Ankush Khandelwal

Denver, Colorado

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Summary

Experienced machine learning scientist with a product-focused mindset. Extensive experience in working on multi-disciplinary projects solving complex real-world problems with a proven record of publications and patents. Highly independent professional with a proven record of launching projects from scratch and aligning customer needs with project goals. Passionate about mentorship and aspiring to lead cross-disciplinary teams to deliver real-world impact.

Interests: Computer Vision, Spatio-temporal Analysis, Agile Development, Product Management

Experience

Terra Cover | Co-Founder and CTO   *Denver, USA | Jan. 2020 - Present*

- Successfully raised $ 250K from National Science Foundation SBIR grant for startups (≈15 % success rate).
- Established product-market fit for two core products through deep customer engagements and paid pilots.
- Managed ML researchers focusing on semantic segmentation, anomaly detection, and variational inference algorithms to rapidly scale innovative processing of earth observation data on Google Cloud Platform.
- Setup a LLM based pipeline (using OpenAI's API) to achieve 70% reduction in human annotation time to geo-tag news articles for building a catalog of past flood events.

University of Minnesota | Researcher   *Minneapolis, USA | May. 2019 - Present*

- Leading a project to create the first high-resolution map of Arctic lakes using deep learning with the aim to reduce uncertainty in estimation of methane emissions from small lakes.
- Supervising a graduate student to test a novel pre-training strategy for building a foundation model for temporal sequences of satellite imagery.
- Built new techniques for modeling long-term dependencies in time series data using RNNs and Transformers.
- Supervised 3 graduate students on different machine learning projects.
- Co-authored 9 peer reviewed publications.

IBM T.J. Watson Research Center | Research Intern   *Yorktown Heights, USA | Jun. 2016 - Aug. 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 | Jun. 2015 - Aug. 2015*

- Setup the project to study the dependencies of forest ecosystems on climate variables using satellite imagery and weather data.
- Implemented different regression algorithms on NASA's distributed computing environment.

University of Minnesota | Graduate Research Assistant   *Minneapolis, USA | Sep. 2012 - May. 2019*

- Developed new machine learning algorithms for analyzing satellite imagery at scale.
- Actively participated in cross-disciplinary discussions and launched multiple projects for the lab including urbanization, palm oil plantation mapping, surface water mapping, and crop detection.
- Doctoral Dissertation Award winner for research on mapping global water changes with machine learning.
- Mentored 7 undergraduate students supported by the different grants of Prof. Vipin Kumar.
- Co-authored 18 peer-reviewed publications, 7 patents, and created a state-of-the-art dataset.

Education

University of Minnesota   *Minneapolis, USA | 2012 - 2019*
PhD in Computer Science

International Institute of Information Technology, Hyderabad. India   *Hyderabad, India | 2006 - 2012*
MS by Research Dual Degree (B.Tech + MS) in Computer Science and Engineering

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.
- **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.
- 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., 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.
- Idé, T., **Khandelwal, A.**, & Kalagnanam, J. (2016). Sparse Gaussian Markov Random Field Mixtures for Anomaly Detection. Data Mining (ICDM), 2016 IEEE 16th International Conference On, 955–960. 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., Steinhaeuser, 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 | Sep. 2018 - Oct. 2018*
- Conducted 100 interviews with stakeholders in commodity trading, and hydro-power generation market segments.
- Used lean startup methodologies to assess problem-solution fit for satellite imagery processing technology.

Grant Writing *Detroit, USA | Sep. 2018 - Oct. 2018*
- *SBIR Phase I: A Physics Guided Machine Learning Framework for Monitoring Rivers using Satellite Imagery.* NSF Small Business Innovation Research Program, $255,000, Jul 2021 - Dec 2022. **(Principal Investigator)** NSF Grant #2045444.
- *BIGDATA: Advancing Deep Learning to Monitor Global Change.* NSF Translational Impacts Program, $1.43 million, Nov 2018 - Jul 2023. **(Lead Contributor)** NSF Grant #1838159.

Skills

DevOps	Google Cloud Platform, Docker, Git, AI model tracking (wandb), REST APIs, Databases (SQL, Google Big Query)
Progamming	Python, Pytorch, Tensorflow, Pyro, Jupyter, Pandas
Geospatial	Google Earth Engine, Geopandas, GDAL, Shapely, Leaflet, Mapbox, Postgres