Vishesh Gupta

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Education

Indian Institute of Technology, Kharagpur (IIT KGP) **November 2020 – May 2024**
Bachelor of Technology in Electrical Engineering *CGPA 8.09/10.00*

Relevant Coursework

University: Computer Graphics (CS60012), Artificial Intelligence: Foundations and Applications (AI61005), Computer Architecture And Operating System (CS31702), Probability and Statistics (MA20205), Programming and Data Structures (CS10003), Analog Electronic Circuits (EC21207), Signals and Systems (EE21201), Advanced Calculus (MA11003), Linear Algebra, Numerical and Complex Analysis (MA11004).

Research Experience

Max Planck Institute for Informatiks (MPI-INF) **September 2024 – July 2025**
Research Intern *Advisor: Dr. Gurprit Singh*

- Designing a model to leverage noise space temporal corelation, characteristic to an image model, to generate videos by sampling only the image model bypassing the need to inference a bulky video model at each step.
- Performed a literary review on state of the art generative models for faster inference, better compos-ability, wider variety for images and recent developments in 3D generation.
- Presented a meeting on down-streaming pretrained diffusion models for compositional tasks, and improved sampling results using Markov chain monte carlo sampling at inference time to get better results.

Multimedia Lab, École Supérieure de Technologie (ÉTS) **May 2023 – August 2023**
Mitacs Globalink Research Intern *Advisor: Dr. Adrien Gruson*

- Designed and evaluated a novel shift mapping technique, using stochastic lightcuts for correlated light cluster sampling to generate a gradient image. Compared its performance with Stochastic Lightcuts (SLC) and Simple Path Tracing (SPT) to assess its strengths and limitations in generating low-variance gradient images.
- Performed a literary review on state of the art real time light sampling methods such as 'Stochastic Lighcuts' and 'Generalized Resampled Importance Sampling'.
- Presented a meeting on Physically Based Rendering, Gradient Domain Rendering (GDR) and recent developments in real time light transport for the research lab.
- Implemented a physically based Gradient Domain Renderer within the PBRT framework infusing the new shift mapping method.

Vision and Graphics Lab, IIT Delhi **April 2022 – January 2024**
Undergraduate Research Intern *Advisor: Dr. Subodh Kumar*

- Developed a system that generates light rays on the GPU from light sources, shares this data with the vertex shader to render these rays into quads, and utilizes these quads for volumetric radiance estimation.
- Conducted an in-depth review of academic papers in the field of photon mapping and volumetric rendering with a focus on higher-dimensional photon samples.
- Attained proficiency and hands-on experience with ray tracing APIs, including a comprehensive understanding of the codebase of a path tracer utilizing the OptiX Ray tracing API, by implementating various sample projects.
- Developed a custom water surface mesh using CUDA, employing 2D Perlin noise algorithms to simulate realistic wave-like effects.

Work Experience

Game Developer at Mythfic Studio **December 2021 – January 2023**

- Engineered diverse game mechanics for a 2D platformer game, including the development of enemy AI, character locomotion, and intricate environmental puzzles.
- Devised a suite of Unity tools to automate editing processes, significantly reducing debugging and setup time.

VR Developer at Rshifts **December 2021 – January 2023**

- Streamlined the existing code base to eliminate superfluous computations and implemented efficient algorithms, leading to a substantial enhancement in frame rate.
- Enhanced the precision of the existing hand-tracking algorithm to capture more accurate user inputs.

Freelance Game Developer at UpUGo **June 2021 – August 2021**

- Created a tennis game utilizing visual inputs for character control and implemented a scoring system to track player performance.
- Co-Developed a system using Unity Game Engine that integrates camera sensors to accurately detect player location and movements, translating them into game inputs such as left, right, forehand, and backhand.

Projects

Path Tracer | *OptiX API, SlangD, C++, CMake* **December 2024**

- Enhanced project sophistication by seamlessly transitioning the CPU-based path tracer into a real-time GPU renderer using the OptiX ray tracing API, with effective parallel processing and memory management for responsive real-time rendering of complex scenes.
- Built a CPU-based path tracer from scratch, demonstrating a deep understanding of ray tracing principles acquired through the 'Ray Tracing in One Weekend' series.

Laboratory Simulations for Mixed Reality | *Advisor: Dr. Kaushal Kumar Bhagat* **September 2021 – May 2023**

- Created an immersive Virtual Reality (VR) application using Unity to simulate the operation of a silicon wafer fabrication (FAB) machine. This innovative training solution addresses cost constraints, enabling large-scale user training without direct exposure to expensive equipment. Achieved realism, interactivity, and user engagement in the VR environment.
- Designed and developed interactive Augmented Reality (AR) simulations for various physics experiments using the Unity game engine. These simulations offer users control over experiment parameters, serving as effective educational tools that bridge theory and practice.

Technical Skills

Programming Languages: C/C++, Python, C#, Processing, Matlab
API/Libraries: PyTorch, Diffusers, OptiX API, CUDA, OpenGL
Developer Tools/Technologies: CMake, Unity Game Engine, Unreal Game Engine, Git, Visual Studio
Simulator Software: Simulink, Tina TI, LTSpice, FreeCAD
Languages: English, Hindi, Sanskrit

Academic Achievements

Awarded Mitacs GRI 2023 fellowship to undertake a summer research internship at École de technologie supérieure.

Secured an AIR of 869 out of 51K candidates appearing in Kishore Vaigyanik Protsahan Yojana Examination, 2020

Secured an AIR of 1511 out of 150k candidates appearing in Joint Entrance Examination Advanced, 2020.

Secured an AIR of 1025 out of 929k candidates appearing in Joint Entrance Examination Main, 2020.

Achieved the highest aggregate score in Higher Secondary examinations from my school.