GEOSPATIAL EVALUATION AND OBSERVATION LAB

ANNUAL REPORT

JAN 2022 - DEC 2022

GEOLAB.WM.EDU

a new lab director

A RETROSPECTIVE & LOOK FORWARD

I started working at the geoLab in the Fall of 2021, my sophomore year. Before that, I had never taken a programming class, had no idea what GIS was, and had stepped in the ISC a total of two times. I, much like Olivia, stumbled upon the geoLab by chance. When I arrived, starting on what was then known as geoData, I was shocked by the cool things the people on my team were making, able to do stuff like model migration flows and predict covid outbreaks. I simply had no idea students had these skills and were capable of doing these kinds of things. I was inspired by them, and and ended up changing my major so I could make cool things too. Eventually, through just existing in the quiet lab, I started to get to know people and eventually made a lot of close friends. I am thrilled that I now have the chance to make the geoLab an even bigger part of my life and help the lab evolve. Even though there will be an Olivia shaped hole in my heart, I am excited for what this new year brings.

Until next year,

Grace Morales

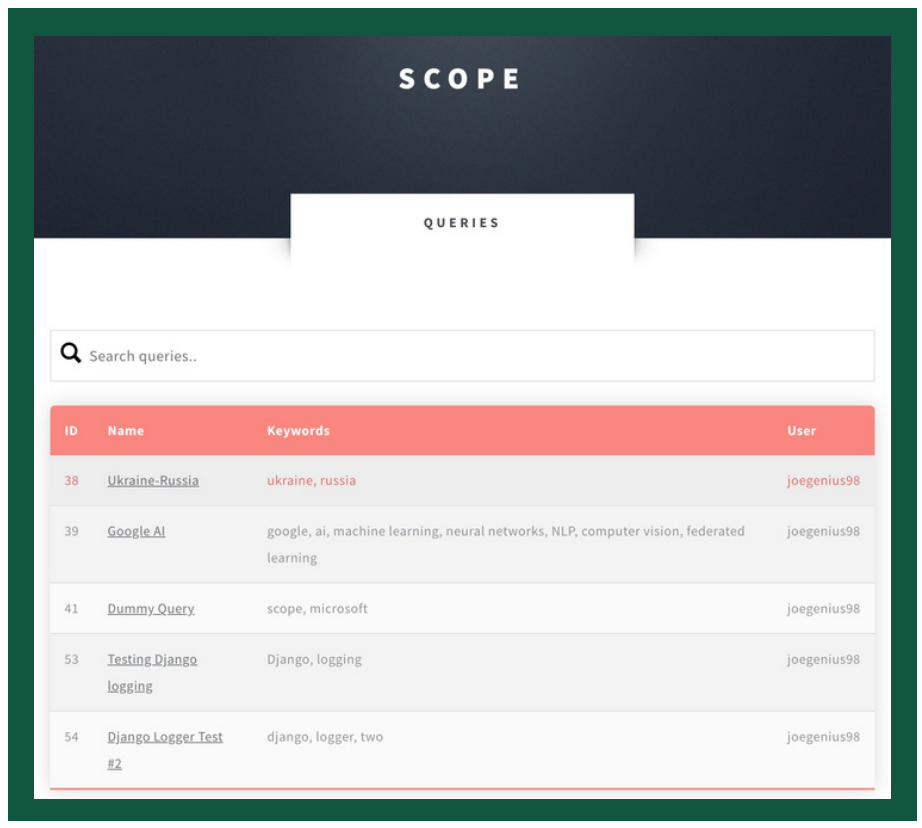
The geoLab has been my most significant experience at William & Mary. I have made some of my best friends (almost all, to be honest), worked on interesting problems, and had the absolute pleasure of helping build this community with my friends. I hope everyone who has passed through our corners of the ISC has gained experiences that both augment current interests and broaden horizons of personal possibility. I walked into the geoLab when I was 18 (thank you Matt and Rachel for taking a chance on me), and I am leaving an infinitely better version of myself. The geoLab gave me the confidence to seek technical education, the space to fall and get back up, and the runway to engineer and implement new ideas. I am incredibly excited for the geoLab's new leadership and endeavors—I know you will grow with each iteration, time and time again.

