Chenhui **Zhang**

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Education

Massachusetts Institute of Technology *Cambridge, MA*

PH.D. STUDENT IN SOCIAL AND ENGINEERING SYSTEMS, INSTITUTE FOR DATA, SYSTEMS, AND SOCIETY (IDSS) *Sep. 2023 - Present*

- **Research Interests:** Geospatial Knowledge Representation in Foundation Models · Machine Learning for Earth Observation · Trustworthy Machine Learning

University of Illinois at Urbana-Champaign *Urbana, IL*

BS AND BSLAS IN COMPUTER SCIENCE AND STATISTICS (DUAL MAJOR) | GPA: 3.97 / 4.0 *Aug. 2019 - May 2023*

- Graduated with Highest Honors (Summa Cum Laude)

Research Experience

Earth Intelligence Lab *Cambridge, MA*

RESEARCH ASSISTANT (Advisor: PROF. SHERRIE WANG) *Sep. 2023 - Present*

- Develop benchmark datasets for the geospatial knowledge of vision-language models.
- Curate multi-modal world knowledge benchmark datasets from the National Agriculture Imagery Program (NAIP) and Wikidata.

National Center for Supercomputing Applications *Urbana, IL*

RESEARCH INTERN (Advisors: PROF. KAIYU GUAN, PROF. SHENG WANG) *Dec. 2020 - Aug. 2023*

- Adapted the Segment Anything Model (SAM) for waterway segmentation through parameter-efficient fine-tuning.
- Utilized transfer learning and semi-supervised learning methods to develop models for cover crop traits and tillage practices.
- Implemented high-throughput processing pipelines for custom airborne hyperspectral remote sensing data and public multispectral satellite data on Bluewater and Delta supercomputers.
- Adapted BRDF correction pipelines for airborne hyperspectral images to GPU platforms with JAX and achieved 60x speed-up.
- Developed surrogate models of computationally expensive radiative transfer models to solve related inverse problems.
- Investigated multi-modal fusion algorithms for hyperspectral and LiDAR remote sensing data.

Secure Learning Lab *Urbana, IL*

RESEARCH INTERN (Advisors: PROF. BO LI, PROF. ATLAS WANG) *Dec. 2021 - Aug. 2023*

- Developed novel benchmark methods for the adversarial robustness of large language models.
- Led the development and maintenance of DECODINGTRUST, an open-source project for performing trustworthiness evaluations of large language models at scale.
- Contributed to the Holistic Evaluation of Language Models (HELM) project of the Stanford Center for Research on Foundation Models.
- Developed novel pruning methods to improve the certified robustness of sparse ensemble models.
- Developed novel sparse finetuning methods to improve the utility of large language models under differential privacy guarantees.

Publications

PEER-REVIEWED PUBLICATIONS

Segment Any Stream: Scalable Water Extent Detection with the Segment Anything Model
Haozhen Zheng*, **Chenhui Zhang***, Kaiyu Guan, Yawen Deng, Sherrie Wang, Bruce L Rhoads, Andrew J Margenot, Shengnan Zhou, Sheng Wang
NeurIPS 2023 Computational Sustainability: Promises and Pitfalls from Theory to Deployment

DP-OPT: Make Large Language Model Your Differentially-Private Prompt Engineer
Junyuan Hong, Jiachen T. Wang, **Chenhui Zhang**, Zhangheng Li, Bo Li, Zhangyang Wang
The Twelfth International Conference on Learning Representations (2024)

DecodingTrust: A Comprehensive Assessment of Trustworthiness in GPT Models
Boxin Wang*, Weixin Chen*, Hengzhi Pei*, Chulin Xie*, Mintong Kang*, **Chenhui Zhang***, Chejian Xu, Zidi Xiong, Ritik Dutta, Rylan Schaeffer, Sang T. Truong, Simran Arora, Mantas Mazeika, Dan Hendrycks, Zinan Lin, Yu Cheng, Sanmi Koyejo, Dawn Song, Bo Li
Thirty-seventh Conference on Neural Information Processing Systems Datasets and Benchmarks Track, **Outstanding Paper Award** (2023)

Cross-scale Sensing of Field-Level Crop Residue Cover: Integrating Field Photos, Airborne Hyperspectral Imaging, and Satellite Data
Sheng Wang, Kaiyu Guan, **Chenhui Zhang**, Qu Zhou, Sibo Wang, Xiaocui Wu, Chongya Jiang, Bin Peng, Weiye Mei, Kaiyuan Li, Ziyi Li, Yi Yang, Wang Zhou, Yizhi Huang, Zewei Ma
Remote Sensing of Environment 285 (2023). P. 113366

Airborne Hyperspectral Imaging of Cover Crops through Radiative Transfer Process-Guided Machine Learning
Sheng Wang, Kaiyu Guan, **Chenhui Zhang**, Chongya Jiang, Qu Zhou, Kaiyuan Li, Ziqi Qin, Elizabeth A. Ainsworth, Jingrui He, Jun Wu, Dan Schaefer, Lowell E. Gentry, Andrew J. Margenot, Leo Herzberger

Using Soil Library Hyperspectral Reflectance and Machine Learning to Predict Soil Organic Carbon: Assessing Potential of Airborne and Space-borne Optical Soil Sensing
Sheng Wang, Kaiyu Guan, **Chenhui Zhang,** DoKyoung Lee, Andrew J. Margenot, Yufeng Ge, Jian Peng, Wang Zhou, Qu Zhou, Yizhi Huang

Preprints & Works In-submission

Good at Captioning, Bad at Counting: Benchmarking GPT-4V on Earth Observation Data
Chenhui Zhang, Sherrie Wang

Credit: Diversified Pruning for Certifiably Robust Model Ensemble
Chenhui Zhang, Linyi Li, Tianlong Chen, Zhangyang Wang, Bo Li
Under Review (2023)

Honors & Awards

2023	**Michael Hammer Fellowship**, Massachusetts Institute of Technology	*Cambridge, MA*
2023	**Fiddler Innovation Fellowship Award,** National Center for Supercomputing Applications	*Urbana, IL*
2022	**Fiddler Innovation Fellowship Award,** National Center for Supercomputing Applications	*Urbana, IL*
2019 - 2022	**James Scholar Honors Program,** Grainger College of Engineering	*Urbana, IL*
2019 - 2023	**Dean's List**, Grainger College of Engineering	*Urbana, IL*

Teaching Experience

Head Course Assistant	Probability & Statistics for Computer Science, Fall 2020 - Spring 2023, University of Illinois Urbana-Champaign
Course Assistant	Introduction to Computer Science, Spring 2020, University of Illinois Urbana-Champaign

Service

Reviewer	IEEE Transactions on Pattern Analysis and Machine Intelligence
Reviewer	USENIX Security '23
Reviewer	MDPI Remote Sensing

Technical Skills

GIS	GDAL, Rasterio, QGIS, ArcGIS, Google Earth Engine
Back-end	Flask, Google Firebase, MySQL, MongoDB, Neo4j, Elasticsearch, GraphQL
Programming	C, C++, Python, Java, Kotlin, TypeScript
Machine Learning	PyTorch, Sci-kit Learn, NumPy, JAX, SLURM