



## Sentinel North: Ph.D. project in wireless networking

### Wireless sensor networks for communities in the extreme north

We perform basic research into networks of low-cost sensors endowed with the capacity to read and store data, transmit this information under harsh climatic conditions, and all with minimal energy consumption. Networked sensors covering the whole length of linear transportation infrastructure and the spatial extent of communities will give warning of incipient failures in covered areas by detecting nascent localized heat sources in the terrain. Longer term, innovative, integrated, compact devices will be developed to quantify the ground temperature regime, infrastructure behavior, and ecosystem dynamics.

***This project develops new wireless networking strategies for sensors monitoring strain, displacements, temperature, and pressure in soils under road and airport infrastructures.*** The Ph.D. candidate will optimize network interconnectivity and coordination among sensors. Working in a multidisciplinary setting, the student will interact with researchers developing sensors and analyzing sensor data. Research is both theoretical and experimental (both laboratory and field trials in Northern Quebec). The network must be optimized for extreme temperature operation, and for power and backhaul resources which vary depending on sensor location.

***We are looking for a PhD student interested to acquire expertise in wireless sensor networks.*** This is a multi-disciplinary research project between the Department of Electrical and Computer Engineering (Prof. Leslie Rusch, Canada research chair in Communications Systems enabling the Cloud), and the Department of Geology (Prof. Michel Allard) as well as the Department of Civil Engineering. In addition to excellent academic records at Bachelor and Master's degree level, the PhD candidate should show genuine interest in science, exhibit leadership and demonstrate excellent oral and written communication skills. Please send your curriculum vitae, academic records, statement of interest and the name of three references to:



Prof. Leslie A. Rusch  
Pavillon Optique-Photonique  
COPL, Université Laval  
[leslie.rusch@gel.ulaval.ca](mailto:leslie.rusch@gel.ulaval.ca)

[Video \(research overview\)](#)

[Research program description](#)





This project is funded by Sentinel North, a novel transdisciplinary program that encourages a convergence of expertise in which Université Laval plays a leadership role, in order to develop novel technologies and improve our understanding of the northern environment and its impact on human beings and their health.

One of the major objectives of Sentinel North is to help train the next generation of specialists needed to address the complex challenges facing the changing North. Students involved in this highly transdisciplinary environment will join a learning community fed by an innovative training program that promotes networking and knowledge sharing. Several internship and mobility scholarship opportunities are also offered.

Sentinel North is made possible thanks in part to funding from the Canada First Research Excellence Fund.

[www.sentinellenord.ulaval.ca](http://www.sentinellenord.ulaval.ca)

