

# GEOSPATIAL EVALUATION AND OBSERVATION LAB

## ANNUAL REPORT

JAN 2019 - DEC 2019

[GEOLAB.WM.EDU](http://GEOLAB.WM.EDU)

*a year's overview*

# GEOLAB IN 2019

This year's annual report illustrates the growth and maturity of the geoLab - from a scrappy upstart 2 years ago to the multi-team graduate and undergraduate research group it is today. The breadth and depth of our institutional partnerships are constantly growing - multiple federal entities, NGOs, multilateral institutions, and other academic research groups are now engaged in formal and informal collaborations with students in the lab, as you'll get to read more about here. We have grown into two lab spaces on campus (though I do think the "beanbag lab" is the preferred option!), and we had multiple peer reviewed and policy reports published with student co-authors. We also established our new website ([geolab.wm.edu](http://geolab.wm.edu)), vision, and logo that has all the right W&M colors. This year we also saw two of our founding members graduate on to amazing new careers - Rachel Oberman (Lab Director) and Lauren Hobbs (Geoboundaries Lead); we're now up to 13 (!) geoFellows to help us pick up the ludicrous number of things they did to make the lab amazing.

I'm very excited to see what 2020 brings. Our burgeoning work on Convolutional Neural Networks in the context of roads and schools may revolutionize our data production pipelines. We'll be sending students to at least 3 different organizations for summer internships. Version 2.0 of Geoboundaries will be released, alongside the first geoData and geoParsing releases. I'm also very excited to see the mark our new Lab Lead - Olivia Hettinger - makes on the geoLab; who knows if the Dinosaur and Corgi reign will come to an end?

