

Kausik Lakkaraju

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EDUCATION

- **AI Institute, University of South Carolina** Columbia, SC (USA)
Ph. D. - Computer Science & Engineering; GPA: 3.83
Courses: Neural Networks, Bayesian Networks and Decision Graphs, Trusted AI, Foundation of Analysis 1 (MATH)
Jan 2021 - Present
- **University of South Carolina** Columbia, SC (USA)
MS - Computer Science & Engineering; GPA: 3.87
Courses: Artificial Intelligence, Data Mining and Warehousing, Natural Language Processing, Deep Reinforcement Learning, Robotics, Big Data Analytics, Database System Design, Compiler Construction, Analysis of Algorithms, Computer Architecture
Aug 2019 - May 2021
- **Osmania University** Hyderabad, Telangana (India)
B.E. - Electronics and Communication & Engineering; Percentage: 76%
Major Project: Multiple color line follower robot with obstacle detection
Aug 2015 - May 2019

SKILLS SUMMARY

- **Languages:** Python, JavaScript, C++, C, SQL.
- **Areas of Research:** Trusted AI, Causal Models, Multi-modal Decision Support, Rating of AI Systems, AI Fairness

EXPERIENCE

- **University of South Carolina** Columbia, SC, USA
Graduate Research Assistant - Dr. Biplav Srivastava
Jan 2021 - Present
 - **Trusted AI:**
 - *Rating of AI Systems through a Causal Lens:* This is the topic for my Ph.D. thesis. As most of the AI systems are known for giving biased or uncertain outputs, we are working on rating these AI systems for bias using causal models. We are currently working on textual data. We will start working on image-based and multi-modal systems in a few months. I am working with my advisor, Dr. Biplav Srivastava and, Dr. Marco Valtorta on these projects.
 - *Safe Chatbot Conversation:* We are working on building a safe conversation that is free from abusive language or hate speech for our ALLURE chatbot. We are making sure that the chatbot responds to the user based on their mood and that they do not use abusive language or show abusive gestures when conversing with the chatbot.
 - **Chatbot Development:**
 - *ALLURE Chatbot:* We built a Deep Reinforcement Learning based, multi-modal, explainable chatbot which teaches children how to solve a Rubik's Cube and allows the children to interact with the multi-modal chatbot while trying to solve the Cube.
 - *IoT-based Chatbot:* We worked with a company called Tantiv4 to build a RASA-based chatbot which allows users to control their network usage and bandwidth using smart routers in a household or office setting. We built another chatbot which helps users in monitoring the power usage in a household, office or university setting using smart sensors. We, previously, published these chatbots as separate skills on Amazon devices.
 - **Recipe Reasoning:**
 - *TREAT:* We built a tool for recipe retrieval which uses a rich recipe representation to perform multi-modal reasoning on the recipe's content and food preparation process. We used Django framework to develop this tool.
- **University of South Carolina** Columbia, SC, USA
Graduate Research Assistant - Dr. Dezhi Wu
May 2020 - May 2021
 - **Full-stack Development:** Involved understanding a clustering algorithm created by a Professor from Physics department at our university. We used Django REST framework to build the back-end. I was also part of front-end development. We used ReactJS for the UI.
 - **Front-end Development:** Involved in building a website for a scientific experiment that Dr. Wu has conducted with some other research scientists. We used ReactJS to build the front-end.
- **University of South Carolina** Columbia, SC, USA
Teaching Assistant - Ms. Catherine Matthews
Jan 2020 - Apr 2020
 - **Front-end Development:** Helped students solve some assignment problems involving HTML, CSS and Javascript.
 - **Python Coding:** Helped students solve assignment problems involving Python coding.
- **ECIL** Hyderabad, Telangana, India
Intern
May 2018 - June 2018
 - **Home-based Automation System using GSM Module:** With the device we built, one could control (turn any device ON and OFF) by just sending a simple text message with their phone, even when they are away from their home. GSM module converts the text message that user sends to a format which is understandable by the AT89S52 Micro-controller we used. This micro-controller controls the devices based on the command.

