# Tianrui Guan

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## EDUCATION

**University of Maryland**, College of Computer, Mathematical, and Natural Sciences                    College Park, MD
*Ph.D.,* **Computer Science**, *advised by Dinesh Manocha*                    *Fall 2021 – Current*
Master of Science, **Computer Science**, *GPA: 4.0*                    *Fall 2019 – Spring 2021*

**University of Maryland**, College of Computer, Mathematical, and Natural Sciences                    College Park, MD
Bachelor of Science, **Computer Science and Statistics**, *GPA: 3.97*                    *Fall 2016 – Spring 2019*
Graduate with Magna Cum Laude Latin Honor in three years
   - Computer Science Departmental Honors (All semesters)

*Relevant Coursework:* • Object-Oriented Programming • Operating System • Computer Network • Algorithms
• Data Structure • Probability Theory and Statistics • Linear Algebra • Database System • Distributed System
• Computer Vision (3D Detection/Segmentation) • Machine Learning • Deep Learning

## PUBLICATIONS / RESEARCH PROJECT

**Semantic Segmentation on Off-road Dataset,** *Python, Computer Vision (submitted)*                    *Fall 2020*
   - Proposed a novel group-wise attention semantic segmentation designed for off-road dataset
   - A general framework of grouping scheme that can boost the accuracy for recognizing navigability and condition of different regions

**3D Point Cloud Detection with Transformer,** *Python, Computer Vision (in progress)*                    *Fall 2020*
   - A novel transformer 3D detection network on Point Cloud from KITTI and Waymo dataset

**OF-VO: Reliable Navigation among Pedestrians,** *robotic (submitted)*                    *Fall 2020*
   - Built a hybrid model that combines segmentation network and optical flow network
   - Created a modified version of velocity obstacle algorithm based on partial observation
   - Implemented the algorithm in both simulator and turtlebot2 with good successful rate (collision avoidance)

**Frozone: Freezing-Free, Pedestrian-Friendly Navigation in Human Crowds**, *Robotics*                    *Spring 2020*
*RA-L and IROS 2020*

   - Made collision avoidance policy that significantly reduce the freezing robot problem
   - Classified pedestrians that could potentially impact motion planning
   - Predicted the trajectories of pedestrians to form a Potential Freezing Zone using perception module

**Trajectory and Behavior of Road-Agents Using Spectral Clustering in Graph-LSTMs**, *Python*                    *Fall 2019*
*RA-L and IROS 2020*

   - Extracted and formatted data for Lyft level 5, Argoverse and Apolloscape*)*
   - Used a two-stream LSTM network to predict trajectory and behavior of road agents
   - Conducted extensive experiments on several state-of-the-art pedestrian prediction algorithms

**TrackNPred: A Software Framework for End-to-End Trajectory Prediction** *Python/Qt*                    *Summer 2019*
*ACM CSCS 2019 &*
**DenseCAvoid: Real-time Navigation in Dense Crowds using Anticipatory Behaviors**
*ICRA 2020*

   - Created a pipeline of object detection, object tracking and trajectory prediction
   - Incorporated several state-of-the-art methods in the pipeline
   - Built an GUI to enable switching between different methods and visualizing results
   - Deployed the system in a robotic navigation project

## ENGINEERING PROJECTS

**Distributed Storage System**, *Go, Distributed System.*                                          *Fall 2020*
- Built distributed servers with consensus algorithm RAFT for file storage and restoration
- Created a simple client file system using FUSE to store data persistently on the server
- Used anchors and claim to build mutable semantics on immutable data chunks
- Used Merkle tress to synchronize multiple servers
- Used Rabin-Karp chunking with rolling hash to chunk files and RSA encryption for verification

**Database (Class Project)**, *C++, Database (in progress)*                                          *Fall 2020*
- Implemented thread-pool and process-pool database system
- Implemented lock manager and various concurrency control (Sequential and Parallel OCC, MVCC)

**GeekOS**, *C, Operating System*                                          *Spring 2020*
- Implemented fundamental functionality of an operating system (pipe, fork, exec, etc..)
- Handled signals, memory allocation and concurrency in kernel thread and register
- Implemented read/write, paging and virtual memory from scratch in geekOS

**Overlay Routing & Distributed Transaction Processing**, *Ruby/C, Computer Network*                                          *Fall 2018*
- Connected nodes at the application layer in CORE virtual environment
- Listened and sent out control messages on each node to help carry traffic
- Built routing table and used link-state routing to converge the network
- Supported fragmentation and kept an internal clock

## WORKING EXPERIENCE

**Research Assistant at GAMMA**, University of Maryland, College Park                                          *May 2019 - Present*
- Advised by Professor Dinesh Manocha
- Worked on trajectory prediction, computer vision and robotic projects (See **PUBLICATIONS** section)

**Teaching Assistant for Data Structures CMSC420**, University of Maryland, College Park   *Nov 2018 - Present*
- Assisted students with study materials and coding for a class of 150 people for 4 semesters
- Created homework and test, and handled grading
- Implemented additional functionality to the base code previously developed by instructors
- Developed more robust testing code for project grading

**Software Engineering Intern,** MicroStrategy, Tysons Corner, VA                                          *Summer 2019*
- Accepted the offer, but could not make it due to belated working permission

**Software Testing Intern**, Advanced Geophysical Technology, Houston, TX                                          *Summer 2017*
- Provided solutions for GUI Test Automation for NoveSeis
- Explored squish for Qt, froglogic and Sikuli Script

## LIST of PUBLICATIONS

[1] Tianrui Guan; Divya Kothandaraman; Rohan Chandra; Dinesh Manocha "GANav: Group-wise Attention Network for Classifying Navigable Regions in Unstructured Outdoor Environments", Under review

[2] Adarsh Jagan Sathyamoorthy; Utsav Patel; Tianrui Guan; Dinesh Manocha. "Frozone: Freezing-Free, Pedestrian-Friendly Navigation in Human Crowds ", *IEEE Robotics and Automation Letters, 2020*

[3] Rohan Chandra; Tianrui Guan; Srujan Panuganti; Trisha Mittal; Uttaran Bhattacharya; Aniket Bera; Dinesh Manocha. "Forecasting Trajectory and Behavior of Road-Agents Using Spectral Clustering in Graph-LSTMs", *IEEE Robotics and Automation Letters (RAL), 2020*

[4] Adarsh Jagan Sathyamoorthy; Jing Liang; Utsav Patel; Tianrui Guan; Rohan Chandra; Dinesh Manocha." DenseCAvoid: Real-time Navigation in Dense Crowds using Anticipatory Behaviors", *IEEE International Conference on Robotics and Automation (ICRA), 2020*

[5] Jing Liang, Yi-Ling Qiao, Tianrui Guan, Dinesh Manocha, "OF-VO: Reliable Navigation among Pedestrians Using Commodity Sensors", Under review