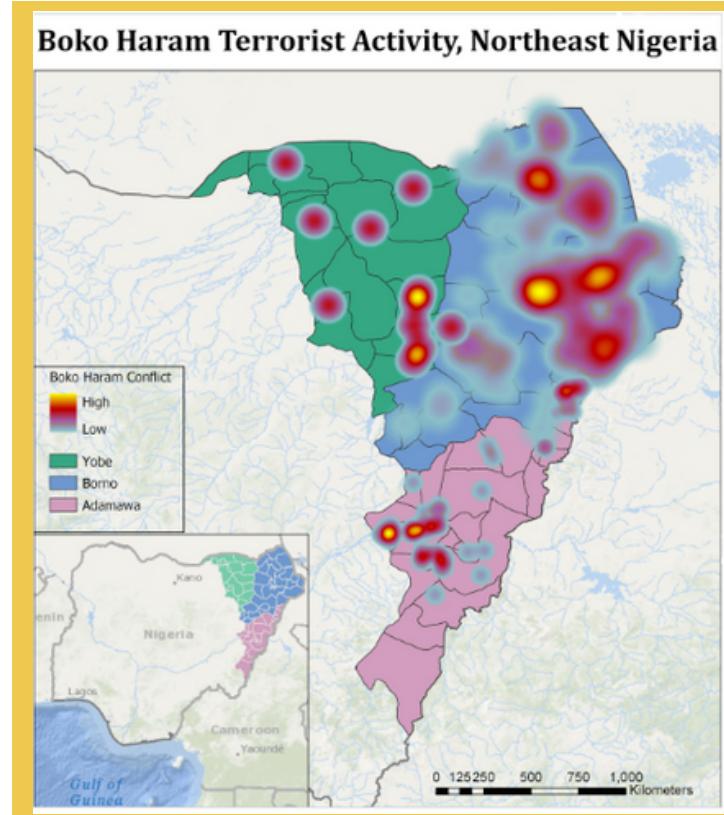
Onward to 2020,



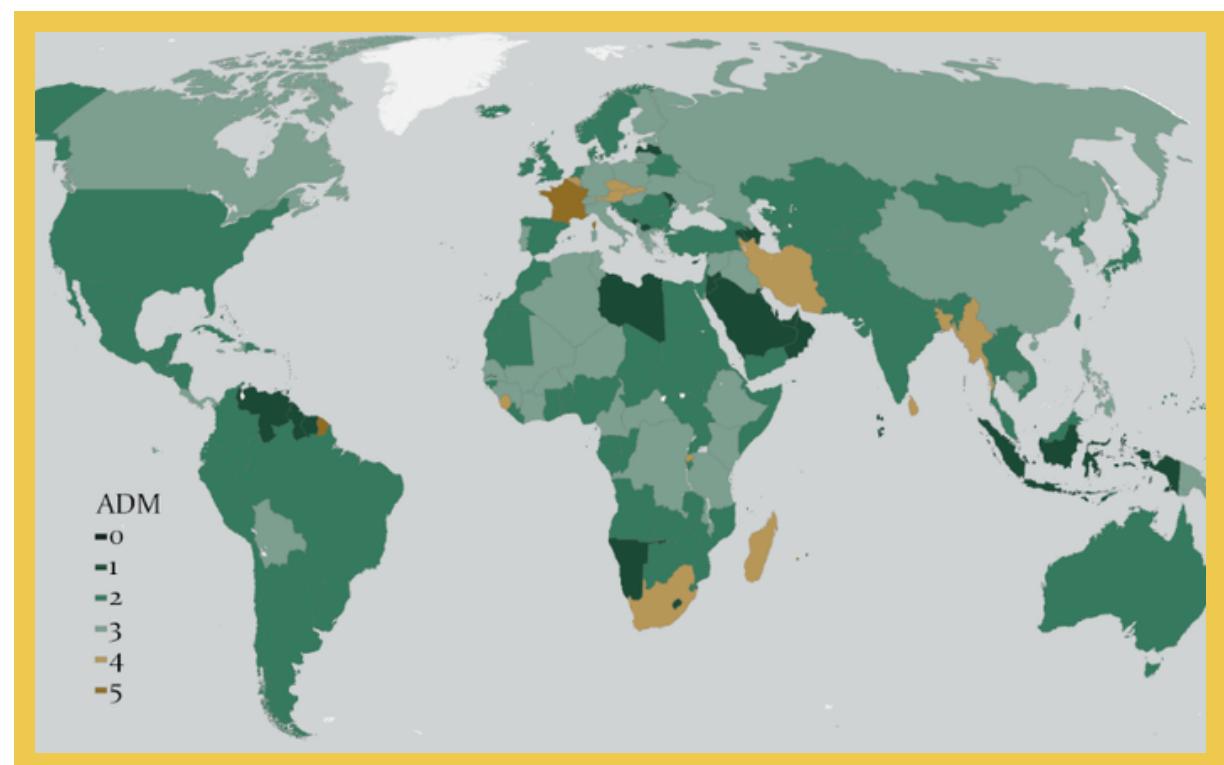
Dan Runfola



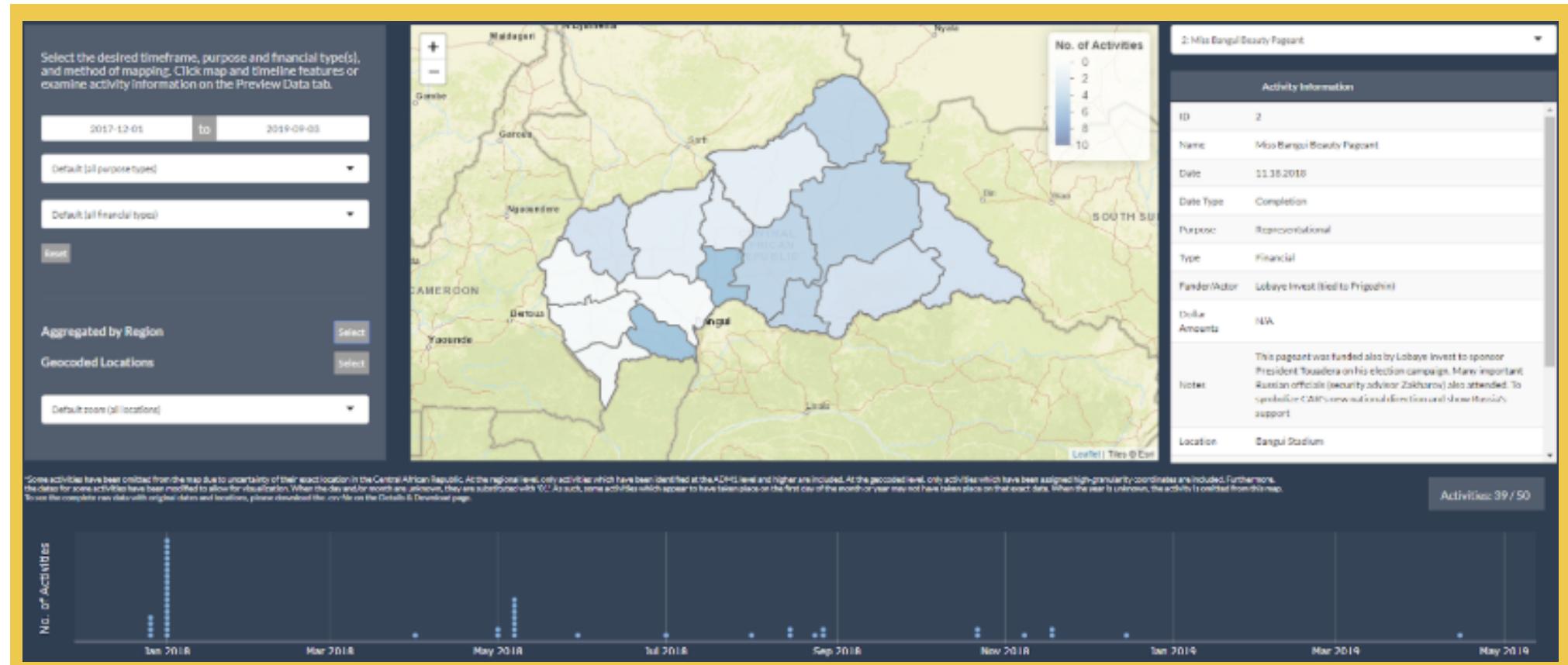
The **geoData** team worked with NGO partners to use satellite data to examine the relationship between crops and conflict in NE Nigeria - this data is being used in decisionmaking today.



The **geoDev** team has implemented a novel set of programs to (1) collect road roughness data with cellphone-based applications, and (2) model it with a Convolutional Neural Networks. This analysis will provide a mechanism to estimate road quality in inaccessible regions of the world. Real-world tests are underway around the Williamsburg area this winter - if you see someone with a cellphone duct-taped to their roof, you now know why.



The **geoBoundaries** team has completed initial data collection and pre-processing for the geoBoundaries 2.0 release, expected during or near winter break. Once released, geoBoundaries 2.0 will be the single largest, public and open license data source on administrative boundaries ever collected.



The **geoParsing** team launched its prototype data exploration tool - TRACAR, which will be the basis for the teams first full data releases in Spring '20. We have also undertaken a new partnership which allows William and Mary students to request the tasking of high resolution imagery acquisition satellites - just like the movies, except it takes a month instead of 15 seconds.

