YILI YANG

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RESEARCH SCOPE

My research develops advanced AI methodologies to solve complex scientific problems, especially in geoscience, environmental and climate sciences. I create AI-driven approaches that accelerate scientific discovery, improve predictions, and transform our understanding of our changing planet through interdisciplinary collaborations.

EDUCATION

University of Edinburgh, UK

PhD in Petrophysics Oct 2016 - Apr 2021

MSc (Research) in Geology, Distinction August 2015 - August 2016

BSc Geology Sep 2011 - May 2015

EXPERIENCE

Data Scientist, Woodwell Climate Research Center, MA, USA (remote) Jan 2022 -

- Project Lead: the pan-Arctic Retrogressive Thaw Slumps (RTS) mapping initiative, applying state-of-the-art deep learning techniques to satellite imagery for detecting and quantifying permafrost thaw features, directly contributing to climate feedback modeling and carbon cycle research
- Designed and built the ARTS scientific dataset, establishing a benchmark training resource for deep learning applications in environmental monitoring
- Developed innovative machine learning workflows for multimodal data integration, combining various satellite imagery types and field observations to enhance feature detection accuracy
- Collaborated in two wild fire projects using deep learning for wild fire mapping on satellite imagery and using environmental variables to predict wild fire using machine learning
- Collaborated in carbon flux time series imputation using machine learning
- Lead annual machine learning workshop series for Woodwell researchers, providing training in advanced AI techniques for environmental science applications including image processing and time-series forecasting. Designing progressive curriculum materials, adapting teaching methods for diverse learner backgrounds.
- Mentored annual summer interns, created training materials for interns and research assistants. Works were presented on the AGU annual conference.

Data Science Fellow, Faculty.ai, London, UK Sep 2021 - Dec 2021

- Completed intensive fellowship in Machine Learning and Artificial Intelligence, focusing on developing practical AI solutions for complex data challenges. Include trainings and courses for professional data scientist and an industry placement.

PhD Researcher, International Centre for Carbonate Reservoirs, Edinburgh, UK Sep 2017 - Sep 2020

- Conducted doctoral research on multiphase fluid flow in porous media, developing novel computational methods for analyzing complex flow dynamics, funded by Petróleo Brasileiro
- Parcipitated in petrophysical experiments at the Diamond Light Source UK, the Advanced Photon Source Argonne National Laboratory, US and the Swiss Light Source Paul Scherrer Institute, CH

PUBLICATIONS, CONFERENCES AND DATA SETS

Amal S. Perera, David Fernandez, Chandi Witharana, Elias Manos, Michael Pimenta, Anna K. Liljedahl, Ingmar Nitze, **Yang, Yili**, Todd Nicholson, Wenwen Li, and Chia-Yu Hsu. Pan-arctic permafrost landform and human-built infrastructure feature detection with vision transformers and location embeddings. In preparation.

Stefano Potter, **Yang, Yili**, Arden Burrell, Anna Talucci, Andrew A. Clelland, Sander Veraverbeke, James T. Randerson, Scott J. Goetz, Logan T. Berner, Michelle C. Mack, Xanthe Walker, Susan M. Natali, and Brendan M. Rogers. Circumpolar burned area mapping using convolutional neural networks with landsat and sentinel-2 imagery. In preparation.

Andrew A. Clelland, Gareth J. Marshall, Robert Baxter, Stefano Hosking, J.Scottand Potter, **Yang, Yili**, Anna C. Talucci, Joshua M. Rady, Hélène Genet, and Brendan M. Rogers. Machine learning projections of fire occurrence in the arctic-boreal zone for 2025-2100 under different ssp scenarios. In preparation.

Wenwen Li, Chia-Yu Hsu, Sizhe Wang, Zhining Gu, **Yang, Yili**, Brendan M. Rogers, and Anna Liljedahl. A multi-scale vision transformer-based multimodal geoai model for mapping arctic permafrost thaw. *IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing*, 2025. doi: 10.1109/JSTARS.2025.3564310. Accepted.

Yang, Yili, Heidi Rodenhizer, Brendan M Rogers, Jacqueline Dean, Ridhima Singh, Tiffany Windholz, Amanda Poston, Stefano Potter, Scott Zolkos, Greg Fiske, et al. A collaborative and scalable geospatial data set for arctic retrogressive thaw slumps with data standards. *Scientific Data*, 12(1):18, 2025.

