

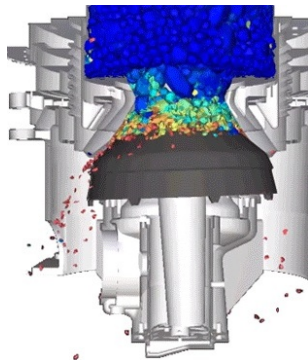
# Modeling and numerical simulation of granular matter for the mining industry

6 months internship. Postgraduate Master degree or PhD student.  
Santiago de Chile. Starting date between January 2015 up to July 2015

**Context** The mining sector in Chile is one of the pillars of Chilean economy and copper exports alone stands for more than one third of government income. The Chilean mining industry, in collaboration with the universities and the centers of excellence, make a sensible effort in terms in research and development in order to improve and optimize the exploitation processes. An important point concerns the mechanics of granular materials (rocks, sand), for which the mineral is a characteristic example with a wide range of granularity. The mechanical modeling and the numerical simulation are at the heart of the optimization of the different exploitation processes: transportation by conveyors, transfer chutes, milling and crushing, vibrations screening. One of the issue is to answer by the numerical simulations to the challenges raised by the mineral processes.



**Objectives** The objectives of the internship aim at showing that the approaches based on the “Nonsmooth Contact dynamics” method are relevant and well-suited for the mineral processes that involve granular matter.



This numerical method enables the simulation of large collections of rigid or flexible bodies in interaction through contact, friction and cohesion. In this study, the LMGC90 software, which will be used, has a long experience in simulating granular matter in industrial context<sup>1 2</sup>. The first subject concerns the milling/crushing process in mills and crusher that contained hard steel balls. The second process of interest concerns the transport of material by a fluid and the sedimentation process. The last subject calls for the fluid/solid coupling as it has been already studied in LMGC90. According to the interest of the industrial partners, the work will be focused on one of this subject.

**Work environment** Inria Chile is a recently-established foundation in Santiago de Chile, set up by Inria (“Institut National de Recherche en Informatique et en Automatique”), a French public institution devoted to Research and Development of future digital technologies within the fields of computer sciences and applied mathematics. Inria Chile seeks to be, within its areas of expertise, a strategic innovation partner for the Chilean industry. We rely on recent discoveries made either by our university partners in Chile or by our researchers in France.

## Required skills

- Numerical modeling in Mechanics
- Applied maths and numerical modeling and scientific computing (good skills in software development).
- English and Spanish should definitively be a plus.

## Practical aspects

- Location: INRIA Chile. Santiago de Chile<sup>3</sup>
- Duration : 6 months. Pay : around 800 000 pesos + flight tickets
- Contact : Vincent Acary. Research fellow INRIA Chile, [vincent.acary@inria.cl](mailto:vincent.acary@inria.cl)<sup>4</sup>.

<sup>1</sup>[https://hal.archives-ouvertes.fr/file/index/docid/596875/filename/ar\\_42S6S3BF.pdf](https://hal.archives-ouvertes.fr/file/index/docid/596875/filename/ar_42S6S3BF.pdf)

<sup>2</sup><http://transfert.lmgc.univ-montp2.fr/LMGC90>

<sup>3</sup><http://www.inria.cl>

<sup>4</sup><http://bipop.inrialpes.fr/people/acary>