Lingchen Zhu

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Education

Aug 2011–Dec 2016	**Ph.D. in Electrical and Computer Engineering**, *Georgia Institute of Technology*, North Ave, Atlanta, GA 30332, Advisor: Prof. James H. McClellan, GPA: 3.9/4.0.
May 2009–May 2011	**Master of Science in Electrical and Computer Engineering**, *Georgia Institute of Technology*, North Ave, Atlanta, GA 30332, GPA: 4.0/4.0.
Aug 2008–Mar 2011	**Master of Science in Telecommunication and Information System**, *Shanghai Jiao Tong University*, 800 Dongchuan Road, Shanghai 200240, China, Advisor: Prof. Hongkai Xiong, GPA: 3.5/4.0.
Sept 2004–Jul 2008	**Bachelor of Science in Information Engineering**, *Southeast University*, 2 Sipailou, Nanjing 210096, China, GPA: 3.7/4.0.

Industrial Experience

Sept 2016–Present	**Research Scientist**, *Schlumberger-Doll Research Center*, Cambridge, MA.
Project	Acoustic Signal Processing for Well Borehole

- ○ Process signals from sonic and ultrasonic tools to evaluate borehole cementing for well integrity
- ○ Designed supervised & unsupervised machine learning frameworks for well borehole cementing evaluation
- ○ Developed probabilistic Bayesian neural networks to understand the aleatoric and epistemic uncertainty of machine learning predictions
- ○ Developed deep generative models to learn the intrinsic latent low-dimensional information of the high-dimensional geophysical, geographical and acoustic data
- ○ Developed a deep reinforcement learning framework for sonic processing algorithm workflow automation
- ○ Developed and improved efficient signal processing techniques for sonic and ultrasonic tools

May 2015–Aug 2015	**Research Intern**, *Schlumberger-Doll Research Center*, Cambridge, MA.
Project	Real-time Mud Pulse Telemetry (MPT) System for Borehole Image Transmission

- ○ Designed an efficient and robust borehole image compression system based on compressive sensing
- ○ Implemented pattern recognition method to effectively identify various image structures
- ○ Minimized data redundancy to improve transmission efficiency
- ○ Improved decompressed image quality for ultra-low MPT rates and emphasized crucial structures

May 2013–Aug 2013	**Research Intern**, *InterDigital Communications Corp.*, Melville, NY.
Project	An Enhanced Compressed Sensing-based Interference-resistant Receiver for LTE Systems

- ○ Designed a novel interference-resistant receiver for wideband LTE system
- ○ Improved receiver performance under mutually interfering and noisy environments
- ○ Decreased required signal sampling rate if spectrum is underutilized based on compressive sensing technique
- ○ Proposed an iterative interference cancellation algorithm for LTE OFDMA signals based on semi-blind resource block detection

Academic Experience

May 2014–Aug 2016	**Graduate Research Assistant**, *Center for Energy and Geo Processing*, Georgia Institute of Technology, Atlanta, GA.
	Advisor: Prof. James H. McClellan
Dissertation	Sparse Seismic Signal Processing using Adaptive Dictionaries

The objective of my Ph.D. dissertation is to enhance the efficiency and performance of seismic imaging and inversion with the aids of sparse signal processing and high performance computing.

○ Individually developed a Matlab/C-based software package *SSSI*(*Seismic Simulation, Survey and Imaging*) that facilitates seismic simulations of wave propagation, data acquisition, migration and inversion, downloadable from `http://cegp.ece.gatech.edu/codedata/s3i/`

○ Implemented efficient pre-stack migration and full waveform inversion algorithms to recover the subsurface image using high performance parallel computing

○ Developed efficient sparsity-promoting algorithm for full waveform inversion based on compressive sensing

○ Proposed a novel seismic data denoising scheme based on sparse and multi-scale dictionary learning method

Aug 2011– **Graduate Research Assistant**, *Center for Signal and Information Processing*, Georgia Institute of
May 2014 Technology, Atlanta, GA.

Advisor: Prof. James H. McClellan and Prof. Xiaoli Ma

Project Interference Cancellation for Heterogeneous Network (Het-Net) System

I enhanced the spectrum efficiency of LTE system in the overlaying systems which can be modeled and detected as strong but narrowband interferers.

