

PROPOSITION DE STAGE EN COURS D'ETUDES

Référence : **DTIS-2019-64**
(à rappeler dans toute correspondance)

Lieu : Palaiseau

Département/Dir./Serv. : DTIS/IVA

Tél. : 01 80 38 65 73

Responsable du stage : Bertrand Le Saux

Email. : bertrand.le_saux@onera.fr

DESCRIPTION DU STAGE

Domaine d'étude : Intelligence artificielle et décision, Perception et traitement de l'information

Type de stage Fin d'études bac+5 Master 2 Bac+2 à bac+4

Intitulé : Multimodal geospatial analysis: aerial / streetview / text

Sujet :

More and more data are now geo-localized, and this opens a whole new research area at the intersection of remote sensing (aerial or satellite images), computer vision (standard images shot from the ground) and machine learning (text and structured information). Hence, this relationship between heterogeneous data allows to new questions with lots of practical applications. For example, where was this streetview image taken ? It will be useful for self localization in autonomous driving, but also to disambiguate fake news if the photo appears to belong to a different place it claims... Or, what is this location, given aerial, streetview and text describing it (from Wikipedia) ? This allows precise land use and landcover classification, much better than standard Earth-observation (EO).

The objective of the internship is to design and develop algorithm for classification of geolocated, multimodal aerial / streetview / text data. It will build on multimodal convolutional neural networks (CNNs) for semantic segmentation of EO data , developed at ONERA/DTIS **[Audebert et al., 2017][Audebert et al., 2018]**.

Especially, the intern will work on two hot topics of deep learning.

- How to design multimodal network models able to handle heterogeneous data and build a representation space suitable for various tasks ?
- How to benefit from multiple related data to get better performances ? We will investigate multi-task learning offers promising solutions to make the models more statistically robust **[Zamir et al., 2018]**

The work program will comprise of: study of neural networks for multimodal classification and semantic segmentation; coding (python) and experiments with CNNs using open libraries (Pytorch) on large-scale geospatial datasets built at ONERA.

References:

[Audebert et al., 2018] Beyond RGB: Very high resolution urban remote sensing with multimodal deep networks *Nicolas Audebert, Bertrand Le Saux, Sébastien Lefèvre*, ISPRS Journal of Photogrammetry and Remote Sensing, 2018

[Audebert et al., 2017] Joint Learning from Earth Observation and OpenStreetMap Data to Get Faster Better Semantic Maps *Nicolas Audebert, Bertrand Le Saux, Sébastien Lefèvre*, [CVPR/Earth Vision](#) workshop, Hawaiï, USA, July 2017

[Zamir et al., 2018] Taskonomy: Disentangling Task Transfer Learning. Zamir, Sax, Shen, Guibas, Malik, Savarese, CVPR, Salt Lake City, USA, June 2018

Est-il possible d'envisager un travail en binôme ? Non

Méthodes à mettre en oeuvre :

X Recherche théorique	Travail de synthèse
X Recherche appliquée	Travail de documentation
Recherche expérimentale	Participation à une réalisation

Possibilité de prolongation en thèse : Oui

Durée du stage : Minimum : 4 months Maximum : 6 months

Période souhaitée : January - September 2019

PROFIL DU STAGIAIRE

Connaissances et niveau requis :

Machine Learning, Deep Learning, Image Processing and Algorithmic Geometry.

Programming experience (python, etc.)

Ecoles ou établissements souhaités :

Grandes Écoles, Master 2 recherche learning / computer vision

Ms. Eng. (CS, EE, ...), M.Sc.