Yang, Y, H Rodenhizer, and J Dean. Arctic retrogressive thaw slumps (arts): digitisations of pan-arctic retrogressive thaw slumps, 1985-2021. Arctic Data Center, 2024. doi:10.18739/A2PK0738B.

Zhining Gu, Wenwen Li, Chia-Yu Hsu, Sizhe Wang, **Yang, Yili**, Brendan M Rogers, and Anna Liljedahl. A multi-scale vision transformer-based multimodal geoai model for mapping arctic permafrost thaw. *Available at SSRN 4762408*, 2024.

Wenwen Li, Chia-Yu Hsu, Sizhe Wang, Yezhou Yang, Hyunho Lee, Anna Liljedahl, Chandi Witharana, **Yang, Yili**, Brendan M Rogers, Samantha T Arundel, et al. Segment anything model can not segment anything: Assessing ai foundation model's generalizability in permafrost mapping. *Remote Sensing*, 16(5):797, 2024.

Heidi Rodenhizer, **Yang, Yili**, Greg Fiske, Stefano Potter, Tiffany Windholz, Andrew Mullen, Jennifer D Watts, and Brendan M Rogers. A comparison of satellite imagery sources for automated detection of retrogressive thaw slumps. *Remote Sensing*, 16(13):2361, 2024.

Yang, Yili, Heidi Rodenhizer, Brendan M Rogers, Jacqueline Dean, Ridhima Singh, Tiffany Windholz, Amanda Poston, Stefano Potter, Scott Zolkos, Greg Fiske, et al. Arts: a scalable data set for arctic retrogressive thaw slumps. In *EGU General Assembly Conference Abstracts*, page 1365, 2024.

Brendan M Rogers, Susan Natali, Robin Bronen, John P Holdren, Patricia Cochran, Kyle Andreas Arndt, Elchin E Jafarov, Melissa Shapiro, Anna Virkalla, **Yang, Yili**, et al. Permafrost pathways: Connecting

science, people, and policy to advance understanding of the local to global impacts of permafrost thaw and develop just and equitable responses. In *AGU Fall Meeting Abstracts*, volume 2023, pages B33H–233, 2023.

Yang, Yili, Brendan M Rogers, Greg Fiske, Jennifer Watts, Stefano Potter, Tiffany Windholz, Andrew Mullen, Ingmar Nitze, and Susan M Natali. Mapping retrogressive thaw slumps using deep neural networks. *Remote Sensing of Environment*, 288:113495, 2023a.

Stefano Potter, Arden Llewellyn Burrell, Anna Talucci, **Yang, Yili**, Logan T Berner, Scott J Goetz, Sander Veraverbeke, James T Randerson, Susan Natali, and Brendan M Rogers. Mapping alaskan and canadian wildfires using convolutional neural networks. In *AGU Fall Meeting Abstracts*, volume 2023, pages B31M–2252, 2023.

Stefano Potter, **Yang, Yili**, Arden Burrell, Anna Talucci, Sander Veraverbeke, James T Randerson, Scott Goetz, Logan Berner, Michelle Mack, Xanthe Walker, et al. Mapping arctic-boreal burned area in north america using a convolutional neural network with landsat and sentinel-2 imagery. *Available at SSRN 4803815*, 2024.

Heidi Rodenhizer, **Yang, Yili**, Greg Fiske, Stefano Potter, Tiffany Windholz, Andrew Mullen, Jennifer Watts, and Brendan M Rogers. Comparison of three different imagery sources for retrogressive thaw slump detection using a unet3+ deep learning model. In *AGU Fall Meeting Abstracts*, volume 2023, pages C21E–1276, 2023.

Wenwen Li, Chia-Yu Hsu, Sizhe Wang, Yezhou Yang, Anna K Liljedahl, Hyunho Lee, Chandi Witharana, **Yang, Yili**, Brendan M Rogers, Samantha T Arundel, et al. Geoai foundation models for vision: A view from ai augmented environmental mapping. *AGU23*, 2023.

Yang, Yili, Brendan M Rogers, Greg Fiske, Jennifer Watts, Stefano Potter, Tiffany Windholz, Andrew Mullen, Ingmar Nitze, and Sue Natali. Mapping retrogressive thaw slumps using satellite data with deep learning. In *EGU General Assembly Conference Abstracts*, pages EGU–1675, 2023b.

