

Ruiwen Zhen

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Linkedin ◊ Google Scholar ◊ Github

EXPERIENCE PROFILE

- 15 years of research and professional experience in efficient image processing & computer vision algorithms and software development on edge devices.
- 10 years of expertise with development of machine learning & deep learning models including data collection, network architecture design, training, testing, compression, quantization and deployment.
- 7 years of mentoring scientists and software engineers, and collaborating with leaders to create road-map for the organization.

EDUCATION

University of Notre Dame, Notre Dame, IN, USA

Ph.D. in Electrical Engineering

Aug 2011-Sep 2016

M.S. in Electrical Engineering

Aug 2011-May 2013

GPA: 3.98/4.0

Advisor: Robert L. Stevenson

Courses: Random Process, Mathematical Optimization, Algorithm Analysis, Data Structures, Machine Learning, Reinforcement Learning, Pattern Recognition, Computer Vision, Digital Image Processing, Mobile Computing, Parallel Computing

Tongji University, Shanghai, P.R.China

B.S. with honors in Electrical Engineering

Sept 2007-Jul 2011

GPA: 4.84/5.0 (Rank 1/89)

PROGRAM SKILLS

- Language: Python (JAX), C/C++, Matlab, Java, Verilog
- Library: Pytorch, Tensorflow, OpenCV, OpenCL, CUDA C, Eigen, OpenMP, MPI, ROS2, OpenNI, PCL, VES/Kiwi

PROFESSIONAL EXPERIENCE

Google, USA
Technical Lead of Camera Team in Beam Project Dec 2023-Present

Project Beam (formerly Starline) is an AI-powered 3D telepresence platform that leverages advanced computer vision, machine learning, and light-field display technology to create a hyper-realistic, real-time communication experience that simulates physical co-presence.

- Designed and implemented multi-camera AE and AWB synchronization algorithms, ensuring consistent brightness and color across multiple sensors in complex lighting environments.
- Architected Region-of-Interest (ROI) compression strategies for both uplink and downlink video streams, significantly improving perceptual quality at constrained bitrates.
 - Engineered a content-aware compression engine driven by semantic segmentation networks, dynamically allocating bitrate to perceptually critical regions (e.g., faces) identified by real-time inference.
 - Innovated an uplink video encoding strategy that utilizes blend weights and geometry cues from Multi-Plane Image (MPI) representations to guide quantization decisions in video compression.

- Implemented advanced resampling algorithms in the rendering pipeline, resulting in sharper and more detailed novel view synthesis.

Sensebrain Technology, USA

Technical Lead

Jan 2021-Sep 2023

- Led the work in designing and delivering SDKs for mobile cameras with focus on multi-frame processing pipeline that consists of algorithms modules image align/fusion, denoising, tone mapping, sharpening, chroma noise reduction, moire removal and so on.
 - Developed a tunable denoising neural network that could adaptively removes the noise on the raw image given the current noise level
 - Built a GAN-based neural network as a post-processing block for super-resolving portraits
 - Adopted the deformable neural network with attention mechanism to locally align multiple-exposure images in order to synthesize ghost-free HDR image
 - Compressed the above networks using Network Architecture Search and quantization tools, and deployed them with SNPE, QNN and internal inference engine
- Collaborated with Sony to develop AI solutions for innovative sensors, including RGBW, 2x2 OCL and organic sensor.
 - Designed the lightweight network architect to convert RGBW CFA pattern to regular Bayer pattern with better SNR. This product has been shipped in Vivo X80 main camera.
 - Invented and tested a novel multi-exposure CFA pattern on RGBW sensor to address the ghost issue in HDR fusion and the aliasing issue in multi-exposure CFA pattern on Bayer sensor.
 - Led the effort to develop a neural network solution for the non-linearity issue specific to 2x2 OCL on which 4 pixels share a single lens.
 - Participated in several phases of research on organic sensor that aims to decrease sensor manufacturing costs but introduces lag artifacts. We designed the synthetic data generation pipeline and invented & compressed the neural network to mitigate the lag artifact.

