

# Lixun Zhang

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## Education

### The University of Texas at Austin

PH.D. IN COMPUTER SCIENCE

- Dissertation: A Particle Filter Program Generator on GPU.

Austin, Texas

Jan. 2013 - May. 2022

### Tsinghua University

B.S. IN ENGINEERING, AUTOMATION

Beijing, China

Sep. 2008 - Jul. 2012

## Research Projects

### Implementation of Monte Carlo Localization on Heterogeneous Systems

May. 2021 - Aug. 2021

- Implemented the Monte Carlo Localization algorithm in CUDA.
- Partitioned the particles among multiple threads: one launches the GPU kernel and others run on CPU in a multi-threaded manner.
- Mutex and condition variables were used to synchronize between threads.
- Simulated the localization of the fifth autonomous car system using ROS.

### Implementation of Particle Filter on Heterogeneous Systems

Jan. 2021 - Apr. 2021

- Partitioned the particles among two processes: one runs on CPU and the other launches the GPU kernel.
- POSIX shared memory and System V semaphore were used to communicate and synchronize between the two processes.
- Conducted experiments on NVIDIA GTX TITAN and Jetson TX2 to obtain the optimal partition among CPU and GPU.

### An Analytical Performance Model for GPGPU kernels

Jan. 2019 - Dec. 2020

- Developed a mathematical model to estimate the execution time of simple kernels based on static analysis of CUDA assembly code and knowledge of GPU architecture.

### Laser Power Control for Selective Laser Sintering

Sep. 2016 - Aug. 2017

- Achieved motion detection of galvanometer by comparing two consecutive images taken by infrared cameras in LabVIEW.
- Built an automatic laser power control system at both vector-level and layer-level control granularity to eliminate thermal gradients in the post-sintering temperature on the Laser Additive Manufacturing Pilot System at the department of mechanical engineering.

### A MATLAB to CUDA translator for Particle Filter Applications

Sep. 2014 - Aug. 2015

- Developed a front-end in C to translate MATLAB code of particle filter estimator into CUDA code.
- Developed domain-specific optimization passes in C for the generated CUDA code.

### CUDA Implementation of Particle Filter for Real World Applications

Jun. 2013 - Aug. 2014

- Applications include Vacuum Arc Remelting and Early Kick Detection.
- Implemented sampling, importance, and resampling modules in CUDA.
- Analyzed and improved GPU kernel performance through profiling.

## Internship

### MathWorks

COMPILER ENGINEER, CODE GENERATION

Natick, MA

Jun. 2016 - Aug. 2016

- Developed a C++ pass to analyze for loops in the IR to find loop invariant variables.
- Generated intrinsic functions which expand to OpenMP pragmas in the code generation phase.
- Performed timing experiments of the generated code on multi-core systems.

## Course Projects

### CS380C Compilers

Jan. 2015 - May. 2015

- Wrote LLVM passes to perform domain-specific local optimizations.
- Implemented an iterative data-flow analysis framework and used it to implement both a forward data-flow analysis (Reaching Definitions) and a backward data-flow analysis (Liveness) using LLVM.
- Wrote LLVM passes to perform Dead Code Elimination and Loop Invariant Code Motion.

## Teaching Assistant Courses

### CS375 Compilers

Jan. 2018 - Dec. 2021

- Developed lexical analyzer (in lex and C), parser (in Yacc), and code generator (in C) for Pascal.
- Developed an autograder in Bash script for programming assignments.

### CS380P Parallel Systems

Jun. 2019 - Aug. 2019

- Developed programming assignments for course projects: prefix sum using pthread, Kmeans using CUDA and Thrust, tree comparison using Go, and Barnes-Hut using MPI.
- Developed an autograder in Bash script for programming assignments.