Andrew L Mullen, Jennifer D Watts, Brendan M Rogers, Mark L Carroll, Clayton D Elder, Jonas Noomah, Zachary Williams, Jordan A Caraballo-Vega, Allison Bredder, Eliza Rickenbaugh, and **others**. Using high-resolution satellite imagery and deep learning to track dynamic seasonality in small water bodies. *Geophysical Research Letters*, 50(7):e2022GL102327, 2023.

Ridhima Singh, **Yang, Yili**, and Brendan M Rogers. Mapping retrogressive thaw sumps (rts) using transformer-based neural networks. In *AGU Fall Meeting Abstracts*, volume 2022, pages C52C–0362, 2022.

Yang, Yili, Sohan Seth, Ian B Butler, and Florian Fusseis. Fast segmentation of 4d microtomography volumes from core-flooding experiments in porous rock using convolutional neural network. *Authorea Preprints*, 2022.

S Marti, F Fusseis, IB Butler, C Schlepütz, F Marone, J Gilgannon, R Kilian, and **Yang, Y**. Time-resolved grain-scale 3d imaging of hydrofracturing in halite layers induced by gypsum dehydration and pore fluid pressure buildup. *Earth and Planetary Science Letters*, 554:116679, 2021.

Sina Marti, Florian Fusseis, Ian B Butler, Christian Schlepütz, Federica Marone Welford, James Gilgannon, Rüdiger Kilian, and **Yang, Yili**. Chemical-mechanical-hydraulic coupling in deforming, dehydrating halite-gypsum rocks-implications for basal detachments in thin-skinned tectonics. In *EGU General Assembly Conference Abstracts*, page 9560, 2020.

Yang, Yili, Ian B Butler, Florian Fusseis, Rink van Dijke, Sebastian Geiger, and Xianghui Xiao. Immiscible fluid displacement and trapping during a drainage-imbibition cycle in porous carbonate rock imaged by synchrotron x-ray micro-tomography. In *AGU Fall Meeting Abstracts*, volume 2018, pages H41E–08, 2018.

RESEARCH FUNDINGS

Funding for Climate Solutions: A Generic Climate AI Framework for Multi-domain Time Series Prediction, Woodwell Climate Research Center, $99,749

Overall Objectives: This project will attempt to develop a generic climate AI framework that will unify and accelerate time-series inferences across Woodwell Climate Research Center's diverse research domains, from Arctic carbon fluxes to tropical forest dynamics.

Pending/ongoing funding applications with NASA, NSF, Google.org and the Bezos Foundation

PARTICIPATED RESEARCH INITIATIVES

Permafrost Discovery Gateways Funded by Google.org and NSF, the Gateway is making information of permafrost conditions available throughout the Arctic by providing access to big geospatial products and tools to allow exploration and discovery for researchers, educators, and the public at large. This includes providing automated monthly monitoring of permafrost thaw during the snow-free season from satellite imagery.

Permafrost Pathways Funded through the TED Audacious Project — a collaborative funding initiative catalyzing big, bold solutions to the world's most urgent challenges. Through a joint effort between Woodwell Climate Research Center, the Arctic Initiative at Harvard Kennedy School, and the Alaska Institute for Justice, Permafrost Pathways brings together leading experts in climate science, policy action, and environmental justice to inform and develop adaptation and mitigation strategies to address permafrost thaw.

GeoAI Challenge Cooperate with the Cyberinfrastructure and Computational Intelligence Lab at the Arizona State University to host an AI challenge using remote sensing imagery to detect permafrost thaw.

ACADEMIC SERVICES, PRESENTATIONS AND TALKS

- Peer-reviewed 5 manuscripts 2022-2025
- Invited webinar at the Royal Meteorological Society: Machine Learning for Atmospheric Sciences: Values and Controversies, UK 2022
- Invited panel talk at the Esri UC Spatial Analytics Summit, US 2024
- Invited talk at the Cyber2A Workshop, US 2024
- European Geophysical Union Annual Conference, EU 2022, 2023, 2024
- Google Geo-for-Good Conference, US 2022, 2023
- Tri-Polar Remote Sensing Conference, China 2023, 2024
- American Geophysical Union annual conference, US 2018
- RTSInTrain Workshop, EU 2023

- NASA Arctic-Boreal Vulnerability Experiment workshop, US 2022
- Invited Permafrost Discovery Gateway Webinar 2022