

Chang Zhao, Ph.D.

Assistant Professor, Ecosystem Services AI
Agronomy Department, University of Florida

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Google Scholar: <https://scholar.google.com/citations?user=C9z9unYAAAAJ&hl=en>

Education

Ph.D., Geography (2018), Department of Geographical and Sustainability Sciences, University of Iowa, USA.

- Dissertation: "[Quantifying and mapping the supply of and demand for urban ecosystem services](#)"
- Advisor: Heather A Sander, Associate Professor of Geography

Geoinformatics Certificate (2018), Department of Geographical and Sustainability Sciences, University of Iowa, USA.

B.E., Geodesy and Geomatics Engineering (2012), School of Informatics, Wuhan University, China.

Research Interests

Human-Environment Interactions	Ecosystem Services	Landscape Ecology
Geographic Information Science	Artificial Intelligence	Spatial Data Science

Professional Appointments

Assistant Professor, Ecosystem Services AI, Agronomy Department, University of Florida, Jan 2023 – Present.

Affiliated Assistant Professor, Department of Geography, University of Florida, March 2023 – Present.

Affiliated Assistant Professor, School of Natural Resources and Environment (SNRE), University of Florida, Dec 2023 – Present.

Research Methodologist, Geospatial Data Science, Department of Methodology and Quantitative Social Sciences, NORC at the University of Chicago, May 2018 – Dec 2022.

Graduate Research Assistant, Department of Geographical and Sustainability Sciences, University of Iowa, Jan 2013 – May 2018.

Graduate Teaching Assistant, Department of Geographical and Sustainability Sciences, University of Iowa, Aug 2012 – May 2018.

Teaching Experience

Instructor, University of Florida, USA

AGR: 6932 Topics in Agronomy, Digital Mapping of Soil Carbon, Jan 2024 – May 2024.

AGR: 6932 Topics in Agronomy, Machine Learning for Invasive Species Detection, Aug 2023 – Dec 2023.

Teaching Assistant, University of Iowa, USA

GEOG:1050 Foundations of GIS, Jan 2018 – May 2018.

GEOG:1070 Contemporary Environmental Issues, Aug 2013 – May 2015.

Geographical Information Systems Instructional Lab, Aug 2012 – May 2013.

Mentoring Experience

Postdoctoral Research Fellow

Zhou Tang, Agronomy, University of Florida, Feb 2024 – present.

Non-thesis Master Student

Jiayi Song, Electrical and Computer Engineering, University of Florida, January 2024 – present.

Yifei Suo, Electrical and Computer Engineering, University of Florida, October 2023 – present.

Dinesh Gogineni, Computer Science, University of Florida, July 2023 – present.

Srikanth Nagராஜா, Electrical and Computer Engineering, University of Florida, March 2023 – present.

Undergraduate Student

Joseph Benjamin, Zachary Grosswirth, Tan Hollman, Renee Listrom, Benjamin Hernandez, Liam Sy from the IDS 4940 Active Learning Program, University of Florida, Jan 2024 – May 2024.

Funded Grants and Proposals (4)

1. University of Florida UF/IFAS The Archer Early Career Seed Grant: Leveraging Artificial Intelligence and Geospatial Big Data for Quantifying Ecosystem Service Bundles and Biodiversity across Heterogenous Rangelands in Florida, 1/2024-6/2025, award amount: \$50,000, **Zhao. C.** (Principal Investigator).
2. Florida Cattle Enhancement Board: Digital soil carbon storage and sequestration mapping in Florida grazinglands through machine learning, 9/2023-6/2024, award amount: \$65,687, **Zhao. C.** (Co-PI).
3. USDA NIFA Hatch Capacity Grant: Harnessing Artificial Intelligence for Ecosystem Service Assessments across Scales to Support Sustainable Land Use Planning and Management, 8/2023-8/2028, award amount: \$3,000, **Zhao. C.** (Principal Investigator).

4. Florida Strawberry Research and Education Foundation (FSGA): Phenome Insight? An Integrated Web-GIS Platform for Generation, Visualization, and Analysis of Strawberry Phenotypes for Breeding, 9/2023-8/2024, award amount: \$39,990, **Zhao, C.** (Co-PI).