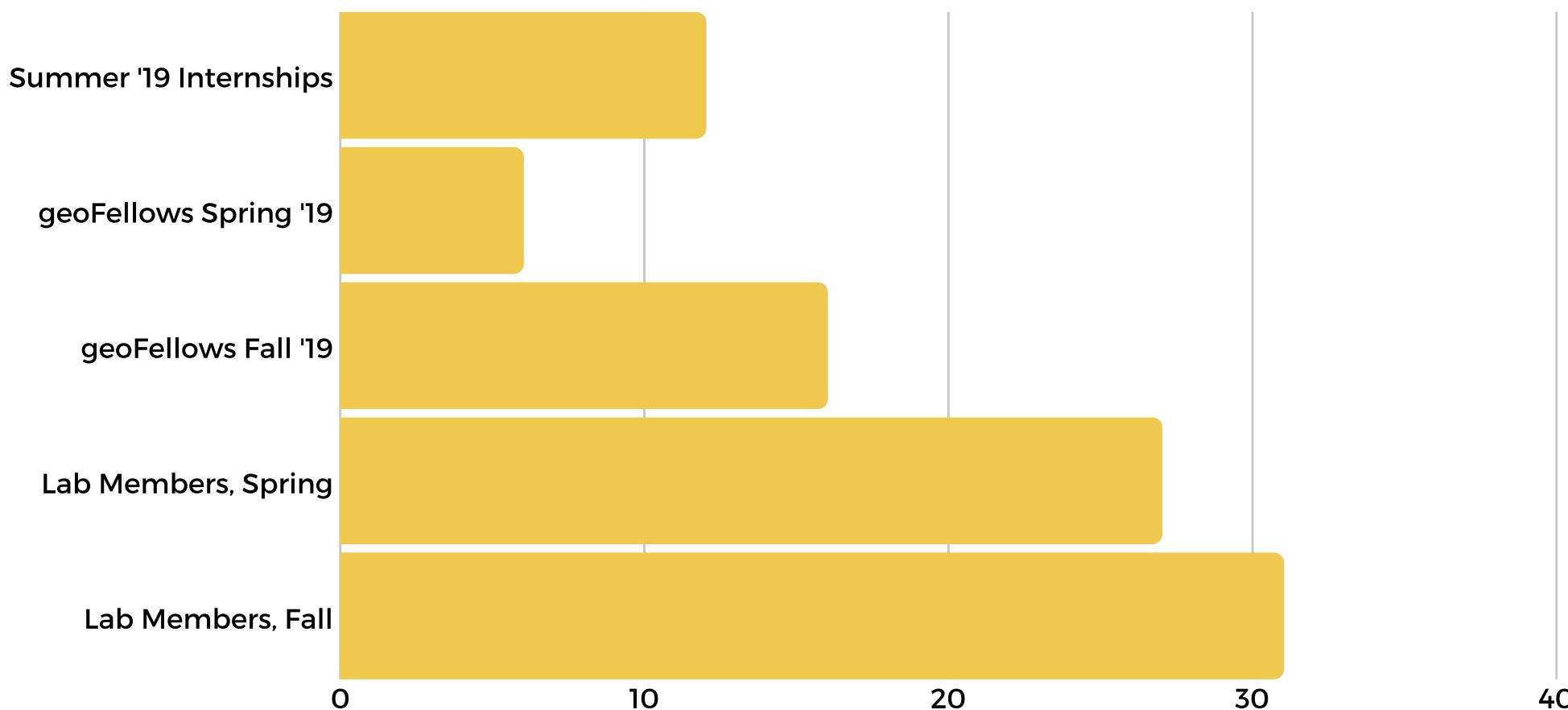
# NUMBERS & STATISTICS

We continue to grow as a lab - now approaching 31 members, with plans to grow again in Spring '20! With the goal of ensuring that our lab culture isn't harmed by growth, we're keeping a close eye on retention. So far, so good - as of Fall '19, every student that was a member of the lab in Spring '19 is still a member in Fall '19. Except those darn graduating seniors.

**PERFECT!**  
*student retention rate*

**31**

*lab members, Fall '19*



## A SPECIAL FAREWELL

This year marks the first time a geoLab director - Rachel Oberman - will be graduating. To put into perspective just how integral to the lab's success Rachel has been, I wanted to spend a moment highlighting how far we've come during her tenure. Since Rachel joined as lab director in Fall of 2016, the geoLab has:

