Shashank Bhushan

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Education

2018–2022 **Ph.D. in Civil and Environmental Engineering**, *University of Washington Seattle, USA*, *GPA- 3.88/4*,
Thesis:- *Using High-Resolution Satellite Observations to Understand Glacier Mass Balance and Dynamics in High-Mountain Asia*.
Advisors:- Dr. David Shean

2013–2018 **5 Yr. Int. MSc. Tech. in Applied Geology**, *IIT(ISM) Dhanbad,India*, *GPA- 9.13/10*,
Thesis:- *Investigating Mass Budget and surface dynamics of Himalayan Glaciers*.
Advisor:- Dr. Tajdarul Syed

Research Experience

Sep 2018 – ongoing **Graduate Research Assistant,** Department of Civil and Environmental Engineering, University of Washington, Seattle, USA. Advisor:- Dr. David Shean.
- Developed and evaluated rigorous error estimates for regional scale geodetic glacier mass balance calculations (NASA HiMAT/NASA FINESST)
- Led efforts for development of photogrammetric/DEM generation workflows from Planet imagery (Skysat and PlanetScope) (NASA Commercial Data Buy, NASA Stereo2SWE)
- Assisted in implementing and testing of stereo workflow for high-resolution (0.5 m) panoramic (optical bar) cameras on board declassified US spy satellites. (NASA AIST)

Jun 2020 – Sep 2020 **Photogrammetry Intern,** Data Pipeline, Planet, San Francisco, USA.
Advisor:- Dr. Kelsey Jordahl, Antonio Martos.
- Developed an automated pipeline for DEM production from SkySat imagery on Google Cloud.
- Assisted in time-sensitive SkySat tasking
- Led and assisted experiments involving photogrammetry with Planet data, global reference DEM evaluation.

May – July 2017 **Research Intern,** Applied Physics Lab, University of Washington, Seattle, USA.
Advisors:- Dr. Anthony Arendt, Dr. David Shean
- Processed high resolution WorldView/GeoEye and Cartosat-1 DEMs to produce elevation change and mass budget estimates for glaciers in Sikkim Himalayas as a part of the NASA High-Mountain Asia Project.
- Mapped glacial lakes in the region and computed surface velocities for glaciers in the region.
- Learnt to use the NASA ASP and open source libraries in Python and C for efficient and automated processing of satellite images.

May – July 2016 **Research Intern,** Divecha Center for Climate Change, Indian Institute of Science, Bangalore, India.
Advisor:- Dr. Anil Kulkarni
- Computed Mass Balance of Gangotri glacier from DEM differencing (SRTM and Cartosat-1).
- Generated surface velocity, ice thickness, bed rock topography for Gangotri and delineated potential lake sites using remote sensing data.

May – July 2015 **Research Intern,** Divecha Center for Climate Change, Indian Institute of Science, Bangalore, India.
Advisor:- Dr. Anil Kulkarni
- Delineated glaciers in Western Himalayas by employing FCCs, NDSI, Band Ratios on Landsat imagery and ASTERGDEM-v2 to map ice divides.
- Learnt to generate glacier surface velocity using COSI- CORR algorithm

Achievements/Awards

NASA Future Investigators in NASA Earth and Space Science and Technology (NASA FINESST (2019-2022).

AGU AGU Student Travel Grant to attend the 2017 AGU Fall Meeting, AGU Student Endowment Fund.

S N Bose Fellowship Awarded the prestigious SN Bose Fellowship by the Indo-US Science and Technology Forum to conduct research at the University of Washington, Seattle during the summer of 2017.

AAPG AAPG L. Austin Weeks Undergraduate Grant recipient for the academic years 2016 and 2017.

EAGE Travel Grant to attend the 78th EAGE Conference and Exhibition, EAGE Student Fund.

INSPIRE Recipient of Scholarship for Higher Education (SHE)-INSPIRE from DST, Govt. of India (2013-2018).

IAS SRFP Summer Research Fellowship, Indian Academy of Sciences, 2015.