Peer-Reviewed Journal Publications (15)

1. Bretas, I.L., Dubeux, J.C., **Zhao, C.**, Queiroz, L.D., Flynn, S., Ingram, S., Tembe O.K., Rodrigues, P.J., Ruiz-Moreno, M., Loures, D.R.S., Magalhaes V.D.S., Chizzotti, F. (2024) Detection and Mapping of *Amaranthus spinosus* L. in Bermudagrass Pastures Using Drone Imagery and Deep Learning for a Site-specific Weed Management. ***Agronomy Journal*** (Accepted).
2. English, N., **Zhao, C.**, Brown, K. L., Catlett, C., & Cagney, K. (2022). Making sense of sensor data: How local environmental conditions add value to social science research. ***Social science computer review***, 40(1), 179-194.
3. English, N., Anesetti-Rothermel, A., **Zhao, C.**, Latterner, A., Benson, A.F., Herman, P., Emery, S., Schneider, J., Rose, S.W., Patel, M., Schillo, B.A. (2021). Image Processing for Public Health Surveillance of Tobacco Point-of-Sale Advertising: Machine Learning-Based Methodology. ***J Med Internet Res***. 23(8):e24408. doi: 10.2196/24408
4. Schillo, B.A., Benson A.F., Czaplicki, L., Anesetti-Rothermel, A., Shyanika, W.R., Kierstead, E.C., Simpson, R., Herman, P., **Zhao, C.**, Vallone, D.M. (2020). Modeling retailer-based exemptions in flavored tobacco sales restrictions: National estimates on the impact of product availability. ***BMJ Open***. 10:e040490. doi: 10.1136/bmjopen-2020-040490
5. **Zhao, C.**, Sander, H.A. and Hendrix, S.D. (2019). Wild bees and urban agriculture: assessing pollinator supply and demand across urban landscapes. ***Urban Ecosystems***, 1-16.
6. Koylu, C., **Zhao, C.**, and Shao, W. (2019). Deep neural networks and kernel density estimation for detecting human activity patterns from geo-tagged images: A case study of birdwatching on Flickr. ***ISPRS International Journal of Geo-Information***, 8(1), 45.
7. Qian, H.F. and **Zhao, C.** (2018) Spatial-temporal dynamics of high technology entrepreneurship: Evidence from California and New England. ***Applied Geography***, 95, 111-119.
8. **Zhao, C.**, and Sander, H.A. (2018) Assessing the sensitivity of urban ecosystem service maps to input spatial data resolution and method choice. ***Landscape and Urban Planning***, 175, 11-22.
9. Carrel, M., **Zhao, C.**, Thapaliya, D., Bitterman, P., Kates, A. E., Hanson, B. M., & Smith, T. C. (2017). Assessing the potential for raw meat to influence human colonization with *Staphylococcus aureus*. ***Scientific Reports***, 7(1), 10848.
10. Guo, L., **Zhao, C.**, Zhang, H., Chen, Y., Linderman, M., Zhang, Q., & Liu, Y. (2017). Comparisons of spatial and non-spatial models for predicting soil carbon content based on visible and near-infrared spectral technology. ***Geoderma***, 285, 280-292.
11. Guo, L., Chen, Y., Shi, T., **Zhao, C.**, Liu, Y., Wang, S., & Zhang, H. (2017). Exploring the role of the spatial characteristics of visible and near-Infrared reflectance in predicting soil organic carbon density. ***ISPRS international journal of geo-information***. 6(10), 308.
12. Wilson, C.G., Wacha, K.M., Papanicolaou, A.N., Sander, H.A., Freudenberg, V.B., Abban, B.K.B., **Zhao, C.** (2016) Dynamic assessment of current management in an intensively managed agroecosystem. ***Journal of Contemporary Water Research and Education***

151(1), 148–171.

13. **Zhao, C.**, and Sander, H.A. (2015) Quantifying and mapping the supply of and demand for carbon storage and sequestration service from urban trees. *PLOS ONE*, 10(8), e0136392.
14. Sander, H.A., and **Zhao, C.** (2015). Urban green and blue: Who values what and where? *Land Use Policy*, 42, 194-209.
15. Golden, H. E., Sander, H. A., Lane, C.R., **Zhao, C.**, Price, K., D'Amico, E., and Christensen, J.R. (2015). Relative effects of geographically isolated wetlands on streamflow: a watershed-scale analysis. *Ecohydrology*.