Samsung Research America, USA

Staff Design/Algorithm Engineer

Sept 2016-Dec 2020

- Design image processing algorithms and commercialize SDKs for Samsung flagship phones
 - low-light shot: multi-frame processor shipped in Galaxy S8 and Note8
 - dual camera fusion/SAT
 - Intelligent high dynamic range imaging shipped in Galaxy S10
 - Image motion blur reduction shipped in Note10
 - Night shot mode shipped in Galaxy S20
- Develop and optimize image processing related softwares
 - speed-up image filter operation
 - ARM NEON coding

FutureWei Technologies, Bridgewater, NJ, USA

Research Intern in Media Lab

Apr 2016-July 2016

- Research deep neural networks pruning and quantization (Python, C++)
- Mentor: Heather Yu

Motorola Solutions, Schaumburg, IL, USA

Research Intern in Media Analytics Research Group May 2014-Aug 2014

- Research 3D point cloud registration algorithms for irregular objects (C++)
- Realize the visualization of point clouds on Android platform (Java, JNI)
- Mentor: Ankur Patel and Kevin O'Connell

University of Notre Dame, Notre Dame, IN, USA

Research Assistant in Image and Video Processing Lab May 2012-Aug 2016

- Project: Image deblurring from a single image or multiple images with the aid of inertial sensors (Matlab, C++)
- Advisor: Robert L. Stevenson

Teaching Assistant Aug 2011-May 2012

- Electronic Circuits
- Digital Signal Processing

PUBLICATIONS Conference Publications

Ruiwen Zhen, Xiangyu Chen, Shuai Li, More and Faster: A Model Simplification Roadmap for Image Restoration on Mobile Devices, accepted by ICCVW 2023

Jieyu Li, Ruiwen Zhen, Robert Stevenson, A Lightweight Exposure Bracketing Strategy for HDR Imaging without Access to Camera Raw, in IS&T Conference on Electronic Imaging 2023 (EI)

Baekdu Choi, Ruiwen Zhen, John Glotzbach, Hamid Sheikh, Kernel-aware Single Image Super-resolution on Multi-frame Blended Images, in IEEE International Conference on Acoustics, Speech and Signal Processing 2021 (ICASSP)

Shuang Zhang, Ruiwen Zhen, Robert Stevenson, A Dataset for Deep Image Deblurring Aided by Inertial Sensor Data, in IS&T Conference on Electronic Imaging 2020 (EI)

Vijay Rengarajan, Shuo Zhao, Ruiwen Zhen, John Glotzbach, Hamid Sheikh, Photosequencing of Motion Blur Using Short and Long Exposures, in 2020 IEEE Conference on Computer Vision and Pattern Recognition Workshops (CVPRW)

Yuting Hu, Ruiwen Zhen, Hamid Sheikh, CNN-based Deghosting in High Dynamic Range Imaging, in IEEE International Conference on Image Processing 2019 (ICIP)

Shuang Zhang, Ruiwen Zhen, Robert Stevenson, GAN Based Image Deblurring Using Dark Channel Prior, in IS&T Conference on Electronic Imaging 2019 (EI)

Ruiwen Zhen, Robert Stevenson, Motion Deblurring and Depth Estimation from Multiple Images, in IEEE International Conference on Image Processing 2016 (ICIP)

Ruiwen Zhen, Robert Stevenson, Motion Deblurring for Depth-varying Scenes, in IS&T Conference on Electronic Imaging 2016 (EI)

Ruiwen Zhen, Robert Stevenson, Semi-blind Deblurring Images Captured with Electronic Rolling Shutter Mechanism, in IS&T/SPIE Conference on Electronic Imaging 2015 (EI)

Ruiwen Zhen, Robert Stevenson, Motion Blur Kernel Estimation Using Noisy Inertial Data, in IEEE International Conference on Image Processing 2014 (ICIP)

Ruiwen Zhen, Robert Stevenson, Joint Deblurring and Demosaicing of CFA Image Data With Motion Blur, in IS&T/SPIE Conference on Electronic Imaging 2014 (EI)

Guoping Liu, Ruiwen Zhen, Guozheng Li, Association Analysis and Distribution of Chronic Gastritis Syndromes Based on Association Density, in IEEE International Conference on BIBMW 2010

Peer-Reviewed Journal Publications

- Jieyu Li, Ruiwen Zhen, Robert Stevenson, Learning-based Noise-aware Lightweight Exposure Strategy for High Dynamic Range Imaging, in Journal of Imaging Science Technology 2025
- Jieyu Li, Ruiwen Zhen, Robert Stevenson, Automatic Exposure Strategy Network for Robust Visual Odometry in Environments with High Dynamic Range, in Journal of Machine Vision and Applications 2025
- Shuang Zhang, Ruiwen Zhen, Robert Stevenson, DeblurExpand: Image Motion Deblurring Network Aided By Inertial Sensor Data, in Journal of Signal, Image and Video Processing 2022
- Shuang Zhang, Ruiwen Zhen, Robert Stevenson, Deep Motion Blur Removal Using Noisy/Blurry Image Pairs, in Journal of Electronic Imaging 2021
- Ruiwen Zhen, Robert Stevenson, Inertial Sensor Aided Multi-image Nonuniform Motion Blur Removal Based on Motion Decomposition, in Journal of Electronic Imaging 2018
- Ruiwen Zhen, Robert Stevenson, Multi-image Motion Deblurring Aided by Inertial Sensors, in Journal of Electronic Imaging 2016
- Ruiwen Zhen, Robert Stevenson, CFA Image Demosaicing, published chapter in Color Image and Video Enhancement, Springer 2015