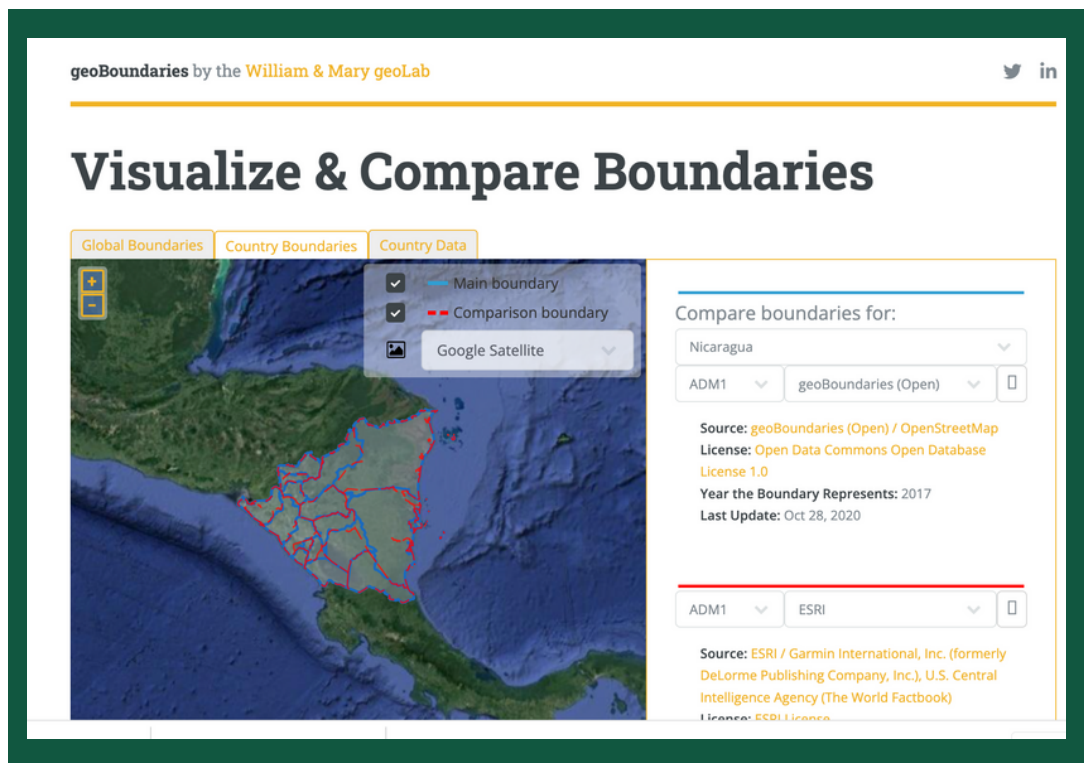
Sincerely,

Olivia Hettinger

HIGHLIGHTS

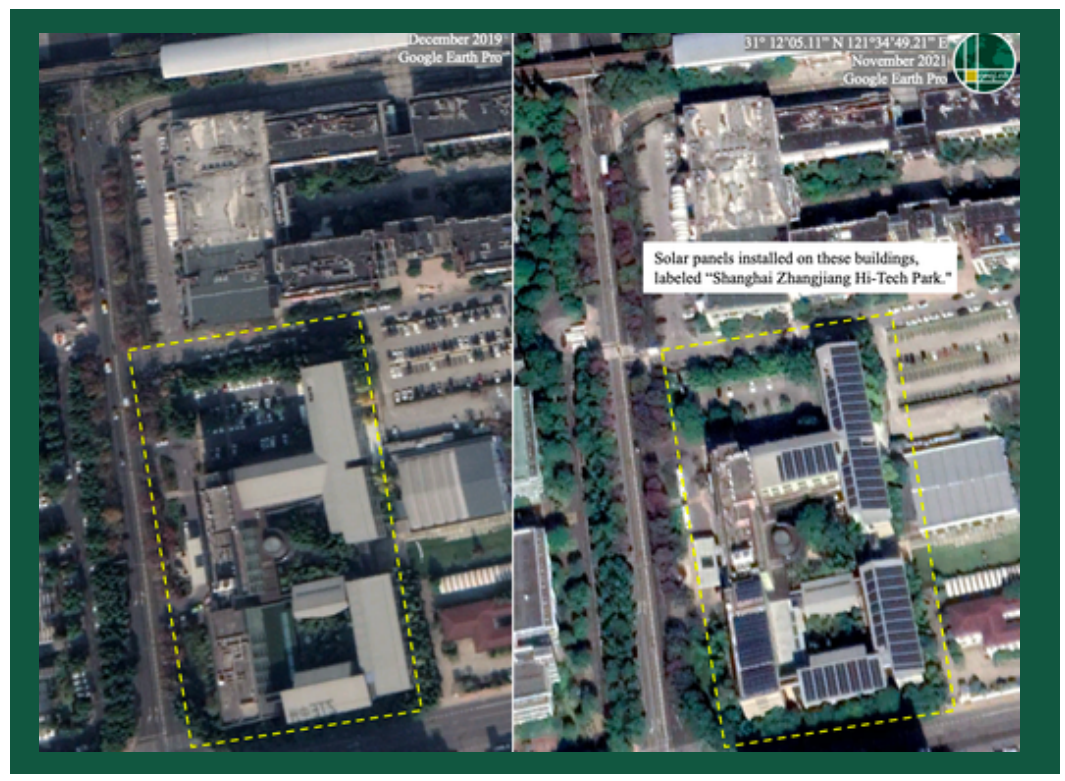
geoDev has been working on SCOPE (formerly, an acronym for "Scientific Collection of Policy Evidence" but now just taken as the word "scope"), a tool to facilitate international development/relations research for other geoLab teams. Scope is a website where users can search for any topic that has been on the news recently and can get extracted summaries of important information efficiently. So far, geoDev has messed around with A.I. PDF text extraction/summarization capabilities, created a sleek user interface, and created programming scripts to pull from Twitter and GDELT, a huge