

# Abhishek V. Potnis

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## CONTACT INFORMATION

Email: potnisav@ornl.gov  
Website: <https://www.ornl.gov/staff-profile/abhishek-v-potnis>  
Google Scholar | ORCID | Github | Web of Science

## RESEARCH INTERESTS

Deep Learning for Computer Vision, Satellite Image Processing, Knowledge Representation and Reasoning, Geospatial Semantics, Remote Sensing and GIS, Natural Language Processing, Internet Of Things

My doctoral research explored the areas of Deep Learning for Satellite Image Processing and Geospatial Semantics, towards leveraging Knowledge Graphs for enhanced Scene Understanding of Remote Sensing Scenes

## EDUCATION

**Indian Institute of Technology Bombay**  
M.Tech. - PhD. Dual Degree July 2014 - Feb. 2022  
Specialization: Geoinformatics  
CPI: 9.28

**University of Mumbai**  
Bachelors of Engineering (B.E) July 2009 - July 2013  
Specialization: Computer Engineering  
Percentage: 74.26

## PROFESSIONAL EXPERIENCE

**Research Associate in Machine Learning  
GeoAI Group, Geographic Data Science Section,  
Oak Ridge National Laboratory, USA** Apr. 2022 - Present  
 Developing scalable machine learning driven geospatial image analytics workflows for humanitarian application for training and deployment over High Performance Computing platforms

**Artificial Intelligence Researcher  
CrowdWorks Inc.**  
*Freelance - Remote* Nov. 2021 - Mar. 2022  
 Leveraged Knowledge Graphs in tandem with Computer Vision approaches for enhanced Scene Understanding for Autonomous Self-Driving Vehicles  
 Implemented an end-to-end workflow for implicit knowledge mining for autonomous vehicles for intelligent decision-making in real-world on-road scenarios

**Google Summer of Earth Engine 2019 - Research Programme  
Identifying Cropping Patterns using Machine Learning for Tracing Wildlife  
Conflict in India** Jun. 2019 - Aug. 2019  
*Organization: Centre for Wildlife Studies / Mentor: Anubhav Vanamamalai*  
 Implemented Supervised Satellite Image Classification for identifying different crop types using Google Earth Engine for understanding wildlife conflict  
 Experimented with different classification approaches such as Random Forest, SVM and ANN, to maximize model performance

**Google Summer of Code 2016** May 2016 - Aug. 2016  
**Enabling Cesium for Liquid Galaxy, Organization: Liquid Galaxy**  
*Mentor: Andrew Leahy, Western Sydney University*

- ❑ Developed a web application, enabling Cesium - a WebGL based virtual globe to run across the multiple displays, providing an immersible experience to the users
- ❑ Focused on endowing Cesium with features such as Camera Synchronization, Content Synchronization across the displays and Space Navigation Camera Control.

### Google Summer of Code 2015

May 2015 - Aug. 2015

**NASA's Data Curtains from Space**, *Organization: Cesium Community*

*Mentors: Ryan Boller, Mike McGann, NASA Goddard Space Flight Center*

- ❑ Developed a web application to process and visualize LiDAR Profiles captured by the CALIPSO Satellite with the orbital tracks of the satellite and Aqua-MODIS-Reflectance as the base layer, using CesiumJS

