Owen Smith

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Brief

Research Software & Data Engineer passionate about open source software with 5+ years of software development to support scientific computing and geospatial applications. Highly experienced in developing performant high throughput data systems and algorithms (`Python`, `C`, `R`, `C++`, `Julia`) for research teams and development for High Performance Computing clusters and cloud services using modern cloud-native specifications, formats, and best practices. My active research is focused on enabling global scale remote sensing analysis through adaptive resolution data structures.

Education

North Carolina State University

Ph.D. in Geospatial Analytics — *2021 - Current*

- Advisor: Josh M. Gray

University of North Georgia

B.S. in Environmental & Spatial Analysis — *2017 - 2021*

- Advisor: Huidae Cho

Experience

Spatial Ecosystem Analytics Lab - NC State University — *Raleigh, NC*

Research Assistant / Software Engineer — *Aug 2021 - Current*

- Develop computationally intensive Bayesian Land Surface Phenology algorithm in C with bindings for R, Python, and Julia.
- Member of the cross disciplinary Accenture Federal team working on the Intelligence Advanced Research Projects Activity (IARPA) Space-based Machine Automated Recognition Technique (SMART) program.
- Developed and implemented algorithms for high throughput multi-source data cube ingestion from STAC and global-scale change detection on AWS.
- Containerized online Bayesian algorithms for change detection with Apache Airflow and created operational dashboards for result assessment.
- Transitioned numerically expensive research code from Python and R to distributed code in C++, in a 94% reduction in memory, 98.7% reduction in time, and a 57% reduction in production cost.
- Contributed to TileDB Python library for bug fixes improving NumPy API.
- Advised and supported peers on programming best practices, efficient processing of big-data, and cloud native remote sensing data models.

NASA Develop — *Athens, GA*

Applied Scientist Intern — *Jan 2021 - May 2021*

- Collaborated to create a Google Earth Engine application to monitor crop phenology to support crop diversification & insurance programs in the midwestern United States.
- Utilized methods for fusing multi-source optical data and validation with *in situ* field level data.
- Partnered with the Practical Farmers of Iowa organization to gather field level data spanning multiple years for validation.

GIS Lab - University of North Georgia — *Oakwood, GA*

Undergraduate Research Assistant — *Aug 2019 - Aug 2021*

- Developed ProjPicker, a Python library for reverse projection querying built ontop of PROJ8.
- Contributed to both core GRASS GIS development and GRASS addons.
- Created a pipeline for the classification & quantification of tree canopy change for the entirety of the state of Georgia utilizing NAIP imagery from 2009-2019 for the Georgia Forestry Commission.
- Tutor for Geospatial Programming class.

Skills

Programming Language — **multilingual** (not limited to any specific language), especially experienced with `Python`, `R`, `C`, `C++` and comfortable with `Julia`, `JavaScript`, `HTML/CSS`

Misc. — UN*X, Spatial Statistics, Bayesian Modeling, Scientific Stack (NumPy, scikit, XArray, etc.), Parallel Computing (language/framework agnostic), Cloud Native Formats (Zarr, COG, etc), Shell Scripting, LaTeX, GDAL, PROJ, STAC, Docker, AWS, Vagrant, Git, TileDB, Figma, Airflow, Leaflet, Flask, SQLite, Postgres

Publications

- Rasmussen, P., Abrahamson, J., Tang, X., **Smith, O.**, Gray, J., Woodcock, C., & Bosch, M. (2023, July). Assessment of Performance of Tree-Based Algorithms to Reduce Errors of Omisssion and Commission in Change Detection. In *IGARSS 2023-2023 IEEE International Geoscience and Remote Sensing Symposium* (pp. 6676-6679). IEEE.
- **Smith, O.**, & Cho, H. (2021). An Open-Source Canopy Classification System Using Machine-Learning Techniques Within a Python Framework. *The International Archives of Photogrammetry, Remote Sensing and Spatial Information Sciences, 46*, 175-182.

Conference Presentations

- **Smith, O.**, Gao, X., & Gray, J. (2024). Overcoming Big Data Challenges in Satellite Observation: A Variable Resolution Scheme for Modeling Land Surface Phenology (No. EGU24-12119). Copernicus Meetings 2024. (oral presentation)
- **Smith, O.**, & Gray, J. (2023), Optimizing spatiotemporal remote sensing data structures: a case study with Bayesian land surface phenology *Fall Meeting of the American Geophysical Union, Dec 11-15, San Francisco, CA.* (poster)
- **Smith, O.**, & Gray, J. (2022), An Adaptive Spatiotemporal Approach for Monitoring Change At Scale with Planet Imagery, *Fall Meeting of the American Geophysical Union, Dec 12-16, Chicago, IL.* (poster)
- **Smith, O.**, & Cho, H. (2021). An Open-Source Canopy Classification System Using Machine-Learning Techniques Within a Python Framework. *Free and Open Source Software for Geospatial (FOSS4G) 2021 Conference. The Open Source Geospatial Foundation (OSGeo), Online.* (oral presentation)
- Landry, O., Bhajan, L., Altun, O. C., & **Smith, O.** Enabling Crop Diversification Practices in Midwestern Farmlands with Climatic and Ground-Based Agricultural Data. *ASPRS 2021 Annual Conference.* (oral presentation)

Projects & Packages

See GitHub for all

BLSP (Bayesian land surface phenology) R package

Co-developer

- Set up GitHub actions for automated code testing
- Dockerized model for development and usage

BLSP-C

Developer

- Linearized MCMC algorithm for BLSP written in C with GSL
- In progress interfaces for R, Python, and Julia

ProjPicker

Co-developer

- Co developed the ProjPicker python library for reverse project querying
- CLI, web application & desktop GUI with OSM, packaging for pip

CanoClass

Developer

- Developed CanoClass as a Python library for efficiently classifying tree canopy from NAIP imagery built on top of scikit-learn
- Presented work at the 2021 annual FOSS4G conference

GRASS GIS

Contributor

- Ongoing work in upstreaming ProjPicker to be default method of projection selection for GRASS
- Developed **i.gabor** module for generating gabor filter banks on remote sensing data
- General maintenance and clean up for core library

Professional Service

Invited Speaker

Felt - Satellite Imagery Webinar *Sept. 2023*

Topic: How Felt aids remote sensing research

Speaker

Center for Geospatial Analytics Lunch & Learn Series *Nov. 2022*

Topic: Introduction to processing remote sensing in the cloud

Invited Talk

Accenture Federal Services Computer Vision: COI Seminar Series. *Jun. 2022*

Topic: Computer vision methods for environmental remote sensing