

# Yuancheng [Mike] Luo

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## PROFILE

Researcher & engineer with a strong background in digital signal processing, numerical linear algebra, and machine learning. Held previous roles in spatial audio research, audio engine / plugin software development, and graphical user interface design.

## EDUCATION

- 2009 – 2014                      University of Maryland College Park, College Park, MD  
Ph.D. and M.Sc. in Computer Science
- 2006 – 2009                      University of Maryland College Park, College Park, MD  
B.Sc. Double major in Computer Science and Mathematics

## WORK EXPERIENCE

- 2017 – Present                      [NuSpace Audio](#)  
**Founder/Research Scientist/Developer.** Founded spatial audio software startup for music and sound post-production. Designed novel algorithms for simulating reverberation and direction cues in high-dimensional spaces. Released binaural 3D panner/mixer/reverb, binaural multi-effects, and Ambisonics reverberator plugins for digital audio workstations. Launched, designed, marketed, and demoed company products and website.
- 2014 – 2016                      Visisonics Corporation, College Park, MD  
**Research Scientist.** Developed algorithms for personalizing spatial audio. Developed generative models for synthesizing and imputing head-related transfer functions (HRTFs). Designed graphical interfaces (JUICE framework), signal process routines, and metrics for the real-time editing and rendering of HRTFs. Integrated RealSpace3D libraries with game engines (Audiokinetic Wwise, Unity, Unreal 4).
- 2011 – 2014                      University of Maryland Institute for Advanced Computer Studies, College Park, MD  
**Graduate Research Assistant.** Developed machine learning (Bayesian Regression, Gaussian and random processes, non-negative matrix factorizations, neural networks) algorithms for spatial audio reproduction (binaural rendering, DSP, psychoacoustics). Designed HRTF recommendation system via active-learning algorithms with listening tests, Gaussian process models for fast HRTF spatial interpolation, and sparse non-negative algorithms for fast HRTF convolution.
- 2009 – 2011                      University of Maryland Institute for Advanced Computer Studies, College Park, MD  
**Graduate Research Assistant.** Developed optimization and model fitting problems for recovering topography data from LIDAR waveforms collected from laser altimetry sensors. Parallelized algorithms for solving the non-negative least squares (NNLS) problems on the GPU. Parallelized speaker recognition system (Joint factor analysis models, mixture modeling) for large-scale evaluations (32-node cluster) using message passing interface (MPI) and open multi-processing (OpenMP).
- 2007 – Summer                      University of Maryland Institute for Advanced Computer Studies, College Park, MD  
**Undergraduate Researcher** (Internship). Researched and designed computer vision and signal processing algorithms on parallel NVIDIA's Compute Unified Device Architecture (CUDA). Developed middleware to interface between C/CUDA and Fortran. Developed fast GPU algorithm of the Canny Edge Detector in CUDA on NVIDIA hardware. Developed GPU implementations of background subtraction via kernel density estimation models for detecting Satin Bowerbirds.

## COMPUTER SKILLS

Languages: C/C++  
Programs/APIs: Microsoft Visual Studios, Matlab, GLSL, CUDA, OpenGL, OpenAL, VST/AU  
Engines: Audiokinetic Wwise, Unity, Unreal 4

## OPEN SOURCE PROJECTS

2006-2008 [Liquidus](#): Fluid dynamics (Navier-Stokes) sandbox simulation game (OpenGL/GLSL/OpenAL) on the GPU

## SELECTED PUBLICATIONS & PATENTS

1. Statistical modelling, interpolation, measurement and anthropometry based prediction of head-related transfer functions. **Y Luo**, R Duraiswami, DN Zotkin - US Patent 9,681,250, 2017.
2. Sparse Decomposition of Head Related Impulse Responses With Applications to Spatial Audio Rendering. **Y Luo**, R Duraiswami, DN Zotkin - US Patent App. 14/732,864.
3. **Yuancheng Luo**, Dmitry N. Zotkin, and Ramani Duraiswami. "Sparse Head-Related Impulse Response for Efficient Direct Convolution", <http://arxiv.org/abs/1502.03162>.
4. **Yuancheng Luo**, Dmitry N. Zotkin, and Ramani Duraiswami. "Gaussian Process Models for HRTF based Sound-Source Localization and Active-Learning", <http://arxiv.org/abs/1502.03163>.
5. **Yuancheng Luo**, Dmitry N. Zotkin, and Ramani Duraiswami. "Gaussian Process Models for HRTF based 3D Sound Localization", International Conference on Acoustics, Speech, and Signal Processing, 2014, Florence, Italy.
6. **Yuancheng Luo**, Dmitry N. Zotkin, and Ramani Duraiswami. "Virtual Autoencoder based Recommendation System for Individualizing Head-related Transfer Functions", IEEE Workshop on Applications of Signal Processing to Audio and Acoustics (WASPAA), 2013, New Paltz, NY.
7. **Yuancheng Luo**, Dmitry N. Zotkin, and Ramani Duraiswami, "Gaussian Process Data Fusion for Heterogeneous HRTF Datasets", IEEE Workshop on Applications of Signal Processing to Audio and Acoustics (WASPAA), 2013, New Paltz, NY.
8. **Yuancheng Luo**, Dmitry N. Zotkin, Hal Daumé III and Ramani Duraiswami, "Kernel Regression for Head-Related Transfer Function Interpolation and Spectral Extrema Extraction", Proceedings 38th International Conference on Acoustics, Speech, and Signal Processing (ICASSP), Vancouver, 2013.
9. **Yuancheng Luo** and Ramani Duraiswami, "Fast Near-GRID Gaussian Process Regression", AISTATS 2013.
10. **Yuancheng Luo**, Dmitry N. Zotkin, and Ramani Duraiswami, "Statistical Analysis of Head-Related Transfer Function (HRTF) data", International Congress on Acoustics, Montreal, accepted, Proceedings of Meetings on Acoustics, 2013.
11. **Yuancheng Luo** and Ramani Duraiswami, "Alternative Tilings for the Fast Multipole Method on the Plane", [arXiv:1204.3105], 2012.
12. **Yuancheng Luo** and Ramani Duraiswami, "Efficient Parallel Non-Negative Least Squares on Multicore Architectures", SIAM Journal on Scientific Computing 2011.
13. **Yuancheng Luo** and Ramani Duraiswami, "Canny Edge Detection on NVIDIA CUDA" Proceedings of the Workshop on Computer Vision on GPUS, CVPR 2008.