved by ENT surgeons in their daily activity.



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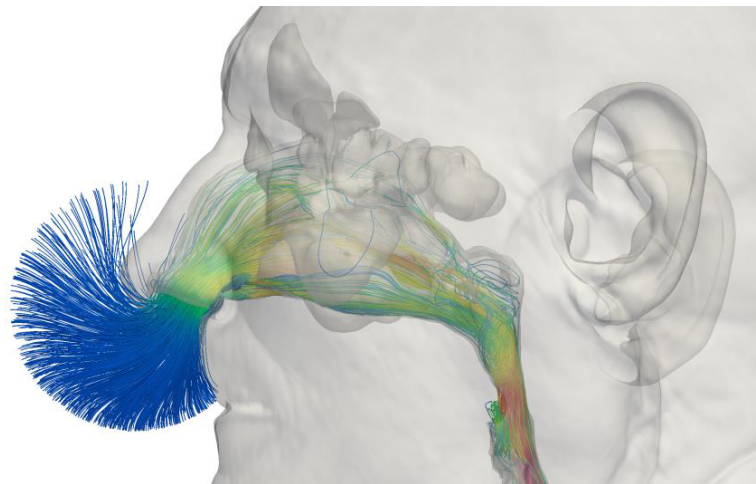
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