### ❑ Geospatial Knowledge Graph Construction Workflow for Semantics-Enabled Remote Sensing Scene Understanding

Abhishek Potnis, Surya S Durbha, Rajat Shinde, Pratyush Talreja

*Advances in Scalable and Intelligent Geospatial Analytics, 2023, CRC Press*

### ❑ High-Performance Computing for Processing Big Geospatial Disaster Data

Pratyush V. Talreja, Surya S Durbha, Rajat C Shinde, Abhishek V. Potnis

*Advances in Scalable and Intelligent Geospatial Analytics, 2023, CRC Press*

### ❑ Geosemantic Standards-Driven Intelligent Information Retrieval Framework for 3D LiDAR Point Clouds

Rajat C. Shinde, Surya S. Durbha, Abhishek V. Potnis, Pratyush V. Talreja

*Advances in Scalable and Intelligent Geospatial Analytics, 2023, CRC Press*

### ❑ Semantics-Driven Remote Sensing Scene Understanding Framework for Grounded Spatio-Contextual Scene Descriptions

Abhishek Potnis, Surya Durbha, Rajat Shinde

*ISPRS International Journal of Geo-Information, 2021*

Ontologies Developed: <https://github.com/abhishekv/Sem-RSSU>

### ❑ LidarCSNet: A Deep Convolutional Compressive Sensing Reconstruction Framework for 3D Airborne Lidar Point Cloud

Rajat Shinde, Surya Durbha, Abhishek Potnis

*ISPRS Journal of Photogrammetry and Remote Sensing, 2021*

### ❑ Towards Visual Exploration of Semantically Enriched Remote Sensing Scene Knowledge Graphs(RSS-KGs)

Abhishek Potnis, Rajat Shinde, Surya Durbha

*IEEE International Geoscience and Remote Sensing Symposium 2021 (IGARSS 2021)*

Visual Interface Developed: <http://www.geosysiot.in/tools/rssKG-Explorer/>

### ❑ Towards Enabling Deep Learning based Question Answering for 3D LiDAR Point Clouds

Rajat Shinde, Surya Durbha, Abhishek Potnis, Pratyush Talreja, Gaganpreet Singh

*IEEE International Geoscience and Remote Sensing Symposium 2021 (IGARSS 2021)*

### ❑ Real-time Embedded HPC based Earthquake Damage Mapping using 3D LiDAR Point Clouds

Pratyush Talreja, Surya Durbha, Rajat Shinde, Abhishek Potnis

*IEEE International Geoscience and Remote Sensing Symposium 2021 (IGARSS 2021)*

### ❑ Towards Natural Language Question Answering Over Earth Observation Linked Data Using Attention-Based Neural Machine Translation

Abhishek Potnis, Rajat Shinde, Surya Durbha

*IEEE International Geoscience and Remote Sensing Symposium 2020 (IGARSS 2020), United States of America*

