

# Ankush Khandelwal

Denver, Colorado

☎ (+1) 612 300 7969 | ✉ ankush.kwal@gmail.com | 🏠 ankushkhandelwal.github.io | 🌐 ankush-khandelwal

## Summary

I am an experienced machine learning scientist with a product-focused mindset. Through effective communication and collaboration, I have contributed to several multi-disciplinary projects funded by NSF, NASA and DARPA with a proven track record in developing AI for remote sensing data applications (27 peer-reviewed publications and 7 patents). As a proactive and self-motivated professional, I have successfully led ML projects from research to product delivery, driven by customer needs. I value mentorship, and aspire to lead cross-functional teams to deliver real-world impact. Please visit my website to learn more.

## Skills

<b>Tools</b>	Google Cloud Platform (App Engine, Dataflow, Big Query) Docker, Git, REST APIs, SQL
<b>Programming</b>	Python, Pytorch, Pyro, Jupyter, Pandas
<b>Geospatial</b>	Google Earth Engine, Geopandas, GDAL, Leaflet, Mapbox, PostgreSQL, QGIS, ArcGIS

## Experience

### Terra Cover | Co-Founder and CTO

Denver, USA | 01/2020 - Present

- Successfully secured a \$255K NSF SBIR grant (~15 % success rate), and established product-market fit for two core products through deep customer engagements, resulting in multiple paid pilot projects.
- Led the development of ML algorithms (semantic segmentation, anomaly detection, and variational inference) and streamlined the development cycle from data collection to product delivery on Google Cloud Platform.
- Implemented an LLM-based pipeline using OpenAI's API to reduce human annotation time by 70% for geo-tagging 20,000 image captions from 9,000 news articles, resulting in a comprehensive catalog of past flood events.

### University of Minnesota | Researcher

Minneapolis, USA | 05/2019 - Present

- Developing a new semantic segmentation network to create the first high-resolution map of Arctic lakes using limited training data for reducing the uncertainty in the estimation of methane emissions from small lakes.
- Developing a new pre-training strategy for building a large-scale foundation model for temporal sequences of satellite imagery sampled from across the world.
- Created the first global dataset containing surface water history of over 0.5 million water bodies (published as an open-source dataset in Nature Scientific Data) to facilitate studies on the impact of climate on water resources.
- Mentored 3 graduate students and co-authored several peer reviewed publications on topics such as advancing RNNs and Transformer based approaches for modeling timeseries data for hydrology.

### IBM T.J. Watson Research Center | Research Intern

Yorktown Heights, USA | 06/2016 - 08/2016

- Contributed to a publication on anomaly detection from multivariate noisy sensor data.
- Implemented key anomaly detection algorithms for IBM's anomaly detection software.

### NASA Ames Research Center | Research Intern

Mountain View, USA | 06/2015 - 08/2015

- Set up the project to study the dependencies of forest ecosystems on climate variables.
- Implemented different regression algorithms on NASA's distributed computing environment.

### University of Minnesota | Graduate Research Assistant

Minneapolis, USA | 09/2012 - 05/2019

- Actively engaged in interdisciplinary discussions to help launch multiple projects aimed at advancing AI for tracking land cover changes such as palm oil plantations, surface water changes, and cover crop detection.
- Doctoral Dissertation Fellowship winner for research on mapping global water changes with machine learning.
- Lead writer of a \$1.43 million NSF grant on advancing deep learning to monitor global land cover change.

## Open Source Contributions

- **Khandelwal, A.**, Karpatne, A., Ravirathinam, P., Ghosh, R., Wei, Z., Dugan, H. A., ... Kumar, V. (2022). ReaLSAT, a global dataset of reservoir and lake surface area variations. Scientific Data, 9(1), 1–12.
- Schwenk, J., **Khandelwal, A.**, Fratkin, M., Kumar, V., Foufoula-Georgiou, E. (2017a). High spatiotemporal resolution of river planform dynamics from Landsat: The RivMAP toolbox and results from the Ucayali River. Earth and Space Science, 4(2), 46–75.