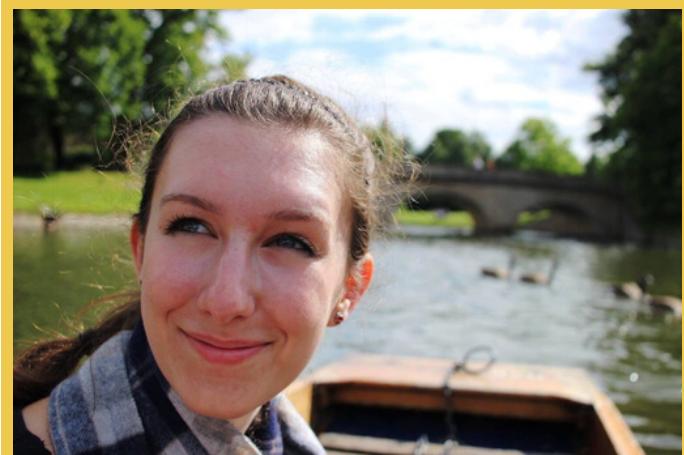
- Grown from 2 to 31 lab members
- Created 4 geoTeams
- Expanded into two lab spaces in ISC.
- Created the geoFellows program
- Published over 15 peer-reviewed articles
- Adopted a strong culture of inclusion and diversity within a STEM oriented lab.

Rachel's presence will be tremendously missed in the lab, and we all hope her party parrots will continue to grace us periodically in Slack :).



# GEOLAB GRADUATES

Keeping Track of What Everyone Does Next



**Lauren Hobbs**

Doing awesome ML at Deloitte.



**Graham Melville**

Sailing the Seven Seas.  
Literally.



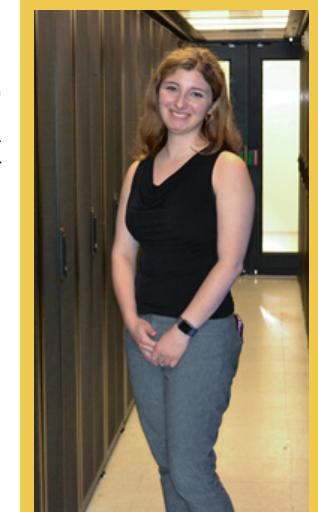
**Grace Grimsley**

Joined the federal  
government, now doing  
things cooler than all of us  
combined.



**Rebecca Youngerman**

Decided a public ivy wasn't cool  
enough, and headed to Harvard  
for graduate school.



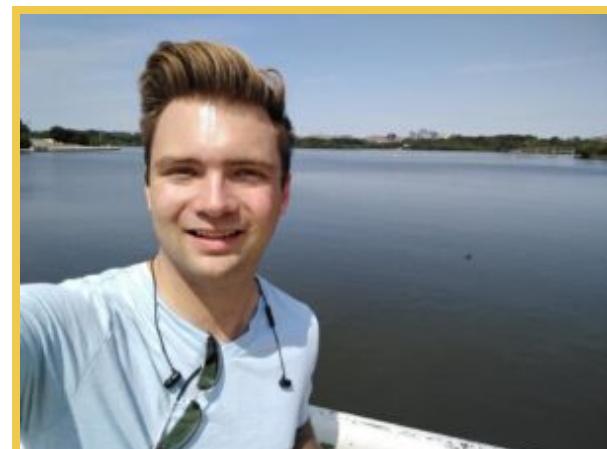
**Rachel Oberman**

Our intrepid lab  
leader for the past  
3 years is headed  
to work at Intel!



**Rachel Layko**

Headed right next door to  
become a CGA Fellow @ WM!



**Jack Bowden**

Graduated to receive a software  
engineering position at ADP.

**100%**

The geoLab aims to have 100% of its students employed in a field they love post-graduation; we work towards this goal by involving students in applied projects with external practitioners. Have a good project and want to collaborate? Email us: danr@wm.edu.