repository of news articles. geoDev is close to a minimum viable product for other teams to test and give feedback!

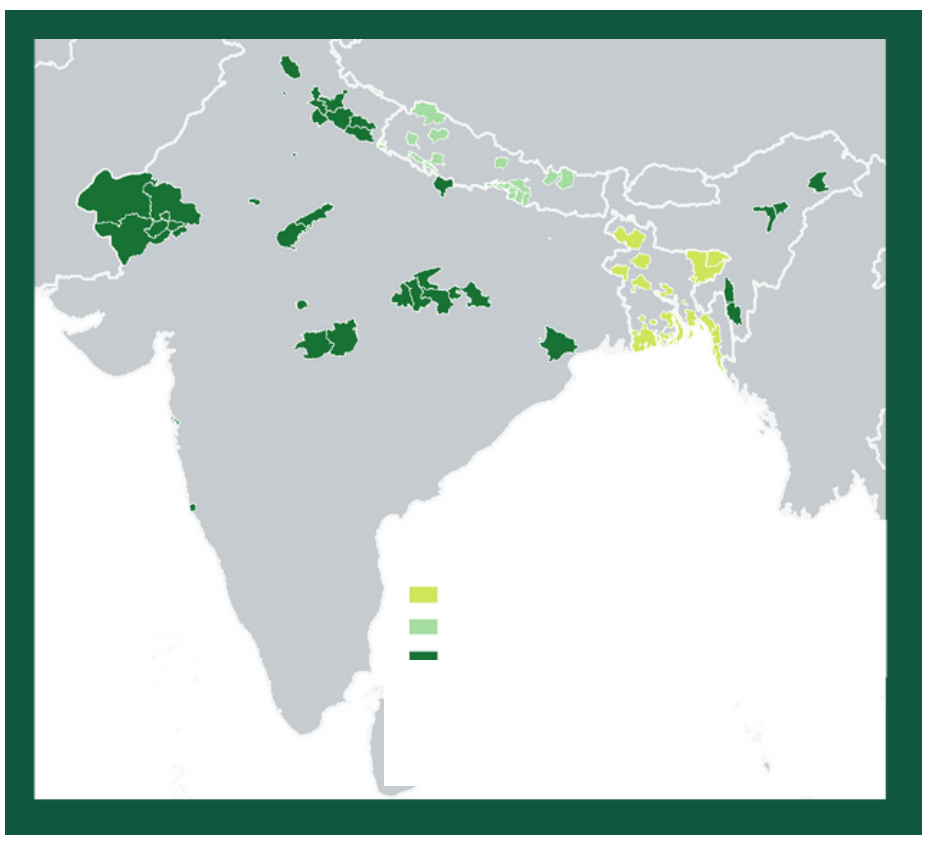




The **geoBoundaries** team has continued to collect boundaries during 2022. The year ended with the introduction of GeoBoundaries 5.0, over 10 thousands unique users on the main website, and with geoBoundaries being one of the most downloaded datasets on all of HDX / Humdata. It was also featured on DataisPlural and syndicated on 538! Looking forward to next year, it's likely 6.0 is going to bring some very large changes to the database, including the final (years later!) handshake between the raster datasets geoData started collections on years ago.

