

Bingxin Shen

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SKILLS

Research: Specializing in Estimation and Detection, Population Monte Carlo, Particle Filters, Digital Signal Processing, Communication Systems, Linear Algebra, and Statistics and Probability Theory.

Computer Languages/Software: Proficiency in MATLAB, Octave, C/C++, Python, and LaTeX.

Operating Systems: Linux/Unix, Windows 7/Vista/XP/2000, and Macintosh X/XI.

EDUCATION

09/2007 – 08/2011 PhD, Electrical Engineering, Stony Brook University; GPA 4.00/4.00

09/2005 – 07/2007 Master of Science, Electrical Engineering, University of Maine; GPA 4.00/4.00

09/2001 – 07/2005 Bachelor of Engineering, Electrical Engineering, Beijing Institute of Technology; GPA 90.4/100
Graduated from the Honor class of 2005, ranked #1 out of 500 in major courses

EXPERIENCE

10/2011 – present **Columbia University (CU) Medical Center** New York, NY Postdoctoral Research Scientist

- To Estimate parameters and 3-D structure of ribosome based on the observation images obtained by cryo-electron microscopy. To apply Population Monte Carlo methods into the single-particle reconstruction algorithm.

09/2007 – 08/2011 **Stony Brook University (SBU)** Stony Brook, NY Research/Teaching Assistant
(SBU was formerly known as State University of New York at Stony Brook)

- Estimated parameters in high dimensional systems using Marginalized Population Monte Carlo (MPMC) by only generating particles of the nonlinear parameters and marginalizing the remaining. Compared the performances of MPMC with respect to other conventional approaches, such as general Population Monte Carlo (PMC), maximum likelihood estimator, and mean likelihood estimator. MPMC exponentially increases the convergence rate and decreases the computational complexity, which are the key issues in the estimation problems.
- Proposed and implemented multiple marginalized PMC algorithm for high-dimensional problems, where the state space was partitioned into subspaces of lower dimensions and handled by a set of estimators that only exchanged limited information. Simulation results showed the accuracy of the estimates and the feasibility of the method, which significantly increases the computational efficiency.
- Proposed and tested a PMC algorithm with Gibbs sampling to estimate the a posteriori distribution of a high-dimensional model. The required number of particles was greatly decreased and the “quality” of the generated particles was exceedingly improved. The accuracy of the estimates demonstrated by simulations and proved to be superior to alternative approaches.
- Designed filters for the detection of meteors using software-defined radio based radar system. The project was collaborated with Brookhaven National Lab, Physics departments in SBU, Rutgers University, and the University of Utah. Software-defined filters were written in Python scripts and applied to the raw data, which significantly decreased the volume of data streams to be processed by Octave.
- Designed a set of research projects on digital communication system that consisted of MATLAB simulations and real implementations for graduate students in ESE 532 *Theory of Digital Communication*.
- Served as a co-adviser on *Signal Processing and Data Analysis for the MARIACHI project* in the Physics and Astronomy Research Experiences for Undergraduates symposium, 2009, Stony Brook University.
- Led discussions in the PMC research group at Statistical and Applied Mathematical Sciences Institute (SAMSI), co-hosted by Duke University, the National Institute of Statistical Sciences, the University of North Carolina at Chapel Hill, and North Carolina State University.

09/2005 – 07/2007 **University of Maine (UMaine)** Orono, Maine Research Assistant

- Proposed an error correction scheme for the performance improvement of IEEE 802.15.4, which is the standard for low-rate wireless personal area networks. The application of the code scheme exponentially decreased the error rate of transmissions or equivalently achieved a lower power level, which are key issues in wireless network field.
- Designed error correction codes in wireless sensor networks. Several coding schemes compared with the overall goal of reduced complexity and maximized performance. The proposed code was optimized in both additive white Gaussian noise channel and frequency-flat Rayleigh fading channel. The codes increased the communication range and therefore reduced the number of nodes required to cover a region of interest.
- Studied the localization of moving sensor nodes with the application of neural networks, and compared the performance with the traditional Kalman filter in a tracking problem, where neural networks required significantly less computations and simpler implementations.
- Founded Maine IEEE Graduates Of Last Decades (GOLD), and served as the Chair for 2006~2008, providing recent graduates with updated technology, online research, career resources, and professional networking opportunities.
- Actively volunteered with Global Links Program at UMaine, conducting six presentations about Chinese culture on campus and in three local high schools.

09/2001 – 07/2005 **Beijing Technology of Institute (BIT)** Beijing, China Teaching Assistant

- Designed a motion detection method using C++ for a moving target tracking project. Applied error detection codes to the image processing subsystem. Effectively detected and tracked the motion targets in a changing background.
- The only selected Teaching Assistant among undergraduates to teach *Digital Image Processing*, Spring 2005.

AWARDS AND SCHOLARSHIPS

- Armstrong Memorial Research Foundation student awards for 2011 academic year, CU and SBU
- Supplemental University Fellowship for the 2007-2008 academic year, SBU
- University Graduate Research Assistantship (UGRA) Award for the 2006-2007 academic year, the only Master student prizewinner, UMaine
- Excellent Student Award for the 2003-2004 and 2002-2003 academic years, 20 out of 500, BIT
- Excellent New Student Fellowship for the 2001-2002 academic year, 50 out of 3000, BIT
- Scholarship won in each semester, BIT

PUBLICATION

- **B. Shen**, M. Bugallo, P. M. Djuric, "Multiple Marginalized Population Monte Carlo for High Dimensional Applications", *IEEE Transactions on Acoustics, Speech, and Signal Processing*, to be submitted.
- **B. Shen**, P. M. Djuric, M. Bugallo, "Estimation of Multimodal Posterior Distributions of Chirp Parameters with Population Monte Carlo Sampling", *2012 International Conference on Acoustics, Speech, and Signal Processing (ICASSP-2012)*, submitted.
- P. M. Djuric, **B. Shen**, M. Bugallo, "Population Monte Carlo Methodology A La Gibbs Sampling", *2011 European Signal Processing Conference (EUSIPCO-2010)*, August 2011, Barcelona, Spain.
- **B. Shen**, M. Bugallo, P. M. Djuric, "Multiple Marginalized Population Monte Carlo", *2010 European Signal Processing Conference (EUSIPCO-2010)*, August 2010, Aalborg, Denmark.
- S. Chiwate, Z. Zhang, K. Mernick, **B. Shen**, D. Vavilov, M. F. Bugallo, P. M. Djuric, H. Takai and M. Marx, "Software Defined Radio-based Radar System for Meteor Detection," *Proceedings of the Digital Signal Processing (DSP) Workshop*, July 2009, Santorini, Greece.
- **B. Shen**, A. Abedi, "Performance Improvement of Wireless Sensor Networks in Presence of Multi-path Fading", submitted to *Journal of the Franklin Institute*.
- **B. Shen**, A. Abedi, "Error Correction in Heterogeneous Wireless Sensor Networks," *24th Biennial Symposium on Communications*, June 2008, Kingston, Canada.
- A. Shareef, Y. Zhu, M. Musavi and **B. Shen**, "Comparison of MLP Neural Networks and Kalman Filter for Localization in Wireless Sensor Network," in *Proceedings of 19th IASTED International Conference on Parallel and Distributed Computing Systems*, November, 2007, Cambridge, MA, USA.
- **B. Shen**, A. Abedi, "A Simple Error Correction Scheme for Performance Improvement of IEEE 802.15.4," *International Conference on Wireless Networks*, June 2007, Las Vegas, NV, USA.

References available upon request