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Shristi Das Biswas

765-775-0005 sdasbisw@purdue.edu Website LinkedIn Github

Education

Purdue University **2021 – Present**
Ph.D. in Computer Engineering; Advisor: Dr. Kaushik Roy *GPA: 3.83/4.0*

Indian Institute of Engineering, Science and Technology **2017 – 2021**
B.Tech. in Electronics and Telecommunication Engineering *GPA: 9.39 /10.0; (Department Rank-2/61)*

Technical Skills

Languages: Python, Git, Bash, MATLAB. **Tools**: Cadence Virtuoso, LTspice. **Frameworks**: Pytorch, Tensorflow, LaTeX.

Internships

- **Applied Science Intern** at **Amazon Kumo, AWS** *(Internship Manager: Radhika Bhargava, Yue Zhang)* 2025 – 2025
- **Applied Science Intern** at **Amazon Fashion** *(Internship Manager: Prateek Singhal, Matthew Shreve)* 2024 – 2024

Publications

- **S. Das Biswas**, Y. Zhang, A. Pal, R. Bhargava, K. Roy. ELLA: Efficient Lifelong Learning for Adapters in Large Language Models. **Accepted at NeurIPS 2025 CCFM Workshop, Accepted at EACL (Main) 2026.** [Paper] [Paper]
- **S. Das Biswas**, A. Roy, K. Roy. Now You See It, Now You Don't - Instant Concept Erasure for Safe Text-to-Image and Video Generation. **Under Review at CVPR 2026.** [Paper]
- **S. Das Biswas***, A. Roy*, K. Roy. SlimDiff: Training-Free, Activation-Guided Hands-free Slimming of Diffusion Models. **Under Review at ICLR 2026.** [Paper]
- **S. Das Biswas***, A. Roy*, K. Roy. CURE: Concept Unlearning via Orthogonal Representation Editing in Diffusion Models. **Accepted at NeurIPS 2025 (Spotlight).** [Paper]
- **S. Das Biswas**, M. Shreve, X .Li, P. Singhal, K. Roy. PIXELS: Progressive Image Xemplar-based Editing with Latent Surgery. **Accepted at AAAI 2025.** [Paper]
- **S. Das Biswas**, E. Soufleri, A. Roy, K. Roy. Learning Unified Spatio-temporal Representations for Efficient Compressed Video Understanding. **Accepted at WACV 2026.** [Paper]
- A. Roy, M. Apolinario, **S. Das Biswas**, K. Roy. Feedback Alignment Meets Low-Rank Manifolds: A Structured Recipe for Local Learning. **Accepted at WACV 2026 (Highlight).** [Paper]
- **S. Das Biswas**, A. Kosta, K. Roy. HALSIE - Hybrid Approach to Learning Segmentation by Simultaneously Exploiting Image and Event Modalities. **Accepted at WACV 2024 (Oral), ICCVW 2023.** [Paper]
- **S. Das Biswas**, R. Chakraborty, A. Pramanik. A Brief Survey on Various Prediction Models for Detection of ADHD from Brain MRI Images. **Accepted at** International Conference on Distributed Computing and Networking **ICDCN 2020**. [Paper]
- **S. Das Biswas**, R. Chakraborty, A. Pramanik. On Prediction Models for the Detection of Autism Spectrum Disorder. **Accepted at** International Conference on Computational Intelligence in Pattern Recognition **CIPR 2020**. [Paper]

Ongoing Project

Developing training-free, efficient finetuning datasets for Large Vision-Language Models to select small, diverse, alignment-preserving subsets of image-text data for in-context learning. The goal is to enable efficient, globally-aware demonstration retrieval that improves multimodal alignment and reduces hallucinations with significantly lower cost.

Selected Experiences

Amazon Kumo, AWS **Bellevue, WA**
Developed Continual Learning Algorithms for Large Language Models *2025 – 2025*

- Researched and developed continual learning strategies for LLMs using **parameter-efficient fine-tuning (e.g., LoRA)** to support **scalable lifelong adaptation** using novel regularization techniques to mitigate task interference and catastrophic forgetting during sequential task learning. Provided a **formal theoretical analysis** of ELLA's properties.
- Evaluated model performance across multiple benchmarks (e.g., **DBPedia, Amazon Reviews, GLUE, SuperGLUE, GSM8k, BBH etc.**) using metrics like Backward Transfer (BWT), Forward Transfer (FWT), and task-wise accuracy, with **relative accuracy gains of up to** 9.6% **and a** 35× **smaller memory footprint across LLaMA and T5 models.**
- Benchmarked against **Claude Haiku 3.5** and **Claude Sonnet 3.5 v2** to achieve **upto** ∼ 59× **lower latency** and up to 99% **lower annual costs** for improvements **upto** +10% **Precision and** +12% **Recall** compared to the AWS internal tool.

C-BRIC Lab, Purdue University **West Lafayette, IN**
Developed a Fast and Interpretable Training-Free Concept Unlearning Framework for Diffusion Models *2025 – 2025*

- Presented CURE, a **strong, scalable and training-free concept unlearning method leveraging orthogonal projections and spectral geometry**, to yield a closed-form weight update operator, dubbed Spectral Eraser, for **reliable and responsible visual content creation in T2I models**.