This past year, the **GeoParsing** team has primarily been continuing our work using satellite imagery and open-source intelligence to produce papers dealing with significant questions on the international stage. We have pursued work documenting the environmental impact of the war on Ukraine, publishing a paper last Spring and adding hyperspectal analysis this semester to understand what is happening on the ground both though a lens of petroleum and coal. Additionally, we have been researching the impact of the Taliban takeover on the future of dams in Afghanistan. These activities are being studied in partnership with the National Geospatial-Intelligence Agency and have allowed a geoParsing's research focus to grow.





This year, the **geoAnalytics** team has worked primarily on building the database for the Global Education Observatory (GEO) and our partnerships with Nuru International and the Global Environment Facility. This summer, five of our researchers worked at the World Bank offices in Washington, D.C., using machine learning techniques to evaluate socioeconomic co-benefits arising from funded environmental interventions. This work was used to inform the UN Council's assessment of the environmental impacts of the COVID-19 pandemic and will hopefully be published as a book in the coming year. The GEO team has been analyzing data trends, writing blog posts, and building their database and website for release to the public in the spring semester. The Nuru team has been working to analyze the productivity of small stakeholder farms in Subsaharan Africa and hopes to continue their analysis through the spring.

GEOLAB GRADUATES

Keeping Track of What Everyone Does Next

Caroline Morin
MITRE

Sean Murphy
Altamira

Jason Lin
Capital One

Laura Mills
University of Cambridge

Dorian Miller
Esri

Elias Wolman
Fulbright Scholar

Asha Silva
KPMG

Cole Spiller
Krach Institute

Calvin Bertoncini
JP Morgan

Kerry Wang
Texas Instruments

John Hennin
West Monroe

Tina Chen
Google

Michael Foster
Princeton Consultants

Minkyong Song
Gap year

Sidonie Horn
Cornerstone Research

Mikayla Williams
W&M MSBA

Yiwen Sun
Cornell University

Charlie Altman
National Grid

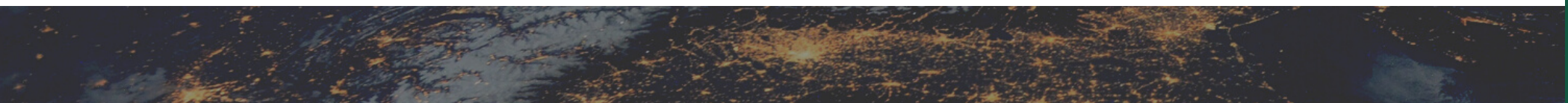
Remington Fritz
Systems Planning & Analysis

Maeve Naughton-Rockwell
Chile

Landon Clime
US Coast Guard Civilian

Linda Ma
Weill Cornell Medicine

William Weston
Bridge Investment Group



LAB TEAM MEMBERS

Acknowledging all of the contributions that make the geoLab go, these are all of the students currently in the lab (Fall '22).

geoBoundaries

Lydia Troup (Team Lead)
Hadley Day
Dominic Fornatora (Technical Lead)
Michael Roth
Kristina Pupkiewicz
Tara McLaughlin
Amanda Reed (Technical Lead)
Victor Gedeck
Jing Li
Krista Tao
Saranga Bansal
Jessica Hobart

geoData

Joe O'Brien (Team Lead)
Caroline Edwards (Technical Lead)
Olivia Wachob
Jane Siwek (GEO Lead)
Naomi Levin
Niraj Patel
Becca Gurysh
Kaitlyn Crowley (Technical Lead)
Courtney Maynard
Annamarie Warnke
Russell Biddle
Selwyn Heminway
Shaun Mathew
Kaitlyn Wilson

geoDev

Joseph S. Lee (Team Lead)
Robert West (Technical Lead)
Jeremy Swack
Megan Sierzega
Dev Saxena (Technical Lead)
Isabella Wu
Lena Zheng
Sihan (Michelle) Zhou
Taylor Liegel
Samira Rahman

