



## Nicholas Soucy

MS Candidate

University of Maine

Research Interests: Physics, machine learning, artificial intelligence



### Student Profiles

**NICHOLAS SOUCY** continues his University of Maine education as a M.S. candidate in Computer Science, working across such fields as physics, machine learning (ML), and artificial intelligence (AI). With a B.A. in Physics from the University of Maine, Soucy received the Center for Undergraduate Research (CUGR) and the Maine Space Grant Consortium (MSGC) Academic Year 2019-20 Fellowship for his THED: Thermal Hand Experience Device.

Currently, Soucy is advised by Salimeh Yasaei Sekeh (an assistant professor in The UMaine School of Computing and Information Science). Soucy also works as a research assistant in The Sekeh Lab, which focuses on theoretical and practical aspects of machine learning as well as designing algorithms and deep learning techniques.

"I love working in ML because I can see the future of humanity within it. It's beautiful, the far-reaching applications ML has on our day-to-day lives from manufacturing to self-driving cars. I believe this technology can save and make lives better. It is an honor to propel that field forward," Soucy states.

Since Soucy was already working with similar machine learning tasks—i.e., using neuroscience and math to define what animal or human brains do then teaching a computer to recognize patterns or trends within that large data—it was fitting for Soucy to work with Sekeh within the multidisciplinary project of INSPIRES as part of Theme 2.

"In our ML-INSPIRES project," Sekeh explains, "we explore deep network approaches for large-scale hyperspectral images (HSI), which are a relatively new remote sensing scheme in forestry and climate change sciences. We develop novel ensemble methods to segment images into tree species. Furthermore, because computational complexity is a prominent challenge in deep network-based algorithms, in this work, we intend to investigate techniques that reduce HSI dimensions and extract informative features as a preprocessing step of our classification/segmentation models."



Left: Pseudocolor image of the Indian Pine data set. Right: Ground-truth classification of the Indian Pine data set.

Sekeh continues, "Soucy plays a key role in our ML-INSPIRES project and he has been an active researcher in The Sekeh Lab working on ideas that develop bridges between deep learning and hyperspectral data sets."

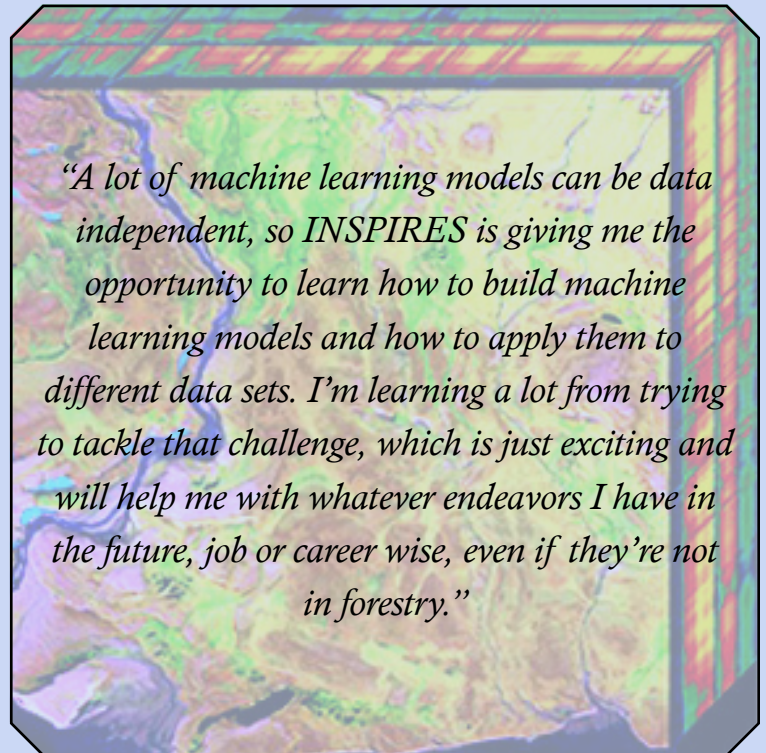
Originally from Maine, Soucy is excited to apply his models—using data sets that were created by Theme 1 researchers, data sets that had been lacking—to New England forests through INSPIRES.

"I'm developing a model that can take in hyperspectral data (data of large areas of land with many wavelengths of light) then reducing the dimensionality of the data so that the images are smaller and therefore, reduces the computational complexity of the data set. Then, we classify tree species and ground types, so that people can know where certain trees are or certain plants are, based on imagery from the sky," Soucy explains.

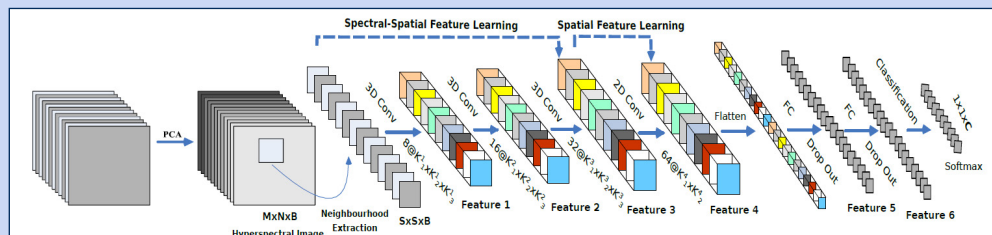
This summer, Soucy is also looking forward to writing and completing a paper on his work this past year on tree species classification ML techniques.

The interdisciplinary approach of the INSPIRES project, from advanced sensing to smart environmental informatics, has provided Soucy with the opportunity to grow in the emerging field of machine learning.

Soucy finds INSPIRES offers interdisciplinary growth:



*"A lot of machine learning models can be data independent, so INSPIRES is giving me the opportunity to learn how to build machine learning models and how to apply them to different data sets. I'm learning a lot from trying to tackle that challenge, which is just exciting and will help me with whatever endeavors I have in the future, job or career wise, even if they're not in forestry."*

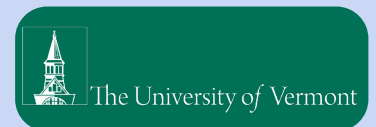


Left: Hybrid Spectral Net (HybridSN) Model which integrates 3D and 2D convolutions for hyperspectral image classification (Roy et al. 2019).



*INSPIRES interviews and profiles by Stefania Irene Marthakis, University of Maine Center for Research on Sustainable Forests*

[crsf.umaine.edu/inspires](http://crsf.umaine.edu/inspires)



## *Smart Data for Resilient Forests*

**INSPIRES: Leveraging Intelligent Informatics and Smart Data for Improved Understanding of Northern Forest Ecosystem Resilience** is an NSF-supported project that leverages unique expertise from the University of Maine, University of New Hampshire, and University of Vermont to construct a digital framework to better assess, understand, and forecast this complex forest at a resolution relevant to scientists, land managers, and policymakers.

◆INSPIRES is supported by the National Science Foundation under Grant No. 1920908◆