PUBLICATIONS

Research Papers

- Lakkaraju, K., 2022. Why is my System Biased?: Rating of AI Systems through a Causal Lens. In Proceedings of the 2022 AAAI/ACM Conference on AI, Ethics, and Society (AIES '22). Association for Computing Machinery, New York, NY, USA, 902. <https://doi.org/10.1145/3514094.3539556>
- Lakkaraju, K., Hassan, T., Khandelwal, V., Singh, P., Bradley, C., Shah, R., Agostinelli, F., Srivastava, B., & Wu, D. (2022). *ALLURE: A Multi-Modal Guided Environment for Helping Children Learn to Solve a Rubik's Cube with Automatic Solving and Interactive Explanations*. Proceedings of the AAAI Conference on Artificial Intelligence, 36(11), 13185-13187. <https://ojs.aaai.org/index.php/AAAI/article/view/21722>
- Lakkaraju, K., Palaiya, V., Paladi, S.T., Appajigowda, C., Srivastava, B., Johri, L. (2022). Data-Based Insights for the Masses: Scaling Natural Language Querying to Middleware Data. In: , et al. Database Systems for Advanced Applications. DASFAA 2022. Lecture Notes in Computer Science, vol 13247. Springer, Cham. https://doi.org/10.1007/978-3-031-00129-1_49
- Biplav Srivastava, Kausik Lakkaraju, Mariana Bernagozzi, Marco Valtorta, Advances in Automatically Rating the Trustworthiness of Text Processing Services, AAAI Spring Symposium, San Francisco, 2023 [AI Rating, Trust]
- Muppasani, B., Pallagani, V., Lakkaraju, K., Lei, S., Srivastava, B., Robertson, B., Hickerson, A. and Narayanan, V., 2022. On Safe and Usable Chatbots for Promoting Voter Participation. arXiv preprint arXiv:2212.11219.
- Agostinelli, F., Panta, R., Khandelwal, V., Srivastava, B., Muppasani, B. C., Lakkaraju, K., & Wu, D. (2022, August 22). Explainable Pathfinding for Inscrutable Planners with Inductive Logic Programming. ICAPS 2022 Workshop on Explainable AI Planning. <https://openreview.net/forum?id=S44aSPW6lRa>
- Vishal Pallagani, Priyadharsini Ramamurthy, Vedant Khandelwal, Revathy Venkataramanan, Kausik Lakkaraju, Sathyanarayanan N Aakur, Biplav Srivastava. ICAPS 2022 KEPS 2022 Workshop. A Rich Recipe Representation as Plan to Support Expressive Multi-Modal Queries on Recipe Content and Preparation Process. http://icaps22.icaps-conference.org/workshops/KEPS/KEPS-22_paper4286.pdf

Patents

- Srivastava, Biplav, Kausik Lakkaraju, Revathy Venkataramanan, Vishal Pallagani, Vedant Khandelwal, and Hong Yung Yip. "Robust useful and general task-oriented virtual assistants." U.S. Patent Application 17/714,508, filed November 10, 2022.

ACADEMIC & PERSONAL PROJECTS

- **YOLOR Vs. YOLOv6 Face-off: A Comparison of SOTA Object Recognition Models (Dec '22)**: We deep-dived into the working of YOLOR and YOLOv6 object recognition models, which were released in 2022, and evaluated them on specific tasks to compare their performance. We tested the original models and also tested them after fine-tuning them on a different blood cells dataset which classifies different blood cells. **Keywords**: Computer Vision, Object Recognition.
- **Causal Robot (May '22)**: I examined the capabilities and limitations of CausalWorld framework which allows us perform various interventions on the environment variables. **Keywords**: Causal Reasoning, Reinforcement Learning, Robotics.
- **Plant Disease Explanation (Dec '21)**: I trained neural network models like CNN and InceptionV3 (using transfer learning) on two well-known datasets, PlantDoc and PlantVillage to predict the plant name and plant disease (if it is diseased). In addition to this, I used LIME explainer which would provide the explanation for why the system had to take a particular decision for a certain sample. **Keywords**: Trusted AI, XAI, Deep Learning.
- **Explainable Pet Class Predicting System (Dec '21)**: Used the 'Pawpularity' dataset from Kaggle to train neural network models to predict a 'Pawpularity score' based on how cute a particular image of the pet is. I added the explainability module to the project so that one would know what features contributed to the outcome given by the black-box neural network model. **Keywords**: Trusted AI, XAI, Deep Learning.
- **Indian sign Language Recognition using OpenCV (Dec '20)**: My project allows one to create an Indian Sign Language (ISL) dataset on their own in a few minutes. I trained a CNN model on one such dataset created by me. It was able to achieve a test accuracy of more than 98%. **Keywords**: Computer Vision, Deep Learning, Image Processing.
- **Deep Reinforcement Learning Based Chatbot (Dec '20)**: I trained a Seq2Seq model using 'Self-Critical Sequence Training (SCST)' method on movie dialogs dataset to create a chatbot (for chitchat). **Keywords**: Deep Reinforcement Learning, Chatbot.
- **Covid-19 Tracker (July '22)**: Built a UI using ReactJS for tracking worldwide and country wise covid cases and deployed it using firebase. (click here). **Keywords**: Front-end, ReactJS.
- **Obstacle Avoidance using 77 GHz RADAR module (Mar '20)**: Constructed a Robotic Operating System (ROS) package for 77GHz Radar module. **Keywords**: Robotics, ROS, C++.

- **Multiple Color Line Following Robot with Obstacle Detection (Apr '19):** We constructed a multiple color line following robot which could detect obstacles on its way. We used wireless technology module called HC-12 and ultrasonic sensors for obstacle detection. **Keywords:** Robotics.
- **Black Line Following Robot (Oct '17):** A simple black line follower which follows a black line. **Keywords:** Robotics.
- **Mobile Controlled Robot (Oct '17):** We created a mobile controlled robot using 8051 Microcontroller. **Keywords:** Robotics.

CERTIFICATIONS & PRIZES

- Presented a student track paper (on my ongoing Ph.D. research) at AIES 2022 conference which was held at University of Oxford (UK).
- Secured first prize in ITT (Innovation Think Tank) certification program for two consecutive years.
- **Certifications:** Building Basic GANs (Coursera), Python for Datascience (IBM), Deep Learning A-Z (Udemy), Machine Learning (A-Z)(Udemy), Django Full Stack Web Development (Udemy).