



PhD position

Granular flows and Artificial Intelligence Orano – Mines Saint-Etienne partnership

Keyword: granular media; fluid mechanics ; rheology, CFD ; DEM ; Artificial Intelligence ; machine learning and neural networks.

Context & Goals: this research project is part of long term collaboration between the Ecole des Mines de Saint-Etienne (top-ranked French engineering school) and Orano, world leader in nuclear energy. The project focuses on granular flows modeling. These flows have fascinating features that make them different from classical fluids. We find them in natural settings (mud flows, snow avalanches ...) or in industrial processes (powder mixing, pneumatic conveying, silo discharge ...) with various materials (metals, oxides, organic compounds ...). Our research group develops numerical strategies to simulate efficiently and rapidly industrial processes that involve a huge number of particles ($10^6 \rightarrow 10^{18}$). In this PhD thesis, the candidate will explore the Artificial Intelligence potentialities to reduce the volume of data generated by simulations using the Discrete Element Method (DEM), classically used to model granular matter. He/she will use this reduced information, for instance in the form of constitutive equations, to feed CFD models. Results are intended to be published in top journals of the field and presented by the PhD student in international conferences.

Desired profile & skills : MSc degree in at least one domain among: fluid mechanics, material physics, soft matter physics, numerical simulation. You like modelling and tackling difficult problems. Curiosity, rigor, engagement, critical analysis capacity, listening and of course passion for science and technology are your key assets for successfully defend an excellent thesis. Fluent English + willingness to learn elementary French.

Application: the file includes four items: cover letter + CV + at least one recommendation letter + MSc ranking or academic results.

Miscellaneous: optimally starting 1st of October, 2020. With industrial funding and co-supervision. The candidate will be member of the SPIN centre of the Ecole des Mines de Saint-Etienne ([website](#)) and of the CNRS laboratory UMR 5307. More informations by simple email to bonnefoy@emse.fr.