- Extensive experiments show **effective and robust removal of unsafe content, artist-specific styles, object and identities by up to** 16%. Significantly outperforms existing training-based and training-free methods in terms of generation quality, efficiency, specificity, and resistance to adversarial red-teaming tools for both **single- and multi-concept removals**.

C-BRIC Lab, Purdue University **West Lafayette, IN**

SlimDiff: Training-Free, Activation-Guided Hands-free Slimming of Diffusion Models *2024 – 2025*

- Proposed the **first closed-form, activation-guided structural compression of Stable Diffusion Models** that is entirely **training-free and timestep-aware** to guide dynamic model pruning under a user-specified compression budget.
- Evaluated SlimDiff on **MS-COCO**, **LAION Aesthetics**, **ImageReward**, **PartiPrompts** and **human-preference scoring using HPS v2.1 and Pic-a-Pic v1**. Achieved up to 35% **acceleration and** $\sim$ 100**M parameter reduction over baselines** with no degradation in generation quality and formal theoretical guarantees of bounded pruning error.

Fashion and Fitness Org, Amazon Fashion **Sunnyvale, CA**

Designed PIXELS, an Approach for Progressive Exemplar-Driven Image Editing in Diffusion Models *2024 – 2024*

- Proposed an **off-the-shelf image editing tool using diffusion models** to enable customization by providing granular control over edits with reference images, allowing adjustments at the pixel or region level. Our method **operates solely during inference** for imitative editing, enabling users to draw inspiration from a **dynamic number of reference images** and **multi-modal prompts** to progressively incorporate all the desired edits without retraining or fine-tuning existing generation models.
- Demonstrated that PIXELS delivers high-quality edits efficiently, **outperforming existing methods in both exemplar-fidelity and visual realism by over** 41% **and** 33.6% **respectively** through quantitative comparisons and a user study.

C-BRIC Lab, Purdue University **West Lafayette, IN**

Designed a Unified Representation Learning Approach for Compressed Video Understanding *2023 – 2024*

- Proposed a lightweight yet powerful factorized end-to-end framework for **compressed video understanding** by revamping dominant raw video architectures since we find **decompressing videos is not only an overhead but also an inconvenience**. Our design made representations **more robust and reduced dimensionality**, making training less computationally challenging.
- Achieved SOTA video recognition performance on UCF-101, HMDB-51, K-400, and SS-v2 datasets with **favorable costs (330× higher)** and **fast inference (15× higher)**, inspiring future work toward efficient video systems not requiring decoded videos.

C-BRIC Lab, Purdue University **West Lafayette, IN**

Designed RSFormer, an approach to Recurring the Spike Transformer for Object Tracking *2023 – 2023*

- Proposed a **multi-scale feature extraction backbone** to generate compact feature representation from event frames for downstream processing. Designed a **hierarchical transformer encoder** with **recurrent networks of spiking attention blocks** to obtain temporally-guided coarse and fine features fused using a lightweight MLP decoder for prediction.
- Achieved comparable performance to SOTA on event datasets 1Mpx and Gen1 with **up to 20× higher** parameter efficiency.

C-BRIC Lab, Purdue University **West Lafayette, IN**

Designed a Low-power Hybrid Approach to Learning Scene Segmentation using Event-Vision *2021 – 2022*

- Proposed HALSIE, a novel **SNN+ANN hybrid** spatio-temporal feature integration approach to learning segmentation by simultaneously leveraging image and event camera modalities, enabling **efficient multi-modal learning**.
- Outperformed SOTA semantic segmentation benchmarks on DDD-17, MVSEC and DSEC-Semantic datasets with **up to 33.23× higher** parameter efficiency and **20× lower** inference cost, suitable for resource-constrained edge applications.

Indian Institute of Engineering, Science and Technology (Project Internship) **Shibpur, India**

Designed Automated Predictive Models for ADHD and ASD Diagnosis *2019-2020*

- Proposed a deep convolutional neural network model developed on **Tensorflow** framework to analyse and classify large **resting state fMRI datasets** for **ADHD and ASD diagnosis.**
- Achieved **up to 6% improvement** in accuracy on SOTA benchmarks within only 30 epochs of training. Our work has has been communicated and is under review at the Journal of Neuroscience Methods, Elsevier

Reviewer Service

NeurIPS, AAAI (**Program Committee**), CVPR, ICLR, ACL, ICCV, WACV, IJCNN.

Relevant Coursework

- Deep Learning (DL)
- Data Structure & Algo
- Optimization for DL
- Data Mining
- Reinforcement Learning
- AI Hardware
- Linear Algebra
- Advanced VLSI Design

Projects

∗ Deep spoken keyword spotting system.
∗ Partitioning and layer assignment algorithm for TSV-aware 3D-IC structural planning.
∗ Gesture controlled virtual mouse with canny edge detection.

Achievements

∗ **NeurIPS 2025 Scholar Award.**
∗ **IEEE Women in Engineering Best Student/ Research Scholar Paper Award**: Presented at ICDCN 2020.
∗ **Google CS Research Mentorship Program Scholar.** Recipient class of 2023b.
∗ **IEEE Women in Engineering Best Student/ Research Scholar Paper Award**: Presented at ICDCN 2020.
∗ **Indian Academy of Sciences Summer Research Fellowship Program 2020.**
∗ **Indian Youth Delegate to the People's Republic of China, 2019**. Organised by the Ministry of Youth Affairs and Sports, Government of India, and the Government of People's Republic of China.