Master Thesis Proposal:
Coupled hydromechanical simulations of saturated granular media

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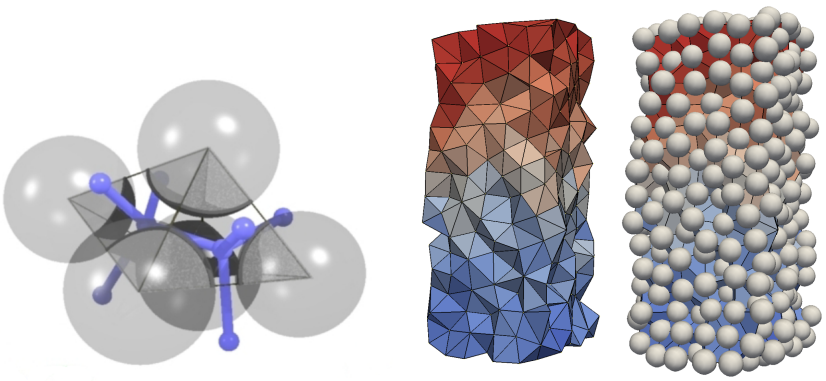
Saturated granular media are extremely common in geomechanical and environmental problems and represents a vast area of research. The interaction between the fluid and solid phases (i.e. hydromechanical coupling) strongly affects the mechanical behavior of the media. In fact, as known from classical geomechanics, it entails a stress exchange between the two phases which may cause non-trivial phenomena as for instance consolidation and liquefaction. This coupling is therefore fundamental in the understanding of many natural disasters such as landslides and debris flows.

The aim of the thesis project is to analyze the influence of the initial state on the stability and the collapsing phase of a granular medium. The thesis will involve a particle-based numerical modelling of immersed granular media. The Discrete Element Method will be coupled with a recently developed technique based on the pore space discretization (Pore Finite Volume).

Two different configurations can be addressed: (a) the collapse of an immersed granular column, and (b) the initiation of an underwater granular avalanche. The numerical results will be compared with existing experimental measurements.



(a) (b)

Figure 1: (a) Adjacent pores and fluid local paths and (b) example of tetrahedral decomposition of the pore space.

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