PhD position offer
Department of Applied Geomatics - Université de Sherbrooke
in collaboration with the Canada Centre for Remote Sensing

Lichen detection and caribou habitat mapping using multiscale remote sensing imagery

Context
The project is a part of the Government of Canada’s initiative for monitoring and assessing regional cumulative effects, a recently added requirement to the new Impact Assessment Act (2019). Among various “valued components” to be assessed, caribou stand out as one of the top priorities because of their importance to the economy, culture, and way of life for indigenous peoples. Previous caribou dietary studies indicate that lichens are the most important food for woodland caribou, especially during the winter and fall. Yet, despite many effects over the years, information on lichen distribution within the various caribou ranges of Canada remains unreliable or unavailable. To fill the information gap, this project aims to map and detect temporal and spatial changes in lichen distribution for selected caribou ranges in Canada. This is a joint effort by scientists from the Canada Centre for Remote Sensing (CCRS), the Canadian Forest Service, Environment and Climate Change Canada, provincial/territorial governments, and other partners.

Approach
We work towards an updated baseline lichen coverage map in high-resolution (10 m or above) for resource inventory and another change-tracking lichen dynamic dataset in 30 m resolution by using lichen as a new environmentally-sensitive component or indicator for cumulative impact assessment. Landsat imagery has been widely used by previous researchers to generate lichen distribution maps with low reported accuracies. The main challenge for producing lichen maps from this moderate (30 m) resolution sensor is the mixture of lichen with other land cover types (e.g., trees, rocks, shrubs, etc.) within the 30 m pixel size. To address this, we are designing and testing a new scaling-up approach. We start with sub-millimeter resolution plot photos and scale them up using centimeter resolution UAV data, half-meter resolution Worldview satellite data, and finally to moderate resolution (i.e. between 10 to 30 m) satellite imagery. In this way, we expect to substantially increase the size of our “ground truth” database, and improve the overall accuracy of lichen distribution and change maps that we generate from this data. In addition, we will develop innovative approaches for mapping lichen cover (abundance) and biomass, and producing related change detection products using cutting-edge technology (e.g., artificial intelligence, big data analytics).
Candidate profile

- Background in geomatics, remote sensing, computer science or other related field, with an interest in environmental remote sensing
- Ability to program computer codes to facilitate and/or automate data analysis, and a familiarity with a geomatics and GIS software packages (e.g. PCI Geomatica, ENVI, eCognition, ArcGIS, QGIS)
- A complementary background in biology, ecology or environmental studies would be an asset
- A background in computer vision, especially in semantic segmentation, would be an asset
- Admissibility to the PhD program “Doctorat en télédétection”
  
https://www.usherbrooke.ca/geomatique/futurs-etudiants/troisieme-cycle/ 

Project environment and conditions

- The PhD student will be based at the Université de Sherbrooke (Qc, Canada) and will join the Cartel (Centre d’applications et de recherches en télédétection) and the QCBS (Quebec Centre for Biodiversity Science)
- The PhD student will have opportunities to spend some time at the CCRS in Ottawa.
- The PhD student will have a personal workspace equipped with a computer at the Université de Sherbrooke
- The PhD student will receive a scholarship during this 3 year-project
- Start date of the project: between June and September 2020

To apply, send a CV, letter of presentation and academic transcripts to:

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PRIORITY WILL BE GIVEN TO APPLICATIONS RECEIVED BY MARCH 20th 2020