Peer-Reviewed Conference Proceedings (3)

1. English, N., Brown, K., **Zhao, C.** (2020) Total Survey Error and Geographic Information Systems. In *JSM Proceedings, Survey Research Methods Section*. Alexandria, VA: American Statistical Association. Retrieved from <http://www.asasrms.org/Proceedings/y2020/files/1505309.pdf>
2. English, N., Brown, K., **Zhao, C.**, Cagney, K.A., Catlett, C. (2019) Linking Extant Social and Environmental Data at Multiple Scales to Surveys: Activity Space. In *JSM Proceedings, Survey Research Methods Section*. Alexandria, VA: American Statistical Association. Retrieved from <http://www.asasrms.org/Proceedings/y2019/files/1199486.pdf>
3. O'Muircheartaigh, C., Hagerty, H., **Zhao, C.**, English, N., (2019) Using Data Analytics for Early Prediction of Response Rate Changes in GSS. In *JSM Proceedings, Survey Research Methods Section*. Alexandria, VA: American Statistical Association. Retrieved from <http://www.asasrms.org/Proceedings/y2019/files/1199559.pdf>

Peer-Reviewed Abstracts (1)

1. Golden, H. E., Sander, H. A., Lane, C., **Zhao, C.**, Price, K., D'Amico, E., & Christensen, J. (2014). Geographically Isolated Wetlands and Hydrologic Connectivity: Quantifying Seasonal and Annual Downstream Effects using a Hybrid Modeling Approach. In *AGU Fall Meeting Abstracts* (Vol. 2014, pp. H311-0746).

Working Papers and Reports (2)

1. **Zhao, C.**, Brown, K.L., English, E.M., Catlett, C., and Cagney, K.A., 2019. Making Sense of Sensor Data: How Local Environmental Conditions Add Value to Social Science Research, *NORC Working Paper Series*, WP-2019-002. Chicago: NORC. Retrieved from <https://www.norc.org/PDFs/Working%20Paper%20Series/WP-2019-002.pdf>
2. Cooper, A., Neece, A., Agan, C., **Zhao, C.**, Moser, S., Ruth, W., Hendrix, S.D. and Nelson, A.E., 2015. Urban Pollinators: Bee Diversity in Iowa City, Iowa. *Iowa Initiative for Sustainable Communities*, University of Iowa. Retrieved from https://outreach.uiowa.edu/sites/outreach.uiowa.edu/files/projects/files/enhancing_urban_pollinators_final_report.pdf

Professional Conference Presentations (30)

1. **Zhao, C.**, Nagaraja S.A., Oduor, K.T., Gogineni, D.C., Bretas, I.L., Dubeux, J. 2024. Geospatial Artificial Intelligence Detects Invasive Cactus Species across Large

