Sakshi Agarwal

PhD, Computer Science

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Google Scholar

Research Interests

I am broadly interested in Machine Learning, Probabilistic Reasoning and Generative AI. I am highly motivated to enhance the adaptability, reliability and robustness of generative models across multi-modal data, like images, videos, audio and text.

Education

University of California, Irvine **Sep 2019 – Mar 2025**
PhD, Computer Science

- Thesis work focused on Generative AI, Probabilistic Reasoning and Computer Vision, advised by Erik Sudderth

Indian Institute of Technology, Kharagpur **Aug 2013 – Aug 2017**
B.Tech, Electrical Engineering & Computer Science Engineering Minor

- B.Tech Project focused on Bio-Medical Semantic Indexing using Machine Learning, advised by Sudeshna Sarkar

Experience

Image Inpainting and Inverse Problems with Deep Generative Models **Jan 2022 – Present**
Graduate Researcher, UCI

- Ideated & developed a training-free variational inference paradigm to recover meaningful images from severe decay using DDPM and HVAE priors; aligns latent image representations in DGMs to partial user inputs.
- Upto 2x more perceptual consistency, 2x faster than DPS-like works using ImageNet Latent Diffusion priors.
- 23% more probable image restoration with latent space Gaussian Mixture, Flow posteriors using VAE prior.
- Hierachical posterior shows 10% improved FID scores over trained/fine-tuned inference networks for HVAEs.
- Mentoring a Masters student to develop this further for text-based image inpainting using Stable Diffusion.

Deep Learning for Message-Passing Inference Algorithms **Sep 2020 – Dec 2021**
Graduate Researcher, UCI

- Ideated & developed an adaptive neural network architecture & training to approximate messages.
- Upto 10x more accurate predictions while also being 2x faster over original DL-based method.

Theme Categorization **June 2020 – Sep 2020**
Applied Scientist Intern, Amazon.com Services LLC

- Formalized a project on Q/A categorization on amazon.com into themes using BERT and clustering methods.
- Ensured themes are exhaustive and distinct, evaluated with the Jaccard Index.

Subtle Hate Speech Detection **Sep 2018 – Sep 2019**
Research Engineer, Xerox Research Center, India

- Built a pipeline to retrieve context from Wikipedia/Urban Dictionary for key phrases in trainset (Fox News).
- Utilized a cross-attention mechanism to identify subtle hateful phrases, yielding 24% boost in F1-score.

Police Business Intelligence **Sep 2017 – Sep 2019**
Research Engineer, Xerox Research Center, India

- Reduced prediction error by 30% in low-crime cities leveraging similar dense-crime city representations.
- Implemented parallel K-Means clustering on R Server in Microsoft Azure for distributed platform deployment.
- Created a decision framework to optimize the big data pipeline for the social media analytics platform.

Aid the Blind **Sep 2024 – Present**
Graduate Researcher, UCI

- Ideating a project for accurate caption predictions of complex images using Vision-Language models.

Undergraduate Experience

- **Research Intern, TCS Innovation labs India**: Classified user queries into hardware, software, and email issues using RNNs. Tackled overfitting by de-correlating hidden units, resulting in 12% accuracy improvement.
- **REU, Duke University**: 1. Studied sentiment analysis on user recorded audio data (My introduction to ML). 2. Participated to integrate a commercial drone, infrared camera, and tablet controller to track wildlife at night.
- **BTech Project**: Developed a deep learning model to index Medical Subject Headings (MeSH) for biomedical abstracts, using various RNN architectures (LSTM, GRU) to capture semantic representations for classification.

Publications

Sakshi Agarwal, Gabriel Hope, Erik B. Sudderth. "**VIPaint: Image Inpainting with Pre-Trained Diffusion Models via Variational Inference**." (Arxiv, 2024). PDF

Sakshi Agarwal, Gabriel Hope, Ali Younis, Erik B. Sudderth. "**A decoder suffices for query-adaptive variational inference**." Proceedings of the Thirty-Ninth Conference on Uncertainty in Artificial Intelligence (**Spotlight** at UAI, 2023). PDF

Sakshi Agarwal, Kalev Kask, Alexander Ihler, Rina Dechter. "**NeuroBE: Escalating NN Approximations of Bucket Elimination**." The 38th Conference on Uncertainty in Artificial Intelligence (UAI, 2022). PDF

Yasaman Razeghi, Kalev Kask, Yadong Lu, Pierre Baldi, Sakshi Agarwal and Rina Dechter. "**Deep Bucket Elimination**." Proceedings of the Thirtieth International Joint Conference on Artificial Intelligence (IJCAI, 2021). PDF

Sakshi Agarwal, Krishnaprasad Narayanan, Manjira Sinha, Rohit Gupta, Sharanya Eswaran, Tridib Mukherjee. "**Decision Support Framework for Big Data Analytics**." IEEE World Congress on Services (SERVICES) (Workshop, 2018). PDF

Mohit Yadav, Sakshi Agarwal. "**Regularization and Learning an Ensemble of RNNs by Decorrelating Representations**." Thirty-First AAAI Conference on Artificial Intelligence (Workshop, 2017). PDF

Patents

Sakshi Agarwal, SS Mannarswamy. "**Neural network architecture for subtle hate speech detection**." US Patent 10,936,817 (2021). PDF

Sakshi Agarwal, Poorvi Agarwal, Arun Rajkumar, Sharanya Eswaran. "**Method and system for forecasting in sparse data streams via dense data streams**." US Patent App. 16/112,768 (2020). PDF

Sharanya Eswaran, **Sakshi Agarwal**, Sitara Shah, Krishnaprasad Narayanan, Shisagnee Banerjee, Terry Johnston, Avantika Gupta, Tridib Mukherjee. "**Operational recommendations based on multi-jurisdictional inputs**." US Patent App. 15/988,247 (2019). PDF

Other Experience

- Reviewer at AISTATS 2023, UAI 2024, NeurIPS 2024 (**top reviewer**).
- Mentored high school students in ML & CS with Lumiere Education in 2022.
- Teaching Assistant at UCI CS courses in AI : CS175, CS171, CS265.

Skills

- Python/PyTorch, C/C++
- Deep Learning
- Gen AI (Diffusion Models)
- VLMs (CLIP, Stable Diffusion)
- Test-Time Reasoning
- Image Inverse Problems