Lab Support Staff

Olivia Hettinger (Outgoing Director)
Grace Morales (Incoming Director)

geoParsing

Erin Horrigan (Team Lead)
Garrison Goetsch (Project Lead)
Aliia Woodworth (Technical Lead)
Sophie Pittaluga
Zoe Roberts
Yasha Barth (Project Lead)
Sebastian Zeldon
Charles Pritz (Project Lead)
Catherine Cable
Anna Glass (Technical Lead)
Carolina Rivera
Daniella Marx
Laina Lomont
Alyson Reynolds
Lilly Doninger

GeoFormal was so much fun this year! Someone put too much salt on the fries though.

Publications, Presentations, News and Datasets

- Runfola, D., **Baier, H., Mills, L., Naughton-Rockwell, M.**, Stefanidis, A. 2022. Deep Learning Fusion of Satellite and Social Information to Estimate Human Migratory Flows. Transactions in GIS. http://doi.org/10.1111/tgis.12953
- **Brewer, E., Lin, J.**, Runfola, D. 2022. Susceptibility & defense of satellite image-trained convolutional networks to backdoor attacks. Information Sciences. https://doi.org/10.1016/j.ins.2022.05.004
- **Lv, Z.,** Nunez, K., **Brewer, E.,** Runfola, D. Accepted 2022. pyShore: A deep learning toolkit for shoreline structure mapping with high-resolution orthographic imagery and convolutional neural networks. Computers & Geosciences. https://doi.org/10.1016/j.cageo.2022.105296
- **FiveThirtyEight (Data is Plural),** 2022. The Datasets We're Looking At This Week (geoBoundaries)**.**
- ***Tearline.mil Articles,*** *2022*
  - Marx, A., Morin, C., Spiller, C., Barth, Y., Woodworth, A., Cable, C., Rivera, C., *Environmental EFfect of Coal Mine Deterioration in Eastern Ukraine*
  - Morin, C., Pittaluga, S., Pritz, C., Glass, A., Lomont, L., Zheng, L. *Made in China 2025 and Shanghai's Zhangjiang High-tech Industrial Park*
  - Roberts, Z., Goetsch, G., Wilson, K., Fritz, R., Altman, C.. *Made in China 2025 and the Shenzhen High-tech Industrial Park*
  - Brewer, E. *Tracking the Industrial Frowth of Modern China with High-resolution Panchromatic Imagery and Deep Learning*

Summer '22 Internship Destinations

Esri, Amazon, Global Environmental Facility, Credit Suisse, Girls Who Code, The Washington Post, Systems Planning and Analysis, GRI Summer Fellowship, US Army Corps of Engineers, US Army War College, Institute for the Study of War, Naval Surface Warfare Center, ANSA-EAP, CSC, University of Pittsburg, Harvey-Mudd College, Rock the Vote, Semilla Nueva, American Bosnian COALITION, Emojent, Southern Bank and Trust Company, American Councils for International Education, Pangea Chat, Georgian Strategic Analysis Center

Notable Accomplishments & Awards, 2022

Fulbright Scholarship, Carr Cup, Selby-Corey Prize for Academic Excellence in Economics Award, Phi Beta Kappa, Houston Accordion Orchestra Retreat 2023 Youth Scholarship, RPSS Tepper Scholarship, Diversity Champions Award, Charles Center Honors Fellow

~~Double~~ Triple Platinum Level Donors (>0.01 USD)

Thanks to all of our donors - ya'll make fun things like T-Shirts & stickers possible.
Ann Marie Stock, Heather ('20), John ('20), Josh ('20), Jack ('19), Olivia ('23), other Olivia ('23), and many Anonymous Donors!

THE WALL OF FAME

Caption Contest
Dan copies Olivia because she is just that magnetic. - Olivia
Preparing to rob a 7-11 - Dan

> The geoLab works to build a more secure, sustainable and vibrant world through AI, machine learning, and geospatial data. Somewhere along the way we got distracted and also started disrupting how education happens at William and Mary. Learn more about us or give to the lab by visiting geolab.wm.edu.