PEER REVIEWED  
PUBLICATIONS

- ❑ **Online Point Cloud Super Resolution Using Dictionary Learning For 3D Urban Perception**  
 Rajat Shinde, Abhishek Potnis, Surya Durbha  
*IEEE International Geoscience and Remote Sensing Symposium 2020 (IGARSS 2020), United States of America*
- ❑ **Multi-Class Segmentation of Urban Floods from Multispectral Imagery using Deep Learning.**  
 Abhishek Potnis, Rajat Shinde, Surya Durbha, Kuldeep Kurte  
*IEEE International Geoscience and Remote Sensing Symposium 2019 (IGARSS 2019), Japan*
- ❑ **Semantics enabled Spatio-Temporal Modeling of Earth Observation Data: An application to Flood Monitoring.**  
 Kuldeep Kurte, Abhishek Potnis, Surya Durbha  
*ACM SIGSPATIAL 2019 International Workshop on Advances in Resilient and Intelligent Cities 2019 (ARIC 2019), United States of America*
- ❑ **A Semantic Framework for Spatial Query Reformulation for Disaster Monitoring Applications.**  
 Kuldeep Kurte, Abhishek Potnis, Rajat Shinde, Surya Durbha  
*IEEE International Geoscience and Remote Sensing Symposium 2019 (IGARSS 2019), Japan*
- ❑ **Compressive Sensing based Reconstruction and Classification of VHR Disaster Satellite Imagery Using Deep Learning.**  
 Rajat Shinde, Abhishek Potnis, Surya Durbha, Prakash Andugula  
*IEEE International Geoscience and Remote Sensing Symposium 2019 (IGARSS 2019), Japan*
- ❑ **Rapid Earthquake Damage Detection using Deep Learning from VHR Remote Sensing Images.**  
 Ujwala Bhangale, Surya Durbha, Abhishek Potnis, Rajat Shinde  
*IEEE International Geoscience and Remote Sensing Symposium 2019 (IGARSS 2019), Japan*
- ❑ **A Geospatial Ontological Model for Remote Sensing Scene Semantic Knowledge Mining for the Flood Disaster.**  
 Abhishek Potnis, Surya Durbha  
*IEEE International Geoscience and Remote Sensing Symposium 2018 (IGARSS 2018), Spain*
- ❑ **On-Board Biophysical Parameters Estimation using High Performance Computing.**  
 Pratyush Talreja, Surya Durbha, Abhishek Potnis  
*IEEE International Geoscience and Remote Sensing Symposium 2018 (IGARSS 2018), Spain*
- ❑ **A Spatio-Temporal Ontological Model for Flood Disaster Monitoring.**  
 Kuldeep Kurte, Surya Durbha, Roger King, Nicolas Younan, Abhishek Potnis  
*IEEE International Geoscience and Remote Sensing Symposium 2017 (IGARSS 2017), United States of America*
- ❑ **Exploring Visualization of Geospatial Ontologies Using Cesium**  
 Abhishek Potnis, Surya Durbha  
*International Workshop on Visualization and Interaction for Ontologies and Linked Data (VOILA 2016), International Semantic Web Conference 2016 (ISWC 2016), Japan*  
 Visual Interface Developed: <http://www.geosysiot.in/tools/geoPoliticalOntoViz/>

**Doctoral Thesis: Semantics-driven Scene Understanding and Multi-modal Rendering from Remote Sensing Scenes**

*Supervisor: Prof. Surya Durbha*

- ❑ Leveraging **Deep Learning based Semantic Segmentation** in tandem with a **Knowledge based approach** for Formalization, Extraction and Mining of **Contextual Spatial Semantics**
- ❑ Modelling Remote Sensing Scenes in the form of **Knowledge Graphs** through the **development of Ontologies**
- ❑ Multi-modal rendering of Remote Sensing Scene Knowledge Graphs(RSS-KGs) in the form of **Grounded Contextual Natural Language Scene Descriptions** and **Visualizations** to enhance the interpretability and understanding of Remote Sensing Scenes, focusing on disaster scenarios

**Bachelor's Thesis: An Open Web App for Editing and Storing Rich Text Documents** Jun. 2012 - Jun. 2013

*Mozilla Student Project*

*Supervisors: Dr. David Rajchenbach-Teller, Mozilla and Prof. Sangita Chaudhari*

- ❑ Worked in a group of 3 to develop a ubiquitous web application to edit rich text documents
- ❑ The web app made use of IndexedDB API of HTML5 to store and retrieve user documents
- ❑ The web app supported adding pictures from gallery and also printing of documents

**Cybertech Systems and Software Ltd.**

Dec. 2014

*Role: Winter Intern - GIS Web Developer*

- ❑ Developed Keyhole Markup Language(KML) File Reader Widget for ESRI's Web App Builder using ESRI's ArcGIS JS API
- ❑ Developed a proof of concept prototype location based web application with offline usability for Hydrant Maintenance Personnel to record maintenance related events

**Mozilla Firefox**

2012 - 2016

*Code and Documentation Contributions*

- ❑ Fixed front-end and performance related bugs by authoring code patches in JavaScript and C++ for Mozilla Firefox
- ❑ Edited and improved technical articles on Mozilla Developer Network
- ❑ Recognized as a core contributor in the "about:credits" section of Mozilla Firefox
- ❑ Recognized as a core contributor on the Mozilla Monument outside Mozilla's Office in San Francisco, CA, USA.

