

# Guangyan Cai

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## RESEARCH INTERESTS

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My research interests are in the field of Computer Graphics, specifically physically-based rendering, physics simulation, and virtual reality. I am open to other topics as well.

## EDUCATION

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**University of California, San Diego**

*Sep 2016 - Jun 2020*

*B.S. Computer Science*

*San Diego, CA*

- Cumulative GPA: 3.6 / 4.0 (Major GPA: 3.9 / 4.0)
- Provost's Honors: 2016-2019

## RESEARCH EXPERIENCE

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**Product Important Sampling**

*Jun 2019 - Present*

*Advisor: Prof. Ravi Ramamoorthi*

*San Diego*

- Explored product important sampling in Monte Carlo light-transport simulation under the framework provided in the paper *Practical Path Guiding for Efficient Light-Transport Simulation*.
- Modified the Mitsuba renderer that comes with the paper to experiment with new data structures and algorithms.
- Investigated different methods for approximating BRDFs and ways to compute their product with local incident radiance.

**Time of Flight Imaging Simulation**

*Jun 2019 - Sep 2019*

*Advisor: Prof. Ravi Ramamoorthi*

*San Diego*

- Simulated a non-line-of-sight imaging system in a confocal setting to gain insight into the problem.
- Proposed a rejection sampling scheme to numerically verify a theoretical differential framework for time of flight imaging.
- Created a time of flight imaging simulation in a confocal setting using the new method.

**Improving Naive Bayes Classifier**

*Jan 2018 - Jun 2018*

*Advisor: Prof. Jerzy Lewak*

*San Diego, CA*

- Analyzed vehicle complaint data and vehicle recall data provided by NHTSA and explored their relation.
- Implemented Naive Bayes Classifier in Python to predict the possibility of future vehicle recalls based on current customer complaints.
- Investigated the feasibility of using phrases instead of words as the basic elements to implement Naive Bayes Classifier.
- Presented final work as a poster at the 2018 FMP Symposium.

## PROJECTS

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**Ocean Water Simulator**

*Oct 2019 - Present*

*Side Project*

*San Diego, CA*

- Followed the paper *Simulating Ocean Water* to create an ocean simulator using a fast Fourier transform.
- Utilized C++, OpenGL, and Cinder to render the ocean and create a GUI for manipulating parameters that control the waves.

## **Marching Terrain**

*Mar 2019 - Jun 2019*

### *Course Project*

*San Diego, CA*

- Created a VR application on Oculus Rift using C++ and OpenGL for the final project of a Virtual Reality course, which can generate random 3D terrain and allow users to travel inside and edit it with their partners.
- Utilized 3D Perlin noise to procedurally generate the terrain and the marching cube algorithm to construct the surface of the terrain.

## **SPH Fluid Simulator**

*Mar 2019 - Jun 2019*

### *Course Project*

*San Diego, CA*

- Built an SPH fluid simulator in C++ for the final project of a physics simulation course.
- Simulated the motion of fluid and the generation of foam and display the fluid as particles using OpenGL.

## **TEACHING EXPERIENCE**

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### **CSE 167: Computer Graphics**

*Sep 2019 - Present*

#### *Tutor*

*San Diego, CA*

- Updated the starter code to use modern C++ and OpenGL and wrote the reference code for each assignment to facilitate students' understanding of the goals of the assignment.
- Led discussion sessions and held office hours to answer students' questions on assignments and course materials.
- Participated in grading homework and exams.

### **CSE 168: Computer Graphics II - Rendering**

*Apr 2019 - Present*

#### *Course Staff*

*San Diego, CA*

- Created the starter code for a path tracer, which is the main focus of the course, using OptiX, Nvidia's ray tracing framework, and C++ and CUDA.
- Implemented the assignments to examine the validity and intelligibility of the writeups, which covers techniques such as area lights, next event estimation, Russian roulette, and multiple importance sampling.

## **PROFESSIONAL EXPERIENCE**

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### **Nanome**

*Nov 2019 - Present*

#### *Intern*

*San Diego, CA*

- Nanome is a software company that utilizes virtual reality technology to help advance the understanding of life science and mathematics.
- Assisted in porting CalcFlow, a VR application that helps to visualize vector calculus, to a recently released VR headset Oculus Quest.

### **SAIC Maxus Automotive Co. Ltd.**

*Aug 2018 - Sep 2018*

#### *Intern*

*Shanghai*

- Participated in the development of a virtual agent that guides users to customize their orders for the featured SUV.
- Designed web crawlers in Python to gather textual data including the definitions of vehicle components and Q&A about SUV.
- Cooperated with engineers from Ruyi.ai to create a knowledge graph based on the data collected and develop the virtual agent using their platform and the knowledge graph.

## **SKILLS**

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- **Programming Language:** C/C++, Python, Java, Matlab, R, JavaScript
- **Frameworks & Libraries** OpenGL, OptiX, PyTorch, NumPy, Matplotlib