ABHILEKHA DALAL

+1 862-703-0709 | adalal@ksu.edu   LinkedIn | GitHub | Google Scholar

AI/ML researcher with a PhD in Computer Science specializing in Explainable AI, Semantics, Knowledge Graphs, and Deep Learning. Experienced in developing interpretable neural networks, enhancing model transparency, and delivering scalable AI solutions. Proficient in Python, PyTorch, and TensorFlow, with a strong foundation in collaborative leadership and scalable AI solutions.

SKILLS

Artificial Intelligence - Deep Learning, Explainable AI, ML, CNNs, Computer Vision, Image Classification.
Languages – Python, Java, C++, C, HTML, JavaScript, CSS, ReactJS**.**
Software Engineering: SQL database management, real-time applications.
Libraries - TensorFlow, Keras, PyTorch, NumPy, Pandas, scikit-learn.
Collaboration: Team leadership, interdisciplinary projects, mentoring
SemWeb – Knowledge Representation and Reasoning.

EDUCATION

PhD in Computer Science   **Jan 2021 – Oct 2024**
Data Semantics Lab, Kansas State University, USA
Thesis - Understanding CNN Hidden Neuron Activations Using Concept Induction over Background Knowledge.

Master's in Computer Science   **Jan 2019- Jan 2021**
(GPA – 3.8/4) Data Semantics Lab, Kansas State University, USA
Thesis - Modular Ontology Modeling Meets Upper Ontologies: The Upper Ontology Alignment Tool

RESEARCH EXPERIENCE

Research Assistant Professor   **Nov 2024 – Present**
Center of Artificial Intelligence and Data Science, Kansas State University

- Responsible for conducting research in artificial intelligence and data science, securing research grants, engaging in outreach activities, and contributing to the university's mission through service.

Graduate Research Assistant   **Aug 2019-Oct 2024**
Data Semantics Lab, Kansas State University
- Designed a groundbreaking approach using deep-deductive reasoning over a large Wikipedia-derived concept hierarchy (about 2 million concepts) to interpret CNN neuron activations, achieving an 11.1% accuracy improvement over state-of-the-art models.
- Created ConceptLens, a Streamlit-based platform that provides real-time neural decision insights with confidence measures, featuring a user-friendly interface. Leveraged AWS to run user-study experiments for calculating confidence measures, demonstrating cloud computing proficiency. **Website Link**
- Investigated and fine-tuned various image scene classification architectures, achieving optimal performance through iterative hyperparameter tuning with TensorFlow and Keras.
- Mentored junior researchers and led the development of automation for Explainable AI project, improving project efficiency by 30% and reducing execution time by 75%.
- Spearheaded collaborations with KSU and USCB teams on projects in diverse domains, focusing on ontology modeling and knowledge graph triplification to enhance cross-domain knowledge representation.
- Developed a software tool that supports integrating different ontology modeling approaches, significantly improving output accuracy by 94% and time efficiency by 20%.

INDUSTRY EXPERIENCE

Software Developer   **Jan 2019 -Aug 2019**
K-State Housing and Dining Center, Kansas State University
- **Spearheaded** the modernization of IT Center website with ReactJS, enhancing user engagement and site performance.
- **Implemented** bug resolution strategy and code review process, leading to 30% error reduction and 15% faster website load times.

Associate Software Engineer   **Mar 2017- Dec 2018**
Nucleus Software Exports, Noida India
- **Developed and Deployed Financial Systems**: Created clean, efficient, and scalable code for finance products, actively participating in deployment and utilizing SQL for data extraction and management, demonstrating proficiency in complex queries and ETL processes.
- **Enhanced System Quality**: Played a key role in design reviews and issue resolution, leveraging debugging techniques to maintain high service quality. Conducted thorough code reviews and designed comprehensive test plans to ensure product excellence.
- **Documentation and Collaboration**: Authored detailed technical and functional documentation to facilitate knowledge transfer and collaborated with peers to align application designs with project goals.

TEACHING EXPERIENCE

Graduate Teaching Assistant   **Aug 2021 – Dec 2023**
Department of Computer Science, Kansas State University, USA
- Assisted as Instructor in creating course and class structure, selecting relevant papers for course.
- Taught and supervised lab sessions (50+ in total students).
- Responsibilities: answering students' questions, holding teaching hours, helping students through preparing for class work, create assignments, grade assignments, providing regular feedbacks.
- GTA for courses - **Explainable Deep Learning, Neuro-Symbolic Artificial Intelligence, Programming Fundamentals. Content covered: Deep Learning, Artificial Intelligence, Explainable AI, Knowledge Representation, Neuro-symbolic Systems, Symbolic Reasoning, Java Programming.**