OPEN SOURCE  
CONTRIBUTIONS

**Identifying Solar Farms in India using Machine Learning with Google Earth Engine** Mar. 2019

*Google Earth Engine India Advanced Summit Buildathon 2019*

- ❑ Worked in a team to employ the Random Forest Classifier with R,G,B, NIR and VV Polarization as features to obtain an Accuracy of 81.07%
- ❑ Added Wavelet Kernel-based Convolution as an additional feature to detect solar panels' texture thus improving the Accuracy to 83.65%

OTHER  
PROJECTS

**SenseQube - An Internet of Things(IoT) based platform for Smart Agriculture** 2017 - 2020

*Research Project funded by the Ministry of Electronics and Information Technology, Government of India*

- ❑ Worked in a team, to develop an IoT based end-to-end platform consisting of an integrated weather station to advice farmers in implementing precision agriculture practices
- ❑ Worked with sensors and embedded systems for data dissemination along with server

side scripting, databases and machine learning models to generate actionable insights such as crop water requirement and disease susceptibility for farmers to improve crop yield

- ❑ Presented at the DST-JST Indo-Japan Project Meeting under the Strategic International Collaborative Research Program (SICORP) at IIT Hyderabad

**An Integrated Client-Server based Interoperable Geographic Information System for Forest Fire Monitoring** Aug. 2015 - Oct. 2015

*Geospatial Data Interoperability and Standards Course Project*

- ❑ Worked in a team to develop an AJAX driven interactive web client aimed at integrating and querying geospatial data conforming to Open Geospatial Consortium(OGC) specifications
- ❑ Integrated services such as Web Feature Service(WFS), Web Map Service(WMS), Web Coverage Service(WCS) and Sensor Observation Service(SOS) to form a web mash-up

**Satellite Image Classifier using Parallelepiped Classification**

*Satellite Image Processing Course Project*

Aug. 2014 - Oct. 2014

- ❑ Studied and implemented the pixel based Parallelepiped Classifier for classifying satellite imagery into land use land cover classes
- ❑ Developed an interactive web application for training the classifier to generate a model and perform satellite image classification

**Emergency Response Route Navigation and Simulation of Bus Service in IIT Bombay Campus** Aug. 2014 - Oct. 2014

*Geographic Information Systems Course Project*

- ❑ Implemented a web app for route navigation, to identify the nearest bus from an emergency location and guide it using the shortest possible route computed using Dijkstra's algorithm

TEACHING  
EXPERIENCE

Teaching Assistant, GNR 629: Advances in Geospatial Standards, Interoperability and Knowledge Discovery

Teaching Assistant, GNR 605: Principles of Geographic Information Systems

Teaching Assistant, GNR 636: Remote Sensing of Vegetation

Teaching Assistant, GNR 615: Geographic Information Systems Lab

Teaching Assistant, GNR 402: Introduction to Geographic Information Systems

RELEVANT  
SKILLS

**Languages, Frameworks , Databases, Tools and Version Control Systems**

*Java, C++, Python, HTML5, CSS3, JavaScript, PHP, JSP, AJAX, XML;*

*Keras, TensorFlow;*

*Android SDK, NodeJS, jQuery, Twitter Bootstrap, ArcGIS JS API;*

*Oracle, MySQL, PostGreSQL, PostGIS, SPARQL, GeoSPARQL;*

*ArcGIS, QGIS, Erdas Imagine;*

*Git, Mercurial*

CERTIFICATIONS

**Building Transformer-Based NLP Applications**

Mar. 2023

*NVIDIA Deep Learning Institute*

**Natural Language Processing in TensorFlow**

Jan. 2020

*Instructor: Laurence Moroney, Google*

**Convolutional Neural Networks in TensorFlow**

Jan. 2020

*Instructor: Laurence Moroney, Google*

**Introduction to TensorFlow for Artificial Intelligence, Machine Learning, and Deep Learning** Dec. 2019

*Instructor: Laurence Moroney, Google*

**Deep Learning Specialization**

Apr. 2019

*Instructor: Dr. Andrew Ng, Coursera*

**Oracle Certified Professional Java Programmer SE - 6**

Jul. 2012

*Secured 96% in the OCJP SE-6 Certification Examination*

PROFESSIONAL  
MEMBERSHIPS

- Institute of Electrical and Electronics Engineers (IEEE) Member
- IEEE Geoscience and Remote Sensing Society (GRSS) Member
- Association for Computing Machinery (ACM) Member

