Abhikhya Tripathy

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RESEARCH INTERESTS

Computer Vision, Multimodal Representation Learning, Robotics, Quantum Information and Computation

EDUCATION

Bachelor of Technology, Indian Institute of Technology Kharagpur **July 2019 - May 2023**

Major in Electronics and Electrical Communication Engineering and Minor in Computer Science and Engineering
Cumulative GPA: **9.34/10.00**
GPA in Minor: **9.42/10.00**

PUBLICATIONS

[1] **Abhikhya Tripathy**, Abhinav Mahajan, Sudeeksha Reddy Pala, Vaibhav Methi, Joseph K J, Balaji Vasan Srinivasan, **Towards Design Generation from its Components**, *To be submitted to WACV 2026.* [*LINK*]

PATENTS

[1] **Abhikhya Tripathy**, Aishwarya Agarwal, Srikrishna Karanam, Balaji Vasan Srinivasan, **TextIT: Improving Text Generation in Diffusion Models through Inference-Time Self-Attention Manipulation** [Filed] (US Patent App. 19/236,437) [*LINK*]

[2] **Abhikhya Tripathy**, Abhinav Mahajan, Sudeeksha Reddy Pala, Vaibhav Methi, Joseph K J, Balaji Vasan Srinivasan, **Towards Design Generation from its Components** [Accepted For Filing] [*LINK*]

WORK EXPERIENCE

Research Associate - Adobe Inc. **July 2023 - Present**

Adobe Research Lab India *Bangalore, India*

- Working in the **Computer Vision** Group on several projects involving Graphic Designs and Multimodal Content Generation for Adobe's flagship design platform, **Adobe Express**.
- Collaborating with various engineering and deployment teams within Adobe to solve industrial use-cases and integrate solutions into larger product frameworks.
- In this role, I lead research projects with both academic and industrial outcomes, mentor undergraduate interns, submit papers to conferences, file patents and deliver talks on both my ongoing research and literature.

Research Intern - Adobe Inc. **May 2022 - July 2022**

System for Automated User Feedback Incorporation for Accelerated Design Creation [*LINK*] *Dr. Srikrishna Karanam*

- Implemented a system to automatically understand the stakeholder comments and map it to key parts of the designs. Further, we recommend new assets that can provide designers with alternatives to help address stakeholder comments.
- Leveraged and enhanced Computer Vision tasks of **Visual Phrase Grounding** and **Style-Based Image Retrieval**.
- **Submitted an Invention Disclosure** and demonstrated a working demo of our system. Based on my performance, I was offered a full-time role as a Research Associate.

Research Intern - Cornell University **November 2021 - May 2023**

Topic: Variational Quantum Algorithms for solving Partial Differential Equations *Dr. Peter McMahon*

- Formulated and implemented Variational Quantum Algorithms for solving the **2-D heat equation** and the **non-linear Poisson equation**.
- Derived cost functions based on the energy minimisation principle using Euler-Lagrange equations [Sato et al., 2021] and the distance minimisation principle [Lubasch et al., 2019].
- Performed simulations across diverse quantum circuits and boundary conditions, and successfully demonstrated the faster time evolution of initial wavefunctions using our algorithms, when compared to the classical Backward Euler method.

Research Intern - Brown University **May 2021 - August 2021**

Topic: Modeling Correlated Topological Insulators *Dr. Brenda Rubenstein*

- Analyzed correlated topological insulators, which are **candidate quantum materials**, through their phase transitions by using Auxiliary Field Quantum Monte Carlo simulations.
- Utilized quantum fidelity metric to signal these phase transitions and derived equations for simulations through meticulous mathematics. Expressed the derivations in terms of quantum-compatible expectation values.
- Significantly contributed to Dr. Rubenstein's ongoing research on quantum materials.

KEY PROJECTS

Towards Design Generation from its Components **November 2024**

Adobe Research India

- System to automatically generate aesthetic graphic designs from user-provided multimodal components, such as texts and images, with individual modules to optimise the design layout, compose background and foreground images and predict typography details for text elements.
- Further focus on the **Image Composition** module which utilises a pre-trained Large Multimodal Model (LMM), which we modify for improved **foreground object identity retention**.
- We leverage the identity information stored in the LMM's image representations to boost the alignment of objects in the composite image with their input images, and manipulate Self-Attention values for **harmonious image composition**.
- Our method achieved significant improvement over baselines for graphic design generation and identity retention in composite image generation. This work has been **accepted for patent filing.**

Improving Text Generation in Diffusion Models **March 2024**

Adobe Research India

- Developed a **training-free approach** to improve the visual text generation of diffusion models through aligning the intermediate self-attention maps with ground truth self-attention maps.
- We further align the Bezier curve control points extracted for the intermediate and ground truth self-attention maps, for fine-grained control.
- Delivered a version of this technology to the engineering team working with Adobe's design platform, Adobe Express.
- This work has been **filed as a patent**.

Quantum Algorithms for the Quadratic Eigenvalue Problem **October 2022 - May 2023**

Bachelor Thesis Project under Dr. Bibhas Adhikari *Indian Institute of Technology Kharagpur*

- Developed a novel constructive VQA to identify the **eigenvalue-eigenvector pairs** of a Quadratic Eigenvalue Problem (QEP) based on its linearisation into a Generalised Eigenvalue Problem.
- Formulated another VQA to compute the Crawford number of a matrix pencil which indicates whether a QEP is hyperbolic or not.
- Finally, devised an algorithm to solve the hyperbolic QEP by transforming it into a Standard Eigenvalue Problem, which was then solved using a quantum adaptation of the Rayleigh-Ritz quotient method.
- Our proposed VQAs theoretically offered **exponential advantage** over their classical counterparts.

Implementing Quantum Algorithms and Bell's Inequality Experiment **December 2020 - January 2021**

Dr. Subroto Mukerjee *Indian Institute of Science, Bangalore*

- Developed Qiskit code to perform the **Bell's Inequality Experiment** through cloud access on IBMQ quantum computers, demonstrating experimental proof of Bell's theorem.
- Implemented quantum algorithms and **black-box problems** like Bernstein-Vazirani, Deutsch-Jozsa and Simon's algorithms.

SCHOLASTIC ACHIEVEMENTS

- Secured **1st rank** in my city in the All India Senior School Certificate Examination (AISSCE) 2019.
- Awarded the national Certificate of Merit by the Central Board of Secondary Education of India for being among the **top 0.1%** total candidates in Physics and Chemistry in AISSCE 2019.
- Secured **99.5 Percentile** in JEE Mains 2019 out of more than 800,000 candidates, and an **All India Rank of 5716** in JEE Advanced 2019 out of more than 100,000 candidates.
- **National Finalist** in Dr. Reddy's Digital Health Hackathon 2022.

Extracurricular

- Part of the Quiz Team in the gold-winning IIT Kharagpur contingent at the Inter IIT Cultural Meet 2023.
- Editor, The Scholars' Avenue, IIT Kharagpur's student-run media body.
- Have represented my institute in numerous national and international Parliamentary debate tournaments, competing all the way through to Quarter Finals and Semi Finals.
- Part of the college Girls' Football Team - My team won the overall silver medal in the 2022 Inter-Hall Football Tournament.