

## **2-year postdoc position: Deep Learning and Community-Focused Sea Ice Feature Detection**

The Ice, Climate, and Ecosystem (ICE) Remote Sensing Lab at the University of Victoria is looking for a postdoctoral researcher to fill a fully funded, full-time, 2-year position (1 year renewable for an additional year).

### **\*Rationale\***

The Arctic is experiencing emerging sea ice conditions that are increasingly variable on diurnal, seasonal, and inter-annual time scales. Examples include the increased flow of old, thick ice into Canadian waterways, due to the intermittent seasonal breakdown of ice arches further north that used to block the ice; the formation of rougher ice due to later than normal freeze-up, when wind speeds are greater; and unpredictable hazards such as thin ice, cracks, and melt holes during early spring melt. Variable conditions impede the safe use of sea ice as a platform for travel and subsistence activities, and impact the ability of Arctic Indigenous users to maintain traditional activities. This project will foster the development of deep learning, in particular the emerging field of tensor methods, for the dynamic mapping of Arctic sea ice conditions at the local scale. Deep learning provides promising tools for identification and mapping features that represent hazards or challenges to local users of sea ice. The methodology is grounded in the need to improve the Arctic sea ice observational capacity at the local scale, and promote climate resilience at the community level, while addressing challenges relating to managing and aggregating high volumes of earth observation data effectively. Stakeholders in the Canadian Arctic will be involved in the research design and co-production of new knowledge on sea ice observation. Outcomes will be delivered in map-product and info-graphic formats designed to guide Indigenous livelihood activities, including safe travel, domain awareness, and subsistence.

### **\*Focus\***

The successful candidate will contribute to a collaborative research project dedicated to the application of Earth Observation technologies (satellite and autonomous) to map features and conditions relevant to the safe usage of sea ice as a platform for travel and subsistence activities by Arctic residents. The successful candidate will work closely with experts in Artificial Intelligence, particularly leading edge Machine Learning/Deep Learning (ML/DL) methods, in the Computer Science Department, as well as partners that have developed mobile and web platforms used to support maritime situational awareness, sea ice safety, two-way knowledge exchange with Inuit users, safe travel, and self-determination. Specifically, the project will explore the use of Earth Observation data from existing satellite radar, optical, and altimetry missions, as well as autonomous ice/ocean and meteorological monitoring sensors, to develop sea ice status data for training ML/DL algorithms for recognition of features relevant to the safety needs of coastal communities in the Canadian Arctic Archipelago. Input data sources may include, but are not limited to, the Copernicus Programme's Sentinel satellites, the Canadian RADARSAT Constellation Mission, ice buoys, and weather stations. Information products will be developed, evaluated, and delivered to Arctic residents through existing web applications, enabling reciprocity with Arctic users and refinement before final mobilization. Initial focus will be

on identifying open water areas (namely cracks and polynyas), thin ice areas, and deformed ice areas. Identification of these features has potential applications to other atmosphere-ice-ocean related research domains such as ice dynamics and biogeochemistry, and the successful candidate will have opportunities to collaborate with sea ice researchers and climate scientists.

**\*Requirements\***

The project is well suited to applicants with a strong background in sea ice geophysics, remote sensing, polar oceanography, geography, and climate science. Knowledge in remote sensing, with a focus on cryosphere geophysics is expected, along with skills in statistical data analysis and scientific programming (Python, R, Matlab, IDL or similar). The applicant should hold a PhD, however a PhD in ABD status will be considered on an exceptional basis. The applicant does not need to have considerable expertise in data science and machine learning, though experience in related fields will be considered an asset. The successful candidate will be expected to disseminate results at international conferences and in leading scientific journals.

**\*Further Information\***

The position is expected to start on July 1<sup>st</sup>, 2021 though a flexible start date may be considered.

To apply, please email a CV, cover letter including a summary of previous research, and the contact information for referees, all in PDF format, to Dr. Randall (Randy) Scharien ([randy@uvic.ca](mailto:randy@uvic.ca)) by the closing date of June 15, 2021.

Please feel free to contact Randy Scharien by email or phone (+1 250-853-3577) with informal enquiries.