PATENTS

- Baekdu Choi, Ruiwen Zhen, John Glotzbach, Hamid Sheikh, Kernel-aware Super Resolution, US Patent 11,615,510, 2023
- Zhen Tong, Baekdu Choi, Ruiwen Zhen, John Glotzbach, Hamid Sheikh, Halo-free Image Sharpening, US Patent App. 17/139,880, 2022
- Ruiwen Zhen, John Glotzbach, Hamid Sheikh, Single Image Detail and Contrast Enhancement, US Patent 11,354,781, 2022
- Ruiwen Zhen, John Glotzbach, Hamid Sheikh, Guided Multi-exposure Image Fusion, US Patent 11,430,094, 2022
- Long N Le, Ruiwen Zhen, John Glotzbach, Hamid Sheikh, Ibrahim Ibrahim Pekkucuksen, Apparatus and Method for Dynamic Range Compression in Multi-frame Processing, US Patent 11,388,348, 2022
- Ruiwen Zhen, John Glotzbach, Ibrahim Pekkucuksen, Hamid Sheikh, Yuting Hu, Techniques for Convolutional Neural Network Based Multi-exposure Fusion of Multiple Image Frames and for Deblurring Multiple Image Frames, US Patent 11,107,205, 2021
- Zhen Tong, John Glotzbach, Ruiwen Zhen, Hamid Sheikh, Local Image Histogram Match with Global Regularization and Motion Exclusion for Multi-exposure Fusion, US Patent 11,200,653, 2021
- Ruiwen Zhen, John Glotzbach, Hamid Sheikh, Apparatus and Method for Chroma Processing for Multi-frame Fusion, US Patent 11,418,766, 2022
- Ruiwen Zhen, John Glotzbach, Hamid Sheikh, Apparatus and Method for Efficient Regularized Image Alignment for Multi-Frame Fusion, US Patent 11,151,731, 2021
- Long N Le, Ruiwen Zhen, John Glotzbach, Hamid Sheikh, Ibrahim Ibrahim Pekkucuksen, System and Method for Dynamic Selection of Reference Image Frame, US Patent 10,911,691, 2021
- Ruiwen Zhen, John Glotzbach, Hamid Sheikh, Apparatus and Method for High Dynamic Range (HDR) Image Creation of Dynamic Scenes Using Graph Cut Based Labelling, US Patent 11,095,829, 2021
- John Glotzbach, Ruiwen Zhen, Ibrahim Pekkucuksen, Hamid Sheikh, Processing Image Data in A Composite Image, US Patent 10,949,959, 2021

Ruiwen Zhen, John Glotzbach, Ibrahim Pekkucuksen, Hamid Sheikh, System and Method for Compositing High Dynamic Range Images, US Patent 11,128,809, 2021
Ruiwen Zhen, John Glotzbach, Raja Bala, Hamid Sheikh, Devices Having Cameras with Different Focal Lengths and A Method of Implementing Cameras with Different Focal Lengths, US Patent 10,972,672, 2021

Ibrahim Pekkucuksen, Hamid Sheikh, John Glotzbach, Ruiwen Zhen, Devices for and Methods of Combining Content from Multiple Frames, U.S. Patent 10,817,996, 2020

AWARDS

Sensebrain Outstanding Award 2021
Samsung Research America President's Award, 2019, 2020
Samsung Best Paper Award, 2019
Graduate Student Fellowship, 2012, University of Notre Dame
Excellent Graduate Student in Shanghai, 2011, Shanghai
GuoXieBiRong Scholarship (Top 1%), 2010, Tongji University
Siemens Scholarship (Top 2%), 2009, Tongji University
National Scholarship (Top 1%), 2008, Tongji University
First Prize Scholarship (Top 1%), 2008, 2009, 2010, Tongji University

REFERENCES

Robert L. Stevenson, Professor and Associate Chair, University of Notre Dame
Email: rls@nd.edu
John Glotzbach, Senior Principle Engineer, Samsung Research America
Email: john.glotzbach@gmail.com