Bharat Sharma

PhD Candidate, Northeastern University Boston, MA
Research Intern, Oak Ridge National Laboratory, TN

704-657-2804
sharma.bha@northeastern.edu
https://sharma-bharat.github.io/

EDUCATION

Northeastern University — Boston, MA
PhD, Interdisciplinary Engineering — expected Aug 2022
Dissertation: Quantification of Carbon Cycle Extremes Under Climate and Land Use & Cover Change and Attribution to Compound Climate Drivers. — GPA 4.0

Technische Universität München — Munich, Germany
MS, Transportation Systems — Aug 2016

National Institute of Technology — Hamirpur, India
B.Tech, Civil Engineering — May 2012

DOCTORAL RESEARCH

Ph.D. Advisor: Prof. Auroop R. Ganguly

Project 1: **Quantifying Carbon Cycle Extremes and Attributing Their Causes Under Climate and Land Use & Land Cover Change from 1850 to 2300**.
Collaborators: Kumar, J., Collier, N., Hoffman, F. M. from **Oak Ridge National Laboratory, TN**

- Analysis of the impact of human activities through fossil fuel emissions and Land Use and Land Cover Change (LULCC) on carbon cycle are crucial for forecasting the changes in carbon uptake.
- Developed a new systematic method for analyzing temporally contiguous extremes in gross primary productivity (GPP) in Earth system modeling studies under changing atmospheric CO_2, climate and LULCC.
- This work involved processing of large geospatiotemporal datasets in an HPC environment.

Project 2: **Investigating Variability in the Intensity, Direction, and Spatial Distribution of Carbon Cycle Extremes and Attribution to Climate Drivers Using Observations and CMIP6 Earth System Models**.
Collaborators: Kumar, J., Hoffman, F. M. from **Oak Ridge National Laboratory, TN**

- Investigated the agreement among GPP and extreme anomalies using upscalled remote sensing GPP and latest generation of Earth System Model simulations.
- Developed set of codes that help a user in data preparation, calculation of anomalies, interannual variability, and extremes and perform attribution to compound climate drivers across common grid resolution.
- Work presented at American Geophysical Union Fall Meeting, December 2021, New Orleans, LA.

Project 3: **Carbon Cycle Extremes Accelerate Weakening of the Land Carbon Sink in the Late 21st Century**.
Collaborators: Kumar, J., Hoffman, F. M. from **Oak Ridge National Laboratory, TN**

- Performed regional analysis of successive spatio-temporal extremes in net biomass productivity and attribution to compound climate drivers using Community Earth System Model v2.

PROGRAMMING/SOFTWARE SKILLS

- **Languages**: English (Fluent), Hindi (Fluent); German (Intermediate)
- **Programming**: Python, bash scripting, R, MATLAB, Octave
- **Toolkits/Software**: NCO, CDO, NCL, ILAMB, MPI, Dask, ArcGIS, VISSIM, AutoCAD
- **Machine Learning/Deep learning Frameworks**: scikit-learn
- **Version Control**: Git, Mercurial
- **Document/Web Preparation Software**: LaTeX, MS office, Markdown, HTML

PUBLICATIONS

PEER-REVIEWED JOURNALS

Sharma, Bharat, Jitendra Kumar, Nate Collier, Auroop R. Ganguly, and Forrest M. Hoffman. Quantifying Carbon Cycle Extremes and Attributing Their Causes Under Climate and Land Use & Land Cover Change from 1850 to 2300. Journal of Geophysical Research - Biogeosciences. (2022). *Manuscript in Review - JGR Biogeosciences.*

Sharma, Bharat, Jitendra Kumar, Auroop R. Ganguly, and Forrest M. Hoffman. ICarbon Cycle Extremes Accelerate Weakening of the Land Carbon Sink in the Late 21st Century. (2022). *Manuscript Forthcoming*

Sharma, Bharat, Jitendra Kumar, Nate Collier, Auroop R. Ganguly, and Forrest M. Hoffman. Investigating Variability in the Intensity, Direction, and Spatial Distribution of Carbon Cycle Extremes and Attribution to Climate Drivers Using Observations and CMIP6 Earth System Models. (2022). *Manuscript in Preparation*

Sharma R. K., Khandelwal, T. and **Sharma, Bharat**[1]. (2013). Compaction and Subgrade Characteristics of Clay Soil Modified with Beas Sand, Fly Ash, and Waste Ceramic. Recent Trends in Civil Engineering & Technology. STM Journals. Volume 3, Issue 2, ISSN: 2249–8753. Link.

Khandelwal, T., **Sharma, Bharat**[1], Thareja, P. and Sharma R. K. (2013). Comparative Study of various Commercially Available Programs in Slope Stability and Simulation of Dynamic Loading. Recent Trends in Civil Engineering & Technology. STM Journals. Volume 3, Issue 2, ISSN: 2249–8753. Link.

