PROPOSITION DE STAGE EN COURS D’ETUDES

Référence : DTIS-2018-xxx
(à rappeler dans toute correspondance)

Lieu : PALAISEAU

Département/Dir./Serv. : DTIS/IVA

Tél. : +33 1 80 38 65 73

Responsable du stage : Bertrand Le Saux

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DESCRIPTION DU STAGE

Domaine d’étude : Intelligence artificielle, Vision par ordinateur, Télédétection

Type de stage ☐ Fin d'études bac+5 ☐ Master 2 recherche ☐ 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 geolocalized, 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, Hawaï, 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
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<thead>
<tr>
<th>Est-il possible d'envisager un travail en binôme ?</th>
<th>Non</th>
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<tbody>
<tr>
<td><strong>Méthodes à mettre en œuvre :</strong></td>
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<tr>
<td>x Recherche théorique</td>
<td>Travail de synthèse</td>
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<td>x Recherche appliquée</td>
<td>Travail de documentation</td>
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<td>Recherche expérimentale</td>
<td>Participation à une réalisation</td>
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<td>Possibilité de prolongation en thèse :</td>
<td>Oui</td>
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<td><strong>Durée du stage :</strong></td>
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<td>Minimum : 4 months</td>
<td>Maximum : 6 months</td>
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<td>Période souhaitée :</td>
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<td>January - September</td>
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**PROFIL DU STAGIAIRE**

| Connaissances et niveau requis :                | Ecoles ou établissements souhaités : |
| Machine Learning, Deep Learning, Image         | Grandes Écoles, Master 2 recherche learning / |
| Processing and Algorithmic Geometry.           | computer vision |
| Programming experience (python, etc.)          | Ms. Eng. (CS, EE, …), M.Sc. |