- Heterogeneous Landscape of Laikipia, Kenya using Sentinel-2 Satellite Imagery. *Association of American Geographers Annual Meeting (AAG)*. Honolulu, HI. April 2024.
2. Nagaraja S.A., Oduor, K.T., Gogineni, D.C., Bretas, I.L., Dubeux, J., **Zhao, C.** 2024. Combating Biodiversity Threats: Machine Learning and Satellite Remote Sensing in Tracking *Opuntia stricta* in Laikipia County, Kenya. *Invasion Science Research Symposium*. Gainesville, FL. May 2024.
 3. **Zhao, C.** Harnessing Artificial Intelligence for Ecosystem Service Assessments across Scales to Support Sustainable Agriculture (poster). 2023. *AI in Agriculture Conference: Innovation and Discovery to Equitably Meet Producer Needs and Perceptions*. Orlando, FL. April 2023.
 4. **Zhao, C.**, English, N., Brown, K. 2022. Investigating the Effects of Local Weather Conditions on Activity Spaces among Elderly Chicagoans Using a Spatiotemporal Approach. *Association of American Geographers Annual Meeting (AAG)*, New York City, NY.
 5. Bilgen, I., Dutwin, D., Xie, G., **Zhao, C.** 2022. Examination of Auxiliary Information Appended to Address Based Samples in Mixed Mode Studies. *American Association for Public Opinion Research (AAPOR)*, Chicago, IL.
 6. Fiorio, L., **Zhao, C.**, Herman, P., English, N. 2022. Housing Unit Listing with Administrative Data using an Interactive Mapping Dashboard. *Federal Committee on Statistical Methodology (FCSM) Research and Policy Conference*, Washington D.C.
 7. Fiorio, L., **Zhao, C.**, Herman, P., English, N. 2022. Using an Interactive Mapping Dashboard to Conduct In-Office Housing Unit Listing using County Assessor Tax Parcel Data. *American Association for Public Opinion Research (AAPOR)*, Chicago, IL.
 8. **Zhao, C.**, English, N., Brown, K., Cagney, K., Catlett, C. 2021. Modeling Environmental Exposure to Air Pollution and Related Health Effects: An Activity-Space Approach. *Association of American Geographers Annual Meeting (AAG)*, Seattle, WA.
 9. **Zhao, C.**, O'Muircheartaigh, C., English, N. 2021. The Robustness [Fragility] of Predictive Response Rate Analytic Models across Surveys and Survey Organizations. *American Association for Public Opinion Research (AAPOR) Virtual Conference*.
 10. Herman, P., Benson, A.F., Patel, M., **Zhao, C.**, English, N., Schillo, B.S. 2021. A Methodological Primer on using Adaptive Bandwidth Kernel Density for Aggregating Spatial Data: Applications to Social Science Research. *American Association for Public Opinion Research (AAPOR) Virtual Conference*.
 11. English, N., Brown, K., **Zhao, C.** 2020. Total Survey Error and Geographic Information Systems. *Joint Statistical Meetings (JSM) Virtual Conference*.
 12. English, N., Brown, K., **Zhao, C.**, Cagney, K., Catlett, C. 2020. Enhancing Household-Level Survey Data with Extant Sensor-Derived Information for Analytical Purposes. *American Association for Public Opinion Research (AAPOR) Virtual Conference*.
 13. Schillo, B.A., Benson, A.F., Czaplicki, L., Anesetti-Rothermel, A., Kierstead, E.C., Simpson, R., Phelps, N.C., Herman, P., **Zhao, C.**, English, N., Shyanika, W. R. 2020. Modeling Flavored Tobacco Policy Restrictions: The Impact on Product Availability in the Retail Environment. *Society for Research on Nicotine & Tobacco (SRNT) 26th Annual Meeting*. New Orleans, LA.

14. **Zhao, C.**, Hagerty, H., English, N., O'Muircheartaigh, C. 2019. Evaluating Field Strategies Using Response Rate Prediction. *Midwest Association for Public Opinion Research (MAPOR)*, Chicago, IL.
15. Brown, K. and **Zhao, C.** 2019. Making Sense of Sensor Data: How Local Environmental Conditions Add Value to Social Science Research. *Advisory Committee on Statistics, Machine Learning and High Performance Computing*. NORC at the University of Chicago, Chicago, IL.
16. Location Powers Summit: Data Science. 2019. *The Open Geospatial Consortium (OGC)*. Google's Crittenden Campus, Mountain View, CA.
17. Anesetti-Rothermel, A, **Zhao, C.**, Latterner A., Benson, A., Herman, P., English, N., Schillo, B. A., Elizabeth, C.H., Donna, M.V. 2019. Using deep neural networks for object detection from digital photographs: An application in Social Science. *American Association for Public Opinion Research (AAPOR)*, Toronto, Ontario, Canada.
18. English, N., Brown, K., **Zhao, C.**, Curtis, B., Cagney, K., and Catlett, C. 2019. Linking extant social and environmental data at multiple scales to surveys: Activity space. *American Association for Public Opinion Research (AAPOR)*, Toronto, Ontario, Canada.
19. English, N., Herman, P., **Zhao, C.**, Anesetti-Rothermel, A. 2019. Is adolescent smoking related to the density of tobacco outlets? An analysis of tobacco retail growth and tobacco use using a spatial approach. *American Association for Public Opinion Research (AAPOR)*, Toronto, Ontario, Canada.
20. O'Muircheartaigh, C., Hagerty, H., **Zhao, C.**, and English, N. 2019. Using data analytics for early prediction of response rate changes in the GSS General Social Survey. *American Association for Public Opinion Research (AAPOR)*, Toronto, Ontario, Canada.
21. **Zhao, C.**, Koylu, C., and Sander, H. A. 2018. Using deep learning and kernel density estimation for detecting spatio-temporal footprints of birdwatchers on Flickr. *American Association of Geographers Annual Meeting (AAG)*, New Orleans, Louisiana.
22. **Zhao, C.**, Koylu, C., and Sander, H.A. 2017. Watching the birdwatchers on Flickr: An adaptive kernel smoothing approach for visualizing spatiotemporal patterns of a cultural ecosystem service. *2nd International Symposium on Spatiotemporal Computing (ISSC)*, Harvard University, Cambridge, MA.
23. **Zhao, C.**, and Sander, H.A. 2017. Wild pollinators and urban agriculture: Assessing pollination supply and demand across urban landscapes. *Association of American Geographers Annual Meeting (AAG)*, Boston, MA.
24. Sander, H.A., Hodson, C.B., and **Zhao, C.** 2017. A framework for assessing urban social and environmental sustainability. *American Association of Geographers Annual Meeting (AAG)*, Boston, MA.
25. **Zhao, C.**, and Sander, H.A. 2016. Uncertainties in ecosystem service mapping: verification and validation of carbon storage maps. *Association of American Geographers Annual Meeting (AAG)*, San Francisco, CA.

