Research Statement
Stanley Yang

My research interests lie at the intersection of computer graphics, programming languages, and efficient data management, with a focus on developing methods to enhance the performance and accuracy of computational systems. My work has primarily explored high-performance rendering, clustering algorithms, and structural optimization, where I aim to bridge foundational theory with practical applications in modern computing environments. I am passionate about creating efficient algorithms and developing tools that advance the fields of graphics and programming languages.

In my current project, I am exploring ways to improve the performance of 3D Gaussian splatting rendering by developing novel clustering algorithms and optimizing backend CUDA code. This work builds upon my prior experience in computer graphics, where I developed semi-automatic methods to identify optimal 3D geometric primitives and parameters for input meshes. These methods enhance rendering quality and processing efficiency by automating critical steps in the pipeline, providing a balance between computational speed and visual fidelity. Through these projects, I have cultivated a strong foundation in algorithm design and performance optimization, which I intend to apply in future research.

In addition to my computer graphics work, I have conducted research on symbolic representation and optimization within programming languages. For instance, I developed a probabilistic approach to E-graph extraction in a graduate-level course on differentiable and probabilistic programming. This project involved exploring ways to improve structural accuracy and efficiency in large-scale symbolic representations, which are crucial for applications in machine learning and code analysis. The knowledge I gained in probabilistic modeling and structural optimization has informed my understanding of how to manage computational complexity and improve model accuracy in diverse systems.

Further, as a Database Research Assistant at the UW PLSE Lab, I gained experience in managing large-scale data sets, optimizing workflows, and ensuring data integrity—skills that have strengthened my understanding of data systems and scalable infrastructures. I developed automated workflows for query analysis and improved data processing efficiencies, both of which are critical for modern software testing and machine learning applications.

Moving forward, I aim to deepen my research in both computer graphics and programming languages, focusing on designing high-performance, efficient systems that can tackle emerging challenges in these fields. My goal is to develop innovative techniques that enhance computational systems' accuracy, scalability, and efficiency, making significant contributions to both academic research and real-world applications.