○ Proposed an interference channel estimation scheme for heterogeneous networks based on compressive sensing and iterative cancellation

○ Incorporated random sampling technique into cyclic feature detector to achieve wideband spectrum sensing and reduced sampling complexity by 75%

○ Developed cyclic feature detectors by exploiting the second-order cyclostationarity of the signals to recognize various sorts of narrowband interference sources

Aug 2008– **Graduate Research Assistant**, *Shanghai Jiao Tong University*, Shanghai, China.
Mar 2011 Advisor: Prof. Hongkai Xiong

Thesis Sparse video coding based on adaptive description of multiscale and orientational multiresolution

I implemented a sparse and multiresolution image representation framework based on 2-D wavelets, contourlets and nonuniform directional filter banks into scalable video coding (SVC) reference software to improve coding efficiency.

○ Proposed a scale and orientation multiresolution representation framework for image & video signals with 2-D wavelets, contourlets and nonuniform directional filter banks

○ Implemented the codec based on 2-D directional filter banks with OpenCV on the state-of-the-art wavelet-based SVC reference software, *VidWav*, originally developed by Microsoft

○ Developed a sparse representation framework for video coding by applying iterative thresholding algorithm on sharp frequency localized contourlet (contourlet/SFL) transform and implemented it on *VidWav*

Technical Skills

○ Proficient in Python, C/C++, Matlab

○ Proficient with development, debugging and version control under Unix/Linux and Windows

○ Proficient with various machine learning Python libraries such as TensorFlow, PyTorch, Theano, Keras, scikit-learn, etc.

○ Proficient with OpenMP, OpenMPI for high-performance parallel computing

○ Proficient with OpenCV for computer vision

○ Familiar with CUDA for GPU computing

Academic Services

Peer Reviewer of the following journals and conferences

○ IEEE Transactions on Circuits and Systems for Video Technology

○ IEEE Transactions on Signal Processing

○ IEEE Signal Processing Letters

○ IEEE Access

○ Signal Processing

○ Circuits, Systems and Signal Processing

- ○ Geophysics
- ○ Interpretation
- ○ Mathematical Geosciences
- ○ Computers and Geosciences
- ○ Chinese Journal of Electronics
- ○ International Conference on Computer Communication and Networks (ICCCN)
- ○ International Conference on Digital Signal Processing (DSP)
- ○ IEEE Wireless Communications and Networking Conference (WCNC)
- ○ International Conference on Physics, Mathematics and Statistics (ICPMS)

Publications

Tuanfeng Zhang, Peter Tilke, Emilien Dupont, **Lingchen Zhu**, Lin Liang, and William Bailey. Generating geologically realistic 3d reservoir facies models using deep learning of sedimentary architecture with generative adversarial networks. *Petroleum Science*, 16(3):541–549, Jun 2019.

Shihao Wang, Nicolas Sobecki, Didier Ding, **Lingchen Zhu**, and Yu-Shu Wu. Accelerating and stabilizing the vapor-liquid equilibrium (vle) calculation in compositional simulation of unconventional reservoirs using deep learning based flash calculation. *Fuel*, 253:209 – 219, 2019.

Shihao Wang, Nicolas Sobecki, Dedier Ding, Yu-Shu Wu, and **Lingchen Zhu**. Accelerated Compositional Simulation of Tight Oil and Shale Gas Reservoirs Using Proxy Flash Calculation. In *the 24th edition of the SPE Reservoir Simulation Conference*, April 2019.

Tuanfeng Zhang, Peter Tilke, Emilien Dupont, **Lingchen Zhu**, Lin Liang, and William J. Bailey. Generating Geologically Realistic 3D Reservoir Facies Models Using Deep Learning of Sedimentary Architecture with Generative Adversarial Networks. In *the 11th International Petroleum Technology Conference (IPTC)*, March 2019.

Yang Liu, Ralph M. D'Angelo, Gloria Choi, **Lingchen Zhu**, Mihir Patel, Sandip Bose, Smaine Zeroug, Ioan Alexandru Merciu, and Kevin Constable. Experimental investigation of acoustic features associated with cement damages in double cased-wellbores. *AIP Conference Proceedings*, 2102(1):050024, 2019.

Yang Liu, Ralph M. D'Angelo, Gloria Choi, **Lingchen Zhu**, Sandip Bose, and Smaine Zeroug. Understanding acoustic physics in oil and gas wellbores with the presence of ubiquitous geometric eccentricity. *AIP Conference Proceedings*, 1949(1):020018, 2018.