BOOK CHAPTERS

Warner, M., **Sharma, Bharat**, Bhatia, U., and Ganguly, A. (2019). Evaluation of Cascading Infrastructure Failures and Optimal Recovery from a Network Science Perspective. In: Ghanbarnejad F., Saha Roy R, Karimi F., Delvenne JC., Mitra B. (eds) Dynamics On and Of Complex Networks III. DOOCN 2017. Springer Proceedings in Complexity. Springer, Cham. URL: https://doi.org/10.1007/978-3-030-14683-2_3

DATA/SOFTWARE PUBLICATION

Codes/programs for the paper "Quantifying Carbon Cycle Extremes and Attributing Their Causes Under Climate and Land Use & Land Cover Change from 1850 to 2300", 2022, DOI: https://zenodo.org/badge/latestdoi/413554760

CERTIFICATIONS

- **Machine Learning by Stanford University**, Coursera — May 2022
- **Machine Learning, Data Science and Deep Learning with Python**, Udemy — Mar 2021
- **New Advances in Land Carbon Cycle Modeling**, Center for Ecosystem Science and Society, Northern Arizona University — July 2020
- **Introduction to Machine Learning**, North Carolina State University — May 2019

AWARDS/ACHIEVEMENTS

Distinguished Dean's Fellowship — 2016-'17
College of Engineering, Northeastern University

Scholarship for Foreign Students — 2014-'16
Bavarian State Ministry of Sciences, Research and the Arts, Munich, Germany

Brilliant Scholarship, HP, India — 2008-'12
Director, Vocational & Industrial Training, Himachal Pradesh, India

Ranked among top 2% of the students, All India Engineering Entrance Examination conducted (in Physics, Chemistry and Math) for undergraduate admissions in India — 2008

[1]Name changed in 2016.

PRESENTATIONS

INVITED PRESENTATIONS

Sharma, Bharat, Jitendra Kumar, Nate Collier, Auroop R. Ganguly, and Forrest M. Hoffman, "Quantifying the Changes in Carbon Cycle Extremes Due to Land Use Change and Attribution to Climate Drivers Through Year 2300". Reducing Uncertainties in Biogeochemical Interactions through Synthesis and Computation. Feb 19, 2021. URL: https://www.bgc-feedbacks.org/research/presentations/Sharma_RUBISCO-SFA_20210219.pdf

CONFERENCE PRESENTATIONS

Sharma, Bharat, Jitendra Kumar, Forrest M. Hoffman, and Auroop R. Ganguly. December 17, 2021. "Investigating Variability in the Intensity, Direction, and Spatial Distribution of Carbon Cycle Extremes and Attribution to Climate Drivers Using Observations and CMIP6 Earth System Models." Improving Earth System Predictability (B041), American Geophysical Union Fall Meeting. New Orleans, LA. Link

Morgan Steckler, **Sharma, Bharat**, Forrest M. Hoffman, William W. Hargrove and Jitendra Kumar. December 14, 2021. "Effects of meteorological and ecological disturbances on tropical vegetation phenology." Understanding Phenological Responses and Feedbacks in Terrestrial Vegetation: Patterns, Mechanisms, and Consequences (B33D), American Geophysical Union Fall Meeting. New Orleans, LA.

Sharma, Bharat, Jitendra Kumar, Forrest M. Hoffman, and Auroop R. Ganguly. December 12, 2020. "Detection and Attribution of Climate-Driven Extremes in Net Biome Productivity from 1850 through 2100." Abstrat B019-0009 presented at American Geophysical Union (AGU) Fall Meeting (December 1–17, 2020).

Sharma, Bharat, Forrest M. Hoffman, Jitendra Kumar, and Auroop R. Ganguly. December 13, 2018. "Cumulative Impacts of Human-Induced Changes on Carbon Cycle Extremes." Abstract 368411 presented at the 100th American Meteorological Society (AMS) Annual Meeting, In Robert Dickinson Symposium (January 12–16, 2020), Boston, Massachusetts, USA.

Sharma, Bharat, Forrest M. Hoffman, Jitendra Kumar, Nathan Collier, and Auroop R. Ganguly. December 13, 2018. "Impact of Changes in Anthropogenic Forcing on the Terrestrial Carbon Budget through the Year 2300." Abstract B41I-2830 presented at the 2018 American Geophysical Union (AGU) Fall Meeting (December 10–14, 2018), Washington, District of Columbia, USA.

Sharma, Bharat, Forrest M. Hoffman, Jitendra Kumar, Nathan Collier, and Auroop Ganguly. June 7, 2018. "Quantifying the Effect of Changes in Climate-Driven Carbon Cycle Extremes on the Terrestrial Carbon Budget through Year 2300." 15th Annual Meeting of the Asia Oceania Geosciences Society (AOGS) (June 3–8, 2018), Hawai'i Convention Center, Honolulu, Hawai'i, USA.

Sharma, Bharat, Forrest M. Hoffman, Jitendra Kumar, Nathan Collier, and Auroop Ganguly. April 11, 2018. "Identification of Spatio-temporal Contiguous Carbon Cycle Extreme Events." 2018 U.S.-International Association for Landscape Ecology (US-IALE) Annual Meeting (April 8–12, 2018), Chicago, Illinois, USA.

