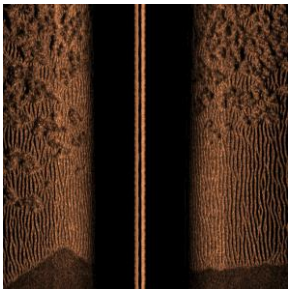
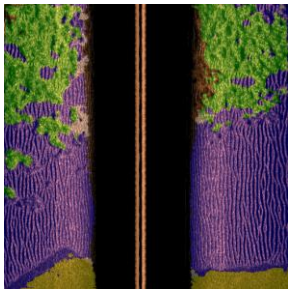
Internships at ENSTA Bretagne

Deep learning methods for seafloor segmentation from sidescan sonar images





1. Context

The project deals with the processing of images recorded by sidescan sonars. Such images reveal detailed textured information about seafloors and may be used to classify any patch into seafloor types (rocks, sand ripples, mud, sand, etc.) and/or to segment images into homogeneous zones. Various works in this domain have studied different approaches using various signal processing algorithms to extract discriminative information and various supervised or unsupervised classifiers to classify these information. Recently, deep learning approaches showed promising progress, and are interesting to replace traditional handcrafted features stage by an automatic feature learning stage, to extract hierarchical representation of information with various level of abstraction and to obtain invariant information (insensitive to contrast changes between images and more generally to small deformations).

2. Subject

Some recent work in our lab has been focused on supervised and unsupervised (autoencoder) architectures applied to seafloor classification and semantic segmentation. In this context, the aim of the proposed internship is to develop new deep-learning-based methods to segment seafloor information recorded by sonar systems.

A number of key points will have to be addressed in this work: the choice of the architecture, the evaluation of results from available sonar images databases, the interpretation of learned representation, the specificity of sonar images. The student will then explore other directions among semi-supervised (learning with few examples) and/or weakly supervised (learning with lower-quality labels) deep learning architectures.

3. Skills

- M2 or engineering school 3rd or 4th year
- Good scientific skills in data science and good scientific programming skills in Python required.
- Appreciated knowledge in one or several of the following: underwater acoustics, sidescan sonar, data science, machine (deep learning), TensorFlow, PyTorch, Keras, etc.
- Methodology, curiosity and team work ability are also required for this internship.

4. Application

- **Application procedure**

Curriculum + cover letter to be sent to Gilles.Le_Chenadec@Ensta-Bretagne.fr.

- **Practical information**

Localization : ENSTA Bretagne - Lab-STICC UMR CNRS 6285 - 2 rue François Verny, 29806 Brest

Durée : 6 mois max.