SYNERGISTIC  
ACTIVITIES

**Manuscript Peer-Reviewer - Journals**

***Total Journal Manuscripts Reviewed = 28***

- International Journal of Applied Earth Observation and Geoinformation, Elsevier  
*Manuscripts Reviewed - 11*
- IEEE Geoscience and Remote Sensing Letters (IEEE GRSL)  
*Manuscripts Reviewed - 5*
- IEEE Transactions on Geoscience and Remote Sensing (IEEE TGRS)  
*Manuscripts Reviewed - 2*
- Journal of the Indian Society of Remote Sensing, Springer  
*Manuscripts Reviewed - 3*
- IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing (IEEE JSTARS)  
*Manuscripts Reviewed - 1*
- Geo-spatial Information Science, Taylor & Francis  
*Manuscripts Reviewed - 2*
- Earth Science Informatics, Springer  
*Manuscripts Reviewed - 1*
- Transactions in GIS, Wiley  
*Manuscripts Reviewed - 1*
- Journal of Open Source Software  
*Manuscripts Reviewed - 2*

**Other Peer-Review and Program Committee Appointments**

- Reviewer for Albert Einstein Distinguished Educator Fellowship (AEF) Program (2023-2024), U.S. Department of Energy
- Reviewer for IEEE International Geoscience and Remote Sensing Symposium 2023
- Reviewer for ACM SIGSPATIAL 2023
- Program Committee Member, 15th International Workshop on Computational Transportation Science (IWCTS 2022), ACM SIGSPATIAL 2022
- Program Committee Member, WebNLG+ Workshop, International Conference on Natural Language Generation (INLG 2020)
- Reviewer for IEEE International Conference on Communication, Information & Computing Technology 2021

**Session Chair**

- [*Session Organizer*] Scaling GeoAI for Rapid Disaster Response and Humanitarian Applications, IEEE International Geoscience and Remote Sensing Symposium 2023
- Different Applications with Remote Sensing Data, IEEE International Geoscience and Remote Sensing Symposium 2023

**Session Manager**

- IEEE International India Geoscience and Remote Sensing Symposium 2020
- IEEE International Geoscience and Remote Sensing Symposium 2020

## AWARDS AND ACHIEVEMENTS

- ❑ Recipient of the Academic Research Credits Grant under the framework of Google Cloud Platform Research Credits Programme
- ❑ Successfully completed the Google Summer of Earth Engine project "Machine Learning based Mapping of Croplands with Google Earth Engine for Identifying Human-Wildlife Conflict Locations" with Centre for Wildlife Studies
- ❑ Winner of Google Earth Engine India Advanced Summit Buildathon 2019 for the project - "Identifying Solar Farms in India using Machine Learning with Google Earth Engine"
- ❑ Successfully completed an 8-week Entrepreneurship Bootcamp (July-September 2019) organized by TiE Delhi-NCR for ITRA, Digital India Corporation, New Delhi
- ❑ Quarter-Finalist for the India Innovation Challenge 2017 hosted by IIM Bangalore and conducted by Government of India and Texas Instruments
- ❑ Recipient of the IEEE Geoscience and Remote Sensing Society Travel Grant to present at IEEE Geoscience and Remote Sensing Symposium (IGARSS) 2018, Spain
- ❑ Recipient of the International Semantic Web Conference 2016 Student Travel Grant funded by Semantic Web Science Association (SWSA) and the US National Science Foundation (NSF) to present at ISWC 2016 in Kobe, Japan
- ❑ Recipient of the Ministry of Human Resources Development(MHRD), Govt. of India Fellowship
- ❑ Successfully completed Google Summer of Code 2016 project "Enabling Cesium with Liquid Galaxy" with Liquid Galaxy
- ❑ Winner of the Esri India's mApp Your Way 2015 App Development Challenge for the application - 'Route Navigation and Pothole Monitoring using Crowd Sourced Pothole Mapping' in Dec. 2015
- ❑ Successfully completed Google Summer of Code 2015 project "NASA's Data Curtains from Space" with Cesium
- ❑ Represented IIT Bombay for the SAP InnoJAM Challenge 2016 held at SAP Labs, Bangalore
- ❑ Name listed as a Core Code Contributor on the Mozilla Monument outside Mozilla's Office in San Francisco, CA, USA
- ❑ Successfully completed Module 1 of French Language Course conducted by International Relations Office, IIT Bombay, in association with Embassy of France, New Delhi in Dec. 2014

