Stephen Wu

Address:
Institute of Statistical Mathematics Rm D405A
10-3 Midori-cho, Tachikawa-shi, Tokyo, Japan

+81 (0) 50 5533 8516
stewu@ism.ac.jp
http://daweb.ism.ac.jp/~stewu/

Education:

2008 – 2014   California Institute of Technology, Pasadena, California
                PhD Degree in Department of Mechanical and Civil Engineering (Minor in Geophysics)
                Master Degree in Department of Mechanical and Civil Engineering
2005 – 2008   The University of Michigan, Ann Arbor, Michigan
                Bachelor of Science in Engineering in Civil and Environmental Engineering
                Bachelor of Science in Mathematics

PhD Thesis: (advised by Prof. James L. Beck)
Future of Earthquake Early Warning: quantifying uncertainty and making fast automated decisions for applications

Research Interests:

1. Polymer Informatics using transfer learning
2. Machine learning and data assimilation in Bioinformatics and Material Informatics applications
3. Uncertainty quantification for large-scale modeling in pharmacokinetics and molecular dynamics applications
4. Parallel computing of hierarchical Bayesian analysis with heterogeneous data
5. Automated decision-making using value of information and decision theory
6. Bayesian Earthquake Early Warning (EEW) algorithm based on Rao-Blackwellized Importance Sampling
    (Collaboration with Prof. Masumi Yamada at DPRI, Kyoto University)
7. Optimal sensor placement strategy using Gaussian processes and value of information
    (Collaboration with Prof. Ikumasa Yoshida at Tokyo City University)
8. Complex network reliability estimation based on subset simulation algorithm
    (Subset simulation for complex network: Collaboration with Prof. Konstantin Zuev at Caltech)
9. Compressive sensing: GAN-CS, Bayesian-CS
    (Collaboration with Dr. Yong Huang and Prof. Hui Li at Harbin Institute of Technology)

Research Funds:

[2018/4-2021/3] JSPS Grants-in-Aid for Scientific Research KAKENHI (JP18K18017) –
                Inverse materials design by integrating transfer learning techniques into a Bayesian framework
[2019/4-2022/3] JSPS Grants-in-Aid for Scientific Research KAKENHI (Sub) – 変分オートエンコーダと粒子フィルタの融合による状態空間モデリングの自動化

Research & Work Experience:

4/2020 – present   Institute of Statistical Mathematics – Tokyo, Japan
                     • Job Title: Associate professor
                     • Research on materials informatics
4/2017 – 3/2020   Institute of Statistical Mathematics – Tokyo, Japan
                     • Job Title: Assistant professor
                     • Research on statistical modeling (bioinformatics, material informatics, seismology)
1/2016 – 3/2017   Institute of Statistical Mathematics – Tokyo, Japan
                     • Job Title: Project assistant professor (advised by Prof. Ryo Yoshida)
                     • Research on data assimilation and modeling for life science problems
9/2014 – 12/2015   Computational Science & Engineering Laboratory, ETH Zürich, Switzerland
                     • Job Title: Post-doctoral (advised by Prof. Petros Koumoutsakos)
                     • Research on uncertainty quantification for multi-scale simulations
7/2015   ICERM IdeaLab, Brown University – Providence, USA
                     • Research discussion on inverse problems and uncertainty quantification
8/2014   Tokyo City University – Tokyo, Japan
                     • Job Title: Exchange researcher (advised by Prof. Yoshida Ikumasa)
                     • Optimal sensor placement with value of information
3/2013 - 9/2013   Disaster Prevention Research Institute, Kyoto University – Kyoto, Japan
                     • Job Title: Exchange researcher (advised by Prof. Masumi Yamada)
                     • Improve existing Japan EEW system to handle multi-event using probability methods

3-6/2012 &	Department of Mechanical and Civil Engineering, California Institute of Technology, USA
3-6/2011	• Job Title: Teaching assistant
	• Engineering Mathematical Principles (Stochastic System Analysis and Bayesian Updating)
7/2007 - 6/2008	Laboratory for Intelligent Structural Technology - Ann Arbor, Michigan, USA
	• Job Title: Research Co-worker (advised by Prof. Jerome P. Lynch)
	• Research on EIT and Carbon-Nano-Tube Sensing Skin Technology
10/2006 - 11/2006	Network for Earthquake Engineering Simulation Research - Ann Arbor, Michigan, USA
	• Participated in Undergraduate Research Experience Program on Fiber-Reinforced Concrete
1/2006 - 6/2008	The University of Michigan, Mathematics Department - Ann Arbor, Michigan, USA
	• Job Title: Math Tutor
5/2006 - 8/2006	AECOM Mecalf & Eddy / Maunsell Hong Kong - Shatin, Hong Kong
	• Job Title: Summer Internship / Project Account Assistance
	• Performed pipe network design and modeling analysis / Oracle database update

Awards:

2019	ASCE-ASME Journal of Risk and Uncertainty in Engineering Systems (Part B) – 2018 Best paper award
2016	Informatics in Biology, Medicine and Pharmacology Research Award
2016	Mathematics Design Dojo Poster Award
2015	The Seismological Society of Japan Best Paper Award
2015	Japan Association for Earthquake Engineering Best Paper Award
2014	Liu Huixian Earthquake Engineering Scholarship Award
2009	George Housner Fellowship – California Institute of Technology
2008	Lemon Scholarship Stipend – University of Michigan, Ann Arbor
2006	Bates and Rogers Scholarship – University of Wisconsin-Madison

