Internship proposal in the **IMAGINE group at ENPC**

**Self-training on unlabeled 3D data for object detection in point clouds**

**Abstract:**
Over the past few years, deep learning methods on point clouds have achieved impressive results on 3D scene understanding, such as object detection [1, 2, 3]. However, these methods require a large amount of training data manually annotated by humans. While rapid advances in sensor technology facilitate the collection of 3D scenes in large scale, annotating them remains the main bottleneck. This calls for semi-supervised methods to exploit larger datasets with limited labels, especially self-training methods, where a teacher model is first trained on the labeled data and then used to generate pseudo-labels on the unlabeled data, and where finally a student model is trained on the combination of the labeled data and the pseudo-labeled data.

While being largely used in image understanding [4, 5, 6], self-training on point clouds is still relatively under-explored [7, 8]. Yet, because of the annotation cost, self-training on 3D data is of major interest for autonomous driving systems or intelligent robotic systems.

The objective of this internship is to develop an efficient self-training method on point clouds, exploiting unlabeled point cloud sequences and inter-frame continuity such as scene flows. Another objective is to study the generalization ability of different 3D detection methods in the semi-supervised setting. A possible starting direction is to adapt existing self-training methods for images to 3D scene datasets such as KITTI, NuScenes or ScanNet, while supposing a certain portion of data is unlabeled.

**Intern profile:** students finishing their Master of Science, with a strong background in computer vision, machine (deep) learning and, ideally, 3D geometry processing.

**Time:** spring and summer 2021 (4-6 months)

**Location:** Ecole des Ponts ParisTech, 6 avenue Blaise Pascal, Cité Descartes, Champs-sur-Marne (25 min from Paris by RER A)

**Main advisors:** Renaud Marlet, Vincent Lepetit, Yang Xiao, Yuming Du

**Contact:** renaud.marlet@enpc.fr, vincent.lepetit@enpc.fr, yang.xiao@enpc.fr, yuming.du@enpc.fr

**To apply:** send your resume, available transcripts and a cover letter to the above contact people.

**References:**