# LAB TEAM MEMBERS

**Acknowledging all of the contributions that make the geoLab go, these are all of the students currently in the lab (Fall '19).**

## GeoParsing

Matt Crittenden (Senior Program Manager)  
 Greyson Pettus (BRIGHT Project Manager)  
 Kate Munkacsy (Tech. Innovation Prog. Man.)  
 Celia Metzger (TRACAR Project Manager)  
 Monica Alicea  
 Monica Sandu  
 Victoria Haver  
 Emily Maison



## GeoData

John Napoli (Team Lead)  
 Coyote Farrell (Shadow Lead)  
 Laura Opsahl-Ong  
 Audrey Way  
 Austin Anderson  
 Lara Maluf-Mas  
 Heather Baier



(Center) Rachel and Lauren pose for a W&M recruitment ad.  
 (Left) John contemplates  
 (Right) Matt tests the structural strength of William and Mary's infrastructure.

## GeoBoundaries

Josh Panganiban (Managing Director)  
 Sydney Fuhrig (Director)  
 Sylvia Shea (Director)  
 Austin Anderson  
 Andrew Peck  
 Hannah Slevin  
 Elizabeth Dowker  
 Maddy Mulder



President Rowe meeting with Josh, Lauren and Rachel during the Spring of 2019.

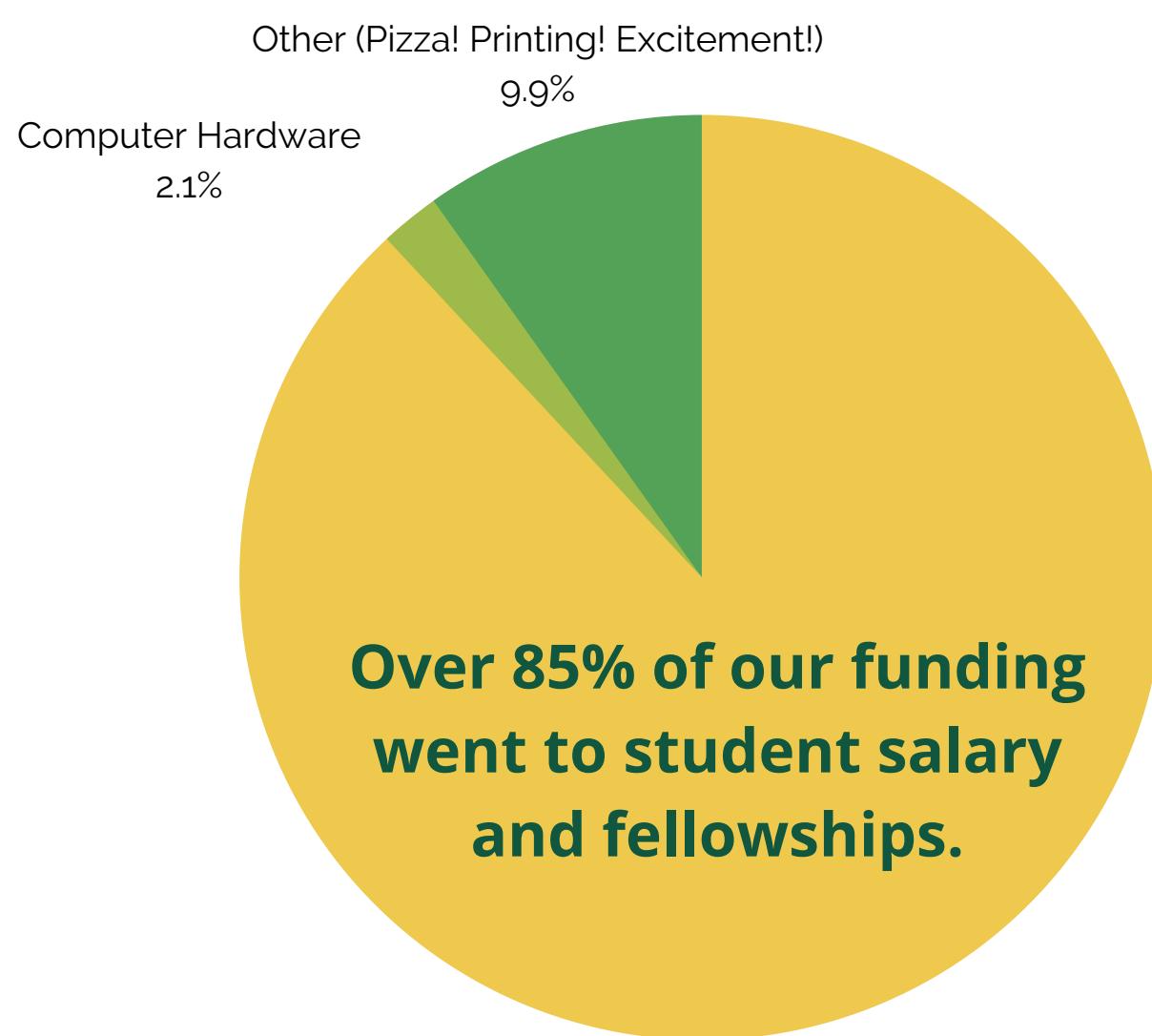
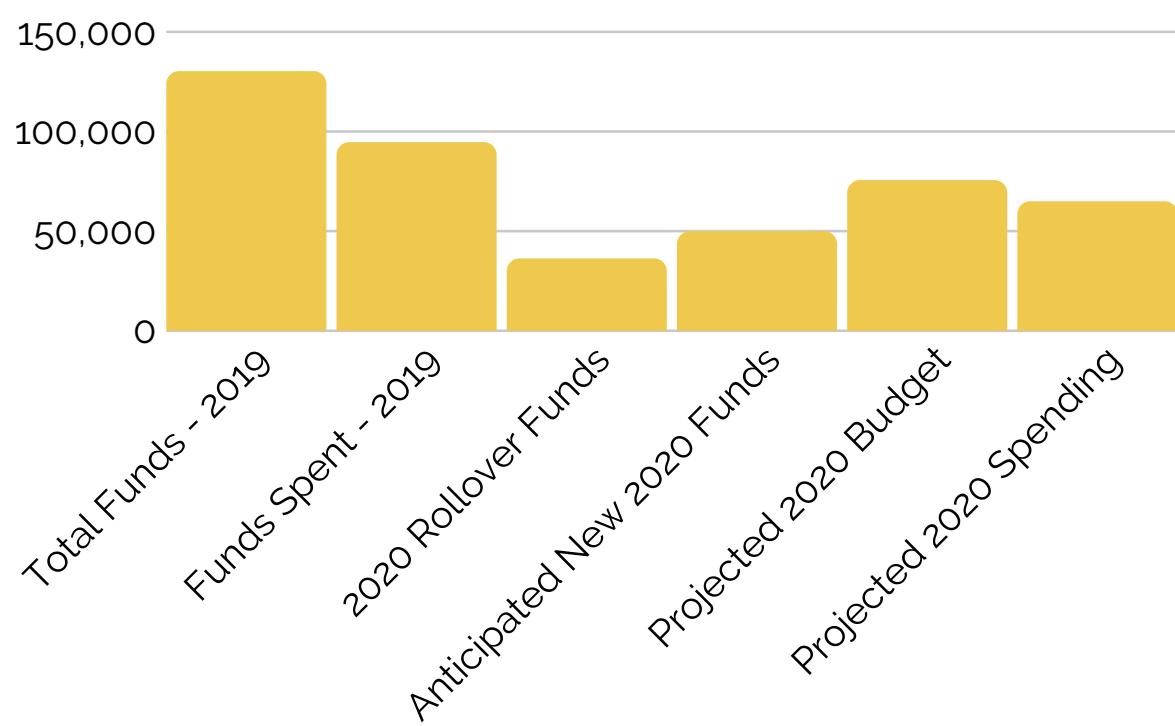
## GeoDev

Grace Lee (Team Lead)  
 Chengzhuo Nolan Ma  
 Jason Lin  
 Nicolas LaGamma  
 Yaw Ofori-Addae  
 Eric Nubbe

## Lab Director

Rachel Oberman (Spring / Fall '19)  
 Olivia Hettinger (Incoming Spring '20)

Finals can be stressful - we use it as an excuse to bring the lab together. Puppies and toddlers included.