26. **Zhao, C.**, and Sander, H.A. 2015. Quantifying and mapping the supply and demand of carbon storage and sequestration services by urban trees. *Association of American Geographers Annual Meeting (AAG)*, Chicago, IL.
27. Sander, H.A., Sanchagrin, J.L., and **Zhao, C.** 2014. Who values what and where? Variation in the value of urban vegetation and greenspace. *Association of American Geographers Annual Meeting (AAG)*, Tampa, FL.
28. Golden, H.E., Sander, H.A., **Zhao, C.**, Lane, C.R., Price, K., D'Amico, E., and Christensen, J.R. 2014. Geographically isolated wetlands and hydrologic connectivity: Quantifying seasonal and annual downstream effects using a hybrid modeling approach. *American Geophysical Union Fall Meeting (AGU)*, San Francisco, CA.
29. Golden, H.E., Sander, H.A., **Zhao, C.**, Lane, C.R., Price, K., D'Amico, E., and Christensen, J.R. 2014. Cumulative effects of geographically isolated wetlands on streamflow in a coastal plain basin: Estimates using a hybrid modeling approach. *Joint Aquatic Sciences Meeting*, Portland, OR.
30. Sander, H.A. and **Zhao, C.** 2013. Variation in cultural ecosystem service values in an urban environment. *Association of American Geographers Annual Meeting (AAG)*, Los Angeles, CA.

Extension Presentations and Posters (4)

1. **Zhao, C.**, Dubeux, J., Bretas, I., Harley, J., Garcia, L., Suo, Y.F. Carbon Dynamics in Florida's Soils. 2024. *UF/IFAS Carbon Conference: Opportunities for Carbon Management and Sequestration*. Gainesville, FL. January 2024.
2. Harley J.B., Pothapragada, S.K., Tian, Z.H., Gupta, R., Simon, G., Goel, P.K., Zare, A., **Zhao, C.**, Dubeux, J., Zotarelli, L. 2023. Integrating Data-Driven Machine Learning and Knowledge-Driven Analyses for Quantifying Ecosystem Services. *Florida AgTech and AI Expo*. December 2023.
3. Bretas, I., Dubeux, J., **Zhao, C.**, Harley, J., Garcia, L. Digital soil carbon storage and sequestration mapping in Florida grazinglands through spatial sampling and machine learning methods. 2023. Poster and handout at the *Florida Climate Smart Agriculture Work Group (FLCSA) field day*, North Florida Research & Education Center, Suwannee Valley, November 2023.
4. Harley, J., Zare, A., Dubeux, J., Zotarelli, L., **Zhao, C.** Quantifying our ecosystems: pathways through artificial intelligence. 2023. *Citrus & Specialty Crop Expo*. August 8, 2023.

Invited Talks (5)

1. **Zhao, C.** Harnessing the Power of Geospatial Artificial Intelligence for Ecosystem Service Assessments. 2023. Institute of Urban Planning and Design Seminar, College of Civil Engineering and Architecture, Zhejiang University, China. November 2023.
2. **Zhao, C.** Artificial Intelligence for Ecosystem Services Quantification and Mapping. 2023. AI UF/IFAS Research External Advisory Board Meeting. Gainesville, FL. February 2023.
3. **Zhao, C.** Quantifying Ecosystem Services with Geospatial AI. 2023. UF/IFAS AI and Data Science Seminar. University of Florida, Gainesville, FL. June 2023.