## SELECTED TALKS

- ❑ **"AI Beyond the Engineering"**  
Panel Discussion at IEEE HKN TechX Conference April 2023
- ❑ **"Towards Semantics driven Scene Understanding"**  
International Research Workshop on Advances in Deep Learning and Applications at Indian Institute of Information Technology (IIIT), Sri City, India February 2022
- ❑ **"Knowledge Graphs driven Remote Sensing Scene Understanding"**  
IEEE GRSS sponsored Short-term Training Program on Computational Intelligence in Remote Sensing at RAIT, Mumbai December 2021
- ❑ **"Machine Learning based Multi-Class Segmentation of Urban Flood Remote Sensing Scenes with Google Earth Engine"**  
Lightning Talk, Google's Geo For Good Summit 2020 October 2020
- ❑ **"Deep Learning for Computer Vision and Natural Language Processing"**  
Invited Talk, Vidyavardhini's College of Engg. and Tech., Mumbai June 2020
- ❑ **"Machine Learning based Crop Mapping using Google Earth Engine"**  
Partner Panel Talk, Google's Geo for Good Summit 2019, USA September 2019
- ❑ **"TensorFlow and Google Earth Engine"**  
Invited Talk, Google Earth Engine Student Summit, IIT Bombay September 2019
- ❑ **"Flood Mapping with Google Earth Engine"**  
Invited Talk, Google Earth Engine India Community July 2019
- ❑ **"Role of Deep Learning in Disaster Monitoring"**

POSITIONS OF  
RESPONSIBILITY

- Invited Talk, Intel AI Meetup, Mumbai September 2018
- ❑ **“QGIS Workshop ”** - Two-day Workshop with Dr. Kuldeep Kurte  
Invited Workshop, GeoWeek 2017, Fergusan College, Pune October 2017
- ❑ **“History of Open Source and Contributing to Mozilla”**  
Thadomal Shahani College of Engineering(TSEC), Mumbai October 2014
- ❑ **“Contributing to Open Source”**  
MozTalk, Web and Coding Club, IIT Bombay June 2013
- ❑ **“Preparing for Google Summer of Code”**  
Talks conducted annually at CSRE, IIT Bombay in January of 2017 - 2021
  
- ❑ Volunteer for the Trillion Pixel Challenge 2023 at Oak Ridge National Laboratory 2023
- ❑ Organizing Team Member, Google Earth Engine Student Summit, IIT Bombay 2019
- ❑ Organizing Team Member, Asia-Pacific Federation for Information Technology in Agriculture(AFITA) 2018 Conference, IIT Bombay 2018
- ❑ Organizing Team Member, De-HPC Conference, IIT Bombay 2016
- ❑ Institute Student Mentorship Program Web Nominee, IIT Bombay 2016
- ❑ Technical Head, Computer Society of India - VCET Student Chapter 2013