PROJECTS AND PUBLICATIONS

Summary: 8 peer-reviewed publications (5 as senior author,3 as coauthor), co-editing a book.
Peer-Reviewed Publications
- **Dalal, A.,** Ryan,R., Barua, A., Vasserman, E., Sarker, M. K., Hitzler, P On the Value of Labeled Data and Symbolic Methods for Hidden Neuron Activation Analysis, International Conference on Neural-Symbolic Learning and Reasoning (NeSy) 2024. (**Link**)
- **Dalal, A.,** Ryan,R**.,** Hitzler, P. Error-margin Analysis for Hidden Neuron Activation Labels NeSy 2024.(**Link**)
- **Dalal, A.,** Understanding CNN Hidden Neuron Activations using Concept Induction over Background Knowledge**.** ISWC 2024 Doctoral Consortium. (**Link**)
- C. Shimizu, S. Stephen, R. Zhu, et al. (including **A. Dalal**), "The KnowWhereGraph Ontology: A Showcase," 13th International Conference on Formal Ontology in Information Systems (FOIS), 2023. (**Link**)
- C. Shimizu, S. Stephen, R. Zhu, et al. (including **A. Dalal**), KnowWhereGraph-Lite: A Perspective of the KnowWhereGraph. In the Knowledge Graph and Semantic WebConference (KGSWC) 2023. (**Link**)
- **Abhilekha Dalal**, Cogan Shimizu, Pascal Hitzler. Bridging Upper Ontology and ModularOntology Modeling: A Tool and Evaluation. In the Knowledge Graph and Semantic WebConference (KGSWC) 2021. (**Link**)
- **Dalal, Abhilekha**, Cogan Shimizu, and Pascal Hitzler. "Modular Ontology Modeling Meets Upper Ontologies: The Upper Ontology Alignment Tool." In The 19th International SemanticWeb Conference, volume 2721, pages 119–124, 2020. (**Link**)
- Samatha Ereshi Akkamahadevi, **Abhilekha Dalal,** Pascal Hitzler Automating CNN Neuron Interpretation using Concept Induction ISWC 2024. (**Link**)

Other Publications (Book, Reports, Projects).
- **Co-editor**, IOS Press Book (in progress) – a comprehensive volume with approximately 50 research chapters and 1,000 pages
- Cogan Shimizu, **Abhilekha Dalal**, Pascal Hitzler, Evan Wallace, Frank Riddick, Scott Niemann, Joe Tevis, Farhad Ameri, Ontology Modules for Grain Supply Chain Tracking, NIST 2021(internal project report).
- B. Paudel, **A. Dalal,** A.S. Dalal, and K. Shende Fingerprint Verification with Siamese Network: Implemented one-shot learning using pre-trained CNN models to distinguish between fingerprint images for verification purposes (project report).

PROFESSIONAL DEVELOPMENT

Coursera Deep Learning Specialization link
- **Topics covered -** Structuring **ML** Projects**,** Neural Networks and Deep Learning**,** Sequence Models**,** Convolutional Neural Networks**,** Improving Deep Neural Networks: Hyperparameter Tuning, Regularization and Optimization**.**

Tableau Desktop Specialist Certification (In Progress)
- Acquiring skills in **data visualization, dashboard design, and data storytelling** using **Tableau**.
- Coursework covers data blending, advanced **chart types**, **dashboard interactivity**, and data server integration.

PRESENTATIONS

Summary: 7 presentations (4 invited, 3 as primary or senior author) in 5 U.S. States and India.

Invited Talks
- Spotlight Speaker at **NeSy 2024** – Abhilekha Dalal, On the Value of Labeled Data and Symbolic Methods for Hidden Neuron Activation Analysis.
- Speaker at **KGC 2023 -** Abhilekha Dalal, Explaining AI - Hidden Neuron Activations using Background Knowledge, in-person.
- Abhilekha Dalal, Explaining Deep Learning with Background Knowledge. The Knowledgeable Computing and Reasoning (KRaCR) Lab, **IIIT-Delhi, India, July 2022.**
- Abhilekha Dalal, Explaining Deep Learning with Background Knowledge. **CSGSA Seminar Talk** Kansas State University, USA, **April 2022.**
- Abhilekha Dalal, Cogan Shimizu, Pascal Hitzler, The Upper Ontology Alignment Tool, **OntoCommons Workshop, April 2021.**
- Abhilekha Dalal, Cogan Shimizu, Pascal Hitzler, Bridging Upper Ontology and Modular Ontology Modeling: a Tool and Evaluation, virtual **KGSWC 2021**.

Posters & Demonstrations
- Poster presentation at **NeSy 2024 (Neuro-symbolic Learning and Reasoning).**
- Poster presentation at **US2TS 2022 (U.S. Semantic Technologies Symposium).**
- Abhilekha Dalal, Cogan Shimizu, and Pascal Hitzler. Modular ontology modeling meets upper ontologies: The upper ontology alignment tool. Proceedings of the **ISWC 2020** Demos and Industry Tracks.

RESEARCH COMMUNITY ACTIVITIES

Summary: reviewed for 9 conferences and one journal (2022-2024), and serving as PC, Co-Chair & Organizer.

- Served as **reviewer** for ECAI 24, AAAI-MAKE 24 SSS-24, IEEE TPAMI 24, IEEE TNNLS 23, IEEE TAI 23, CIKM 23, IJCLR 22**,** The Web Conference 2022.
- Served as **reviewer** for Semantic Web Journal SWJ (2022-2024).
- Served as **Program Committee** for AAAI 2024, AAAI 2025.
- Served as **Co-Chair** and **Organizer** for K-State AI Symposium (2023,2024), Digital Ag & Advanced Analytics Symposium 2023.

AWARDS
- Graduate Student-of-the-Month October 2024, Department of Computer Science Kansas State University, USA
- Awarded ISWC Travel Grant 2024 for ISWC 2024 worth **$2000**.
- Awarded Graduate Student Council Travel Grant 2024 for NeSy 2024 worth **$600**.
- Awarded Graduate Student Council Travel Grant 2023 for KGC 2023 worth **$400**.
- Awarded US2TS Travel Support 2022 for US2TS 2022 worth **$1000.**
- Graduate Student-of-the-Month September 2022, Department of Computer Science Kansas State University, USA