. **Titre**: Learning Methods for Robotic Models

. **Thématique**: Robotics, Machine Learning

. **Laboratoire**: INRIA . **Équipe**: Flowers (flowers.inria.fr)
. **Ville et pays**: Bordeaux, France

. **Directeur de stage**: *Manuel Lopes* (manuel.lopes@inria.fr)
. **Directeur du laboratoire**: *Pierre-Yves Oudeyer* (pierre-yves.oudeyer@inria.fr)

. **Présentation générale du domaine** (5 à 10 lignes):

Robots are becoming complex enough to allow their use in non-structured environments and in tasks involving humans. This change from factory lines, designed for machines, to environments designed for people has several technical, and safety, challenges. The main difficulties arise from their unpredictability, high-dimensionality and the lack of knowledge of the world entities and their dynamics.
To allow machines to deal with such problems they need to be able to acquire (precise) models of the dynamics of the environment, the objects on it and of their relations. With such models robots are then able to efficiently plan how to achieve complex goals, recognize motions and predict events.

. **Objectifs du stage** (10 à 20 lignes):

The goal of this internship is to do a comparative study of the different learning algorithms that can be applied to learn dynamical models of robotic systems. We will consider generic black-box regression methods from machine learning but also methods specially designed to take into account the dynamical constraints of physical systems. We will use as test-beds the robotic systems already available in the lab.

. **Références bibliographiques**

- Sigaud, O. and Salaun, C. and Padois, V. (2011). On-line regression algorithms for learning mechanical models of robots: a survey. Robotics and Autonomous Systems, Elsevier, publisher. Vol 59 No 12 Pages 1115-1129.
- Nguyen-Tuong, D.; Peters, J. (2011). Model Learning in Robotics: a Survey, Cognitive Processing, 12, 4
- Nicolas Mansard, Manuel Lopes, José Santos-Victor and François Chaummette (2006) Jacobian Learning Methods for Tasks Sequencing in Visual Servoing. IEEE – Intelligent Robotic Systems (IROS), Beijing, China.
- Baranes, A., Oudeyer, P-Y. (2009) R-IAC: Robust intrinsically motivated exploration and active learning, IEEE Transactions on Autonomous Mental Development, 1(3), pp. 155--169.

. **Compétences espérées**

Strong mathematical background. Knowledge of machine learning methods is a plus.

Programming capabilities in C/C++ or Python.