4. **Zhao, C.** Geospatial Sciences and Artificial Intelligence for Ecosystem Service Assessments. 2023. Geography Colloquium. Department of Geography, University of Florida, Gainesville, FL. November 2023.
5. **Zhao, C.** A Gentle Introduction of Artificial Intelligence in Agriculture and Natural Resources. 2024. First Friday Stat Talk. Institute of Food and Agricultural Sciences, University of Florida, Gainesville, FL. January 12, 2024.

Professional Service

Journal Reviewer

- Ecosystem Services
- Urban Ecosystems
- Ecosphere
- Stochastic Environmental Research and Risk Assessment
- Transactions in GIS
- Journal of Medical Internet Research
- Tobacco Control
- Spatial and Spatio-temporal Epidemiology
- PeerJ
- Journal of Maps

Organization Membership

- Member of American Association of Geographers (AAG), 2012 – Present.
- Member of Ecosystem Services Partnership: 2023 – Present.
- Member of the North American Regional Chapter of the International Association for Landscape Ecology (IALE–North America): 2023 – Present.
- Member of American Association for Public Opinion Research (AAPOR), 2021.
- Member of Midwest Association for Public Opinion Research (MAPOR), 2019.

Editor and Service to the Profession

- Guest Editor of the special issue "Reviews in Urban Greening: 2022" for the journal *Frontiers in Sustainable Cities*, 2022 – 2023.
- Board Member of American Association of Geographers (AAG) Urban Geography Specialty Group (UGSG), 2021 – 2023.
- Organizer of the "Social Determinants of Health (SDOH) and Quality of Life" sessions in 2023 Annual Meeting of AAG.
- Co-organizer of the "Geographic Information Analysis and Computing Technologies in Ecosystem Science" session in 2022 Annual Meeting of AAG.

Service to the College and University

- Faculty Search Committee Member, Quantitative Ecology Hire at the Department of Wildlife Ecology and Conservation, University of Florida, Spring 2024.
- Graduate Program Committee, University of Iowa, Aug 2016 – May 2017.
- Graduate Student Senator, University of Iowa, Sep 2012 – Jan 2014.

Awards and Honors

- The Social Determinants of Health (SDOH) Visualization Tool was selected to be displayed at the 18th iteration of Places & Spaces exhibition: Macroscopes for a New Perspective, the Cyberinfrastructure for Network Science Center at Indiana University, 2022, <https://scimaps.org/macroscope/18/3>
- Employee Recognition Award, NORC at the University of Chicago, Chicago, IL, USA, 2019.
- Honorable Mention of Best Paper Award for the 2nd International Symposium on Spatiotemporal Computing, Harvard University, Cambridge, MA, USA, 2017.
- Center for Global and Regional Environmental Research Travel Grant, University of Iowa, Iowa City, IA, 2014-2015.
- Graduate Student Affinity Group Travel Award, Association of American Geographers (AAG), Washington, D.C., USA, 2015.
- First Class Scholarship based on academic merit (top 5%) for three years, Wuhan University, Wuhan, China, 2008-2010.
- National Education and Technology Scholarship (top 1%), Wuhan University, Wuhan, China, 2008-2009.
- Outstanding Student Medal (top 5%) for three consecutive years, Wuhan University, Wuhan, China, 2008-2011.

Skills and Techniques

- R for Spatial Data Science, Python (e.g., ArcPy, Pandas, Numpy, Shapely, GeoPandas, ArcGIS API for Python), Jupyter Notebook, SAS, PostgreSQL
- ESRI ArcGIS (e.g., ArcMap, ArcGIS Pro, ArcPy, ModelBuilder, ArcGIS Online, ArcGIS Notebooks), QGIS, PostGIS, GeoDa, TerrSet, MapInfo Pro, MapMarker, ERDAS, ENVI
- R Shiny, JavaScript, HTML/CSS, Tableau
- Microsoft Azure Cognitive Services, AWS, GCP, Linux, Git, BitBucket, GitHub, Matlab, Java