Sharma, Bharat, Forrest M. Hoffman, Jitendra Kumar, and Auroop R. Ganguly. December 15, 2017. "Carbon Cycle Extremes in the 22nd and 23rd Century and Attribution to Climate Drivers." Abstract B53J-02 presented at the 2017 American Geophysical Union (AGU) Fall Meeting (December 11–15, 2017), New Orleans, Louisiana, USA.

Sharma, Bharat, Mary E. Warner, Udit Bhatia, and Auroop R. Ganguly. December 15, 2017. "Cascading Interdependencies of Built and Societal Systems." In: Symposium on Human Dynamics in Smart and Connected Communities: Spatial-Social Networks in GIS. 2017 American Association of Geographers (AAG) Annual Meeting (April 5-9, 2017), Boston, Massachusetts, USA.

POSITIONS OF RESPONSIBILITY

MENTORSHIP ROLES (1 Male, 3 Female Students)

Pragya Kandel **2021 - present**
Graduate Student, University of Knoxville, Tennessee

Russ Limber **2021 - present**
Graduate Student, University of Knoxville, Tennessee

Morgan Steckler **2020 - present**
Graduate Student, University of Knoxville, Tennessee

Sophia Bailey **2020 - 21**
Undergraduate Student, Northeastern University, Massachusetts

CIVE 5363 **Spring 2021**
Co-mentored the class project of 30 graduate and undergraduate students.

TEACHING ROLES

Teaching (Shared), CIVE 5363 Climate Science, Engineering Adaptation, and Policy (NEU) Spring 2021
Taught lectures, created study material, designed and graded assignments and conducted tutorial sessions and mentored projects for 30 graduate students. Received excellent reviews.

CIVE 2260 Materials for the Built Environment **Spring 2018**
Graded assignments and quizzes and held office hours for answering queries of 58 students.

CIVE 2261 Lab for Materials for the Built Environment **Spring 2018**
Supervised field visits for surveying lab, graded lab reports and quizzes and held office hours for answering queries of 58 students.

CIVE 3464 Probability and Engineering Economy for Civil Engineering **Spring 2018**
Designed and taught tutorials, graded assignments and conducted tutorial sessions and held office hours for answering queries of 56 students.

ORGANISATION ROLES

Organiser, Climate Change Science Institute (ORNL) Journal Club **Summer 2018**
In-charge of scheduling and coordinating the paper presentations, and maintaining the website.

WORK EXPERIENCE

Obermeyer Planen + Beraten GmbH, Munich, Germany Mar'15 - Aug'16
Intern + Part-time employee (*Werkstudent*), Department of Rail Design and Engineering.
Project 'High-speed railway between Košice and the Twin-City region Vienna-Bratislava http://www.breitspur.com/', creating high performance transportation from Russia, China and Asian countries to Central Europe.
Supported Phase 1 System Development, analysis of the pre-feasibility studies, selection of suitable rail corridor and terminal locations.

GMR Airport Developers Limited, New Delhi, India Jul'12 - Sep'13
Executive Civil Engineer, Terminal 3, New Delhi International Airport
Supported civil engineering projects and maintenance, preparation and analysis of BOQ, SAP. In charge of quality control for relaying of runway 29/11 and taxiways with Larsen & Tubro Ltd. (ECC).

PROJECTS COMPLETED

Technische Universität München (TUM), Germany Mar'16 - Aug'16
Master Thesis at Department of Urban Structure & Transport Planning. Link.
An approach to study interaction between evacuation and land use & transportation structures.

Technische Universität München (TUM), Germany Jun'14 - Jul'15
Graduate Research Assistant, Department of Urban Structure & Transport Planning.
Project 'MOR€CO', aims to improve accessibility and to foster sustainable mobility by an optimized polycentric

settlement development in the Alpine Space.
Estimated the mobility costs in the metropolitan region of Munich.

Project 'WAM', aims to better understand the dynamics of residential location, workplace and mobility of households and highlight the reciprocal spatial dependence of these decisions.
Created the travel time matrix for the metropolitan region of Munich.

Oct 14 – Mar 15 Technische Universität München (TUM), Germany Oct'14 - Mar'15
Project with TUM, BMW Automobiles, MVV (Public Transport Company) and City of Munich.
Examined whether the new BMW Innovation and Research Center successfully fitted into the Northern Munich by analyzing spatial strategies, current development projects and the inter-action of non-motorized mobility, and provided measures like location of transit station, convenient stores and bike paths among other steps to plan better transit.

HOBBIES/INTERESTS

Enjoy cooking, reading, hiking, spending time with friends and family.

CONNECT VIA

: @BharatSharma_IN
: bharat-sharma
: 0000-0002-6698-2487
: sharma-bharat
: Bharat-Sharma-19

REFERENCES

- **Prof. Auroop R. Ganguly**,
  Professor, Civil and Environmental Engineering, Northeastern University
  a.ganguly@northeastern.edu, 617-373-6005
- **Dr. Forrest M. Hoffman**,
  Distinguished Scientist, ORNL
  hoffmanfm@ornl.gov, 865-576-7680
- **Dr. Jitendra Kumar**,
  Research Scientist, ORNL
  kumarj@ornl.gov, 865-574-9467