The geoLab is only possible due to the support of a wide range of partners - both institutionally at William and Mary as well as from the broader research and donor community. Here, we provide details as to the sources of our funds, how they are spent, and projections for the next year (2020).

## Funding & Gifts

We would like to thank each of our partners and colleagues for their contributions to the lab:

- Cloudera Foundation, for their ongoing support of the geoBoundaries project for integration into GeoQuery.
- The Jeffress Medical Trust, for their ongoing support of undergraduate data collection and analysis using machine learning techniques.
- William & Mary, including the Charles Center, Office of the Provost, and Dean for Graduate Studies.
- Our graduating seniors - your class gifts will make it much easier to buy Pizza!

## THE BUDGET

An annual breakdown of all of the funds going in and out of the geoLab. Want your name on the hall of fame? Click "Give to the geoLab" on the left of our website - [geolab.wm.edu](http://geolab.wm.edu) !

\*Note: These numbers are "Dan's best estimate based on a spreadsheet he made", which is probably pretty good, but should not be used as a basis for anything serious, ever. Not including indirects.

## Publications, Presentations, News and Datasets

- Goodman, S., BenYishay, A., Lv, Z., Runfola, D., 2019. GeoQuery: Integrating HPC systems and public web-based geospatial data tools. Computers and Geosciences.
- Marty, R., Goodman, S., LeFew, M., Dolan, C., BenYishay, A., Runfola, D. 2019. Assessing the Causal Impact of Chinese Aid on Vegetative Land Cover in Burundi and Rwanda Under Conditions of Spatial Imprecision. Development Engineering.
- Batra, G., Anand, A., Goodman, S., Runfola, D., 2019. Value for Money Analysis of GEF Interventions in Support of Sustainable Forest Management. GEF/ME/C.56/Inf.02 . <https://www.thegef.org/council-meeting-documents/value-money-analysis-gef-interventions-support-sustainable-forest>
- Goodman, S., Runfola, D.M. (2019), Global Carbon Dioxide Concentration: 2015-2018. <http://geolab.wm.edu/data>.
- William and Mary News, 2019. "geoLab: Students use satellites & AI to make a better world." <https://www.wm.edu/news/stories/2019/geolab-students-use-satellites-ai-to-make-a-better-world.php>
- Runfola, D., Causal Tree Approaches to Identifying Causal Trends using Geospatial Data. Association for American Geographers (AAG) 2019, Washington, D.C.
- Goodman, S., Runfola, D., Landsat 7 SLC Offset Errors - Corrections in the Context of Convolutional Neural Networks. Association for American Geographers (AAG) 2019, Washington, D.C.

## Summer '19 Internship Destinations

Intel Artificial Intelligence Team (Rachel), Global Environment Facility (Sydney), International Fund for Agricultural Development (Heather, John), AlixPartners (Josh), Alibaba Artificial Intelligence Team (Nolan), CheckMySchool (Matt), Johns Hopkins University Human Language Technology Center of Excellence (Nick\_

## Notable Accomplishments & Awards, 2019

Christian Ewell Scholarship, Freeman Fellowship, GEICO Foundation Scholarship, Bass Family Scholarship, Waverly M. Cole Scholarship, Student Assembly Senator, 1693 Scholar, 1st Place Capital One Finance Hack

## The Really Important Awards, 2019

1st Place, Cypher Hackathon - Cup Stacking Competition  
Bronze Medal in Fencing

## Double Platinum Level Donors (>0.01 USD)\*

Heather Baier  
A bunch of anonymous seniors, who I will give credit to when I learn their names next year!

## Best Use of a Convolutional Neural Network, 2019



"Matt and Cheese"

THE WALL  
OF  
FAME

Effective as of ~October, 2019, you can give to the lab by specifying allocation 4674, geoLab, or you can go to our website ([geolab.wm.edu](http://geolab.wm.edu)) and click "Give to the geoLab".



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](http://geolab.wm.edu).