IIT JEE Advanced Top 1 percentile out of 1.5 million students in Joint Entrance Exam, Advanced 2013.

Peer Reviewed Journal Articles

Jun 2021 D.H. Shugar, M. Jacquemart, D. Shean, **S. Bhushan**, K. Upadhyay, A. Sattar, et al. ***"A massive rock and ice avalanche caused the 2021 disaster at Chamoli, Indian Himalaya"*** in Science. `https://doi.org/10.1126/science.abh4455`.

Jan 2021 **S. Bhushan,** D.E. Shean, O Alexandrov, S. Henderson ***"Automated digital elevation model (DEM) generation from very-high-resolution Planet SkySat triplet stereo and video imagery"*** in ISPRS Journal of Photogrammetry and Remote Sensing. `https://doi.org/10.1016/j.isprsjprs.2020.12.012`.

Jan 2020 D.E. Shean, **S. Bhushan**, P. Montesano, D.R. Rounce, A.A. Arendt and B. Osmanoglu ***"A systematic, regional assessment of High-mountain Asia glacier mass balance"*** in Frontiers in Earth Sciences `https://doi.org/10.3389/feart.2019.00363`.

Jun 2018 **S. Bhushan,** T.H. Syed, A.A. Arendt, A.V. Kulkarni and D. Sinha, ***"Assessing controls on mass budget and surface velocity variations of glaciers in Western Himalaya"*** in Scientific Reports `https://doi.org/10.1038/s41598-018-27014-y`.

Dec 2017 **S. Bhushan,** T.H. Syed, A.V. Kulkarni, P. Gantayat and V.Agarwal, ***"Quantifying Changes in the Gangotri Glacier of Central Himalaya: Evidence for Increasing Mass Loss and Decreasing Velocity"*** in IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing (JSTARS) `https://doi.org/10.1109/JSTARS.2017.2771215`.

Recent Publications in International Conferences

Dec 2019 **S. Bhushan**, D.E. Shean, O. Alexandrov, S. Henderson, "Quantifying changes in dynamic Cryosphere using high resolution imagery: Automated tools for sensor correction, DEM generation and glacier velocity", AGU Fall Meeting, San Francisco, CA, USA.

Dec 2019 D.E. Shean, **S. Bhushan**, J.M Hu, O. Alexandrov, S. Henderson, J. Mayer, J. Lundquist, C. Heimstra, "Snow depth from sub-meter stereo satellite imagery", AGU Fall Meeting, San Francisco, CA, USA.

Dec 2019 F.A. Knuth, D.E. Shean, O. Alexandrov, **S. Bhushan**, "Historical Structure From Motion: Automated production of high-resolution DEMs from historical imagery for quantitative analysis of glacier and geomorphological change.", AGU Fall Meeting, San Francisco, CA, USA.

Dec 2017 **S. Bhushan**, D.E. Shean, U.K. Haritashya, A.A. Arendt, T.H. Syed and L. Setiawan, "Analysis of High Resolution Satellite imagery to assess Glacier Mass Balance and Lake Hazards in Sikkim Himalayas", AGU Fall Meeting, New Orleans, LA, USA.

Scientific Workshops and Training

Jun 2019 IceSAT-2 Hackweek organised by eScience Insititute, University of Washington

Sep 2018 GeoHackWeek organised by eScience Insititute, University of Washington

June 2015 Training on Glaciers and Remote Sensing, IISc, Bangalore and University of Iceland

Technical Skills and Memberships

Coding Python and Bash scripting

Open Source NASA Ames Stereo Pipeline, COLMAP, OpenSfM, GDAL, OGR, GSLIB, OpenCV, QGIS, Linux, Latex

Proprietary Software	ArcGIS 10.2, Rolta Geomatica 15, Pix4D Mapper, ENVI 4.5, MS Office, Adobe Illustrator
Membership	AGU,EAGE and AAPG, IACS Working Group on Debris-covered glaciers
Github Profile	https://github.com/ShashankBice
Review Services	Journal of Glaciology, Water Resources Research, Geophysical Research Letters, Polar Science