Lingchen Zhu, Entao Liu, and James H McClellan. Joint seismic data denoising and interpolation with double-sparsity dictionary learning. *Journal of Geophysics and Engineering*, 14(4):802, 2017.

Lingchen Zhu, Entao Liu, and James H. McClellan. Sparse-promoting full-waveform inversion based on online orthonormal dictionary learning. *GEOPHYSICS*, 82(2):R87–R107, 2017.

Lingchen Zhu, Entao Liu, and James H. McClellan. Fast online orthonormal dictionary learning for efficient full waveform inversion. In *2016 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*, pages 1427–1431, March 2016.

Lingchen Zhu, Entao Liu, and James H. McClellan. Seismic data denoising through multiscale and sparsity-promoting dictionary learning. *GEOPHYSICS*, 80(6):WD45–WD57, 2015.

Kyle Jung-Lin Pan, **Lingchen Zhu**, Tanbir Haque, and James H. McClellan. An Enhanced Compressed Sensing-Based Interference-Resistant Receiver for LTE Systems. In *2015 IEEE 81st Vehicular Technology Conference (VTC Spring)*, pages 1–5, May 2015.

Lingchen Zhu and James H. McClellan. Compressive sensing based intercell interference channel estimation for heterogeneous network. In *2014 IEEE 15th International Workshop on Signal Processing Advances in Wireless Communications (SPAWC)*, pages 429–433, June 2014.

Chenchi Luo and **Lingchen Zhu**. Jittered random sampling with a successive approximation ADC. In *2014 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*, pages 1798–1802, May 2014.

Lingchen Zhu, Chenchi Luo, and James H. McClellan. Cyclostationarity-based wideband spectrum sensing using random sampling. In *2013 IEEE Global Conference on Signal and Information Processing*, pages 1202–1205, Dec 2013.

Chenchi Luo, **Lingchen Zhu**, and James H. McClellan. Coordinated blind calibration for time interleaved ADCS. In *2013 IEEE International Conference on Acoustics, Speech and Signal Processing*, pages 3890–3894, May 2013.

Chenchi Luo, **Lingchen Zhu**, and James H. McClellan. A general structure for the design of adjustable FIR filters. In *2013 IEEE International Conference on Acoustics, Speech and Signal Processing*, pages 5588–5592, May 2013.

Hongkai Xiong, **Lingchen Zhu**, Nannan Ma, and Yuan F. Zheng. Scalable Video Compression Framework With Adaptive Orientational Multiresolution Transform and Nonuniform Directional Filterbank Design. *IEEE Transactions on Circuits and Systems for Video Technology*, 21(8):1085–1099, Aug 2011.

Wei Liu, **Lingchen Zhu**, Xinbing Wang, Hui Yu, and Mohsen Guizani. Opportunistic Multicast Scheduling with Resource Fairness Constraints in Cellular Networks. In *2011 IEEE International Conference on Communications (ICC)*, pages 1–5, June 2011.

Lingchen Zhu and Hongkai Xiong. Iterative Thresholding-Based Sparse Directional Representation for Efficient Low Bit-Rate Embedded Video Coding. In *2011 Data Compression Conference*, pages 93–102, March 2011.

Lingchen Zhu and Hongkai Xiong. Scalable video compression framework with adaptive multiresolution directional filter bank design. In *28th Picture Coding Symposium*, pages 414–417, Dec 2010.

Patents

Lingchen Zhu, Sandip Bose, Smaine Zeroug. Unsupervised learning of acoustic data for well integrity (IS18.0543)

Lingchen Zhu, Sandip Bose, Smaine Zeroug. Regression of ultrasonic measurements from sonic data using deep neural networks (IS18.0544)

Tuanfeng Zhang, Peter Tilke, Emilien Dupont, **Lingchen Zhu**, Lin Liang, William Bailey. Generating Geologically Realistic 3D Reservoir Facies Models using Deep Learning of Sedimentary Architecture with Generative Adversarial Networks (IS18.0606)

Honors and Awards

2012 Outstanding Service Award, Center for Signal and Information Processing (CSIP), Georgia Tech

2010 National Merit Scholarship for Graduate Student

2009 Stellar Scholarship, for top students in Georgia Tech

2007 National Scholarship

2006 Rogers Scholarship