## Education

### University of Minnesota

Ph.D. in Computer Science

Minneapolis, USA | 09/2012 - 05/2019

### International Institute of Information Technology-Hyderabad

B.Tech + MS by Research in Computer Science and Engineering

Hyderabad, India | 07/2006 - 03/2012

## Selected Patents

- **Khandelwal, A.**, Karpatne, A. and Kumar, V., University of Minnesota, 2023. Satellite image classification across multiple resolutions and time using ordering constraint among instances. U.S. Patent 11,625,913.
- Kumar, V., Jia, X., **Khandelwal, A.** and Karpatne, A., University of Minnesota, 2021. Discovery of shifting patterns in sequence classification. U.S. Patent 11,037,022.
- Kumar, V., Mithal, V., Nayak, G. and **Khandelwal, A.**, University of Minnesota, 2020. Classification of highly-skewed data. U.S. Patent 10,776,713.

## Selected Publications

- Renganathan, A., Ghosh, R., **Khandelwal, A.**, & Kumar, V. (2023). Task Aware Modulation using Representation Learning: An Approach for Few Shot Learning in Heterogeneous Systems. arXiv Preprint arXiv:2310. 04727.
- Li, X., **Khandelwal, A.**, Jia, X., Cutler, K., Ghosh, R., Renganathan, A., ... Others. (2022). Regionalization in a global hydrologic deep learning model: from physical descriptors to random vectors. Water Resources Research, 58(8), e2021WR031794.
- Ghosh, R., Ravirathinam, P., Jia, X., **Khandelwal, A.**, Mulla, D. and Kumar, V., 2021, December. Calcrop21: A georeferenced multi-spectral dataset of satellite imagery and crop labels. In 2021 IEEE International Conference on Big Data (Big Data) (pp. 1625-1632). IEEE.
- **Khandelwal, A.**, Xu, S., Li, X., Jia, X., Stienbach, M., Duffy, C., ... Kumar, V. (2020). Physics Guided Machine Learning Methods for Hydrology. arXiv Preprint arXiv:2012. 02854.
- Jia, X., **Khandelwal, A.**, Mulla, D. J., Pardey, P. G., & Kumar, V. (2019). Bringing automated, remote-sensed, machine learning methods to monitoring crop landscapes at scale. Agricultural Economics, 50, 41–50.
- Jia, X., Li, S., **Khandelwal, A.**, Nayak, G., Karpatne, A. and Kumar, V., 2019, May. Spatial context-aware networks for mining temporal discriminative period in land cover detection. In Proceedings of the 2019 SIAM International Conference on Data Mining (pp. 513-521). Society for Industrial and Applied Mathematics.
- Jia, X., **Khandelwal, A.**, Nayak, G., Gerber, J., Carlson, K., West, P., & Kumar, V. (2017a). Incremental Dual-memory LSTM in Land Cover Prediction. Proceedings of the 23rd ACM SIGKDD International Conference on Knowledge Discovery and Data Mining, 867–876. ACM.
- Mithal, V., Nayak, G., **Khandelwal, A.**, Kumar, V., Oza, N. C., & Nemani, R. (2017). RAPT: Rare Class Prediction in Absence of True Labels. IEEE Transactions on Knowledge and Data Engineering, 29(11), 2484–2497.
- **Khandelwal, A.**, Karpatne, A., Marlier, M. E., Kim, J., Lettenmaier, D. P., & Kumar, V. (2017). An approach for global monitoring of surface water extent variations in reservoirs using MODIS data. Remote Sensing of Environment, 202, 113–128.
- Jia, X., **Khandelwal, A.**, Gerber, J., Carlson, K., West, P., & Kumar, V. (2016). Learning large-scale plantation mapping from imperfect annotators. 2016 IEEE International Conference on Big Data (Big Data), 1192–1201. IEEE.
- **Khandelwal, A.**, Mithal, V., & Kumar, V. (2015). Post Classification Label Refinement Using Implicit Ordering Constraint Among Data Instances. Data Mining (ICDM), 2015 IEEE International Conference On, 799–804. IEEE.
- Mithal, V., **Khandelwal, A.**, Boriah, S., Steinhäuser, K., & Kumar, V. (2013). Change detection from temporal sequences of class labels: Application to land cover change mapping. Proceedings of the 2013 SIAM International Conference on Data Mining, 650–658. Society for Industrial and Applied Mathematics.

## Synergistic Activities

### NSF I-Corps Customer Discovery Bootcamp | Entrepreneurial Lead

Detroit, USA | 09/2018 - 10/2018

- Conducted 100 interviews with stakeholders in commodity trading, and hydro-power generation segments.
- Used lean startup methodologies to assess problem-solution fit for satellite imagery processing technology.