Jimmy He

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ABOUT

Generalist who turns math into products. Built and led talented engineering teams creating the future of human-computer interaction. Passionate about computer vision, machine learning, and graphics.

TECHNICAL SKILLS

Programming:	C++, C, Python, Rust, Matlab, R, C#, Javascript, Java, PHP, SQL, Shell, x86 assembly
Frameworks:	Keras, TensorFlow, PyTorch, Numpy, Scipy, Eigen, OpenCV, Qt, CUDA, SSE, NEON
Deep Learning:	CNN, RNN, LSTM, GAN, autoencoders, style transfer, deep reinforcement learning
Computer Vision:	Segmentation, 3D reconstruction, tracking, SfM, SLAM, optical flow, calibration
Mathematics:	Nonlinear optimization, complex analysis, Bayesian statistics, Kalman filtering
Graphics:	OpenGL, GLES, GLSL, Vulkan, Cinder, WebGL, Unity

EXPERIENCE

Redrock Biometrics San Francisco, CA
Principal Software Engineer 2020 – present

- Developed rapid scoring mechanism for matching palmprint images against stored user biometrics
- Created automated pipeline to evaluate matching accuracy on large academic and field datasets
- Improved realism of training dataset by generating labels for field data and by refining synthetically rendered images using neural style transfer
- Implemented support for hardware designs combining visible and infrared cameras for robustness

Cruise Automation San Francisco, CA
Senior Software Engineer 2018 – 2019

- Developed a grid-based temporal object tracker using LIDAR which is robust to occlusions, significantly improving accuracy in distinguishing between parked and moving vehicles
- Modernized machine learning pipeline for predicting active traffic participants given LIDAR, vision, and radar observations
- Devised new method of merging and retracing object tracks based on stored observation histories
- Created dashboard and pipeline to summarize aggregate object tracking accuracy. Integrated with CI to allow quick feedback on real world performance compared to running simulations manually

Leap Motion San Francisco, CA
Engineering Manager 2014 – 2018

- Hired and led teams of 5-10 developers across hand tracking research, front-end applications and firmware. Worked to deliver state-of-the-art VR hand tracking running on cheap off-the-shelf parts
- Unblocked team members to meet aggressive release schedules while keeping technical debt in check
- Provided mentorship on career growth, agile research planning, and software best practices

Principal Software Engineer 2012 – 2018

- Developed key computer vision components in C++ including segmentation, rotation normalization, scale correction, optical flow, non-rigid motion estimation via Kalman filtering, and image denoising
- Created first company prototype of realtime visual-inertial odometry with EKF-based sensor fusion
- Wrote the camera calibration library and much of the in-house math and 3D geometry foundation

- Devised the factory and end-user stereo calibration techniques. Patented a novel method requiring only the device itself and a reflective surface, allowing anyone to recalibrate to sub-pixel accuracy
- Trained and advised team of 20+ customer support specialists throughout first consumer launch
- Wrote the embedded firmware currently running on over 600,000 consumer and developer units
- Built video pipeline with support for windowing, autoexposure, noise correction, and latency testing
- Optimized computationally intensive operations by orders of magnitude using SIMD vectorization
- Developed OpenGL-based visualization engine for live stereo images and 3D reconstructions, which became the company default platform for rapid algorithm prototyping and profiling
- Built "Intro to VR" flagship application to demonstrate hand tracking for first VR developer release

Altera Toronto, ON, Canada
Hardware Engineering Intern 2011

- Developed novel algorithm to optimally route logic units on an FPGA given geometric constraints
- Used spatial indexing on the copies of logic elements to dramatically speed up computation
- Introduced new API for writing internal software tools for processing FPGA device blueprints

PROJECTS

Deep Learning Stock Predictor 2018
Personal Project

- Using collected trade history and level-2 orderbook data, trained a recurrent model that predicts a probability distribution of future price movement
- Outperformed all hand-coded heuristics and technical indicators given a sufficiently large dataset

EDUCATION

University of Waterloo Waterloo, ON, Canada
B.A.Sc. Nanotechnology Engineering 2007 – 2012

PATENTS

Augmented reality with motion sensing 2019
US Patent 10,349,036 – David S. Holz, Neeloy Roy, Jimmy He

Systems and method of interacting with a virtual object 2018
US Patent 9,911,240 – Raffi Bedikian, Jimmy He, David S. Holz

Biometric aware object detection and tracking 2017
US Patent 9,679,197 – Maxwell Sills, Aaron Smith, David S. Holz, Jimmy He

Calibration of multi-camera devices using reflections thereof 2017
US Patent 9,648,300 – Jimmy He, David S. Holz

Method for synchronizing operation of systems 2016
US Patent 9,348,419 – Ryan C. Julian, Jimmy He, David S. Holz

AWARDS

American Invitational Mathematics Examination 2007
2nd place in North America

CEMC Fermat Mathematics Contest 2006
1st place in Canada