Academic contribution:

7/2020 – present   Review Editor in Frontiers in Built Environment - Structural Sensing

Software:

1. [2015] Bayesian Annealed Sequential Importance Sampling (BASIS)
   http://www.cse-lab.ethz.ch/index.php?view=article&id=668
   Language: MATLAB
   Description: A general sampling algorithm for Bayesian analysis
2. [2016] Roiedit3D – Annotation support system (Note: under internal testing)
   Language: MATLAB
   Description: Automated annotation algorithm for C. elegans whole brain 4D images with computer-aided human correction functionality
3. [2018 to now] XenonPy
   https://xenonpy.readthedocs.io/en/latest/
   Language: Python
   Description: Python library that implements a comprehensive set of machine learning tools for materials informatics

Association:

Society for Industrial and Applied Mathematics
日本統計学会　Japan Statistical Society
日本バイオインフォマティクス学会　Japanese Society for Bioinformatics
日本熱物性学会　Japan Symposium on Thermophysical Properties
American Chemistry Society
高分子学会　The Society of Polymer Science, Japan

Language: English, Chinese (Mandarin, Cantonese, Shanghainese), Japanese

Publications:

(Journal)
--- First Author (Equally First [*]) / Corresponding Author ([#]) ---
1. Wu, S., Beck, J.L. & Heaton, T.H. (2013), Earthquake Probability-based Automated Decision-making Framework for Earthquake Early Warning Applications, *Computer-Aided Civil and Infrastructure Engineering*, 28: 737-752.
2. Wu, S., Yamada, M., Tamaribuchi, K. & Beck, J.L. (2015), Multi-events Earthquake Early Warning algorithm using a Bayesian approach, *Geophyical Journal International*, 200: 791-808.
3. Wu, S., Cheng, M.H., Beck, J.L. & Heaton, T.H. (2015), An engineering application of earthquake early warning: ePAD-based decision framework for elevator control, *ASCE-Structural Engineering*, 142(1): 04015092.
4. Wu, S., Angelikopoulos, Papadimitriou, C., P., Moser, R. & Koumoutsakos, P. (2016), A hierarchical Bayesian framework for force field selection in Molecular Dynamics Simulations, *Phil. Trans. R. Soc. A*, 374(2060): 20150032.
5. Wu, S., Angelikopoulos, P., Tauriello, G. & Koumoutsakos, P. (2016), Fusing heterogeneous data for the calibration of molecular dynamics force fields using hierarchical Bayesian models, *Journal of Chemical Physics*, 145(24): 244112.
6. Wu, S., Toyoshima, Y., Jang, M.S., Kanamori, M., Teramoto, T., Iwasaki, Y., Ishihara, T., Iino, Y. & Yoshida, R. (2017), An ensemble learning approach to auto-annotation for whole-brain C. elegans imaging, *bioRxiv:180430*.
7. Wu, S., Angelikopoulos, P., Papadimitriou, C. & Koumoutsakos, P. (2017), Bayesian Annealed Sequential Importance Sampling (BASIS): an unbiased version of Transitional Markov Chain Monte Carlo, *ASCE-ASME Journal of Risk and Uncertainty in Engineering Systems, Part B: Mechanical Engineering*, 4(1): 011008.
8. Wu, S., Angelikopoulos, P., Beck, J.L. & Koumoutsakos, P. (2019), Hierarchical stochastic model in Bayesian inference for engineering applications: theoretical implications and efficient approximation, *ASCE-ASME Journal of Risk and Uncertainty in Engineering Systems, Part B: Mechanical Engineering*, 5(1): 011006.
9. Wu, S., Kondo, Y., Kakimoto, M., Yang, B., Yamada, H., Kuwajima, I., Lambard, G., Hongo, K., Xu, Y., Shiomi, J., Schick, C., Morikawa, J. & Yoshida, R. (2019), Machine-learning-assisted discovery of polymers with high thermal conductivity using a molecular design algorithm, *npj Computational Materials*, 5: 66.
10. Yamada, H.[*], Liu, C.[*], Wu, S.[*], Koyama, Y., Ju, C., Shiomi, J., Morikawa, J. & Yoshida, R.[*] (2019), Predicting materials properties with little data using shotgun transfer learning, *ACS Central Science*, 5(10): 1717-1730.
11. Wu, S.[*], Lambard, G.[*], Liu, C.[*], Yamada, H. & Yoshida, R. (2019), iQSPR in XenonPy: A Bayesian Molecular Design Algorithm, *Molecular Informatics*, 39(1-2): 1900107.
12. Toyoshima, Y.[*], Wu, S.[*], Kanamori, M., Sato, H., Jang, M.S., Oe, S., Murakami, Y., Teramoto, T., Park, C., Iwasaki, Y., Ishihara, T., Yoshida, R. & Iino, Y. (2020), Neuron ID dataset facilitates neuronal annotation for whole-brain activity imaging of *C. elegans*, *BMC Biology*, 18: 30.
13. Huang, Y., Zhang, Z., Li, H.[#] & Wu, S.[#] (2020), Recovering compressed images for automatic crack segmentation using generative models, *Mechanical Systems and Signal Processing*, 146: 107061.

--- Joint Author ---
1. Cheng, M.H., Wu, S., Heaton, T.H. & Beck, J.L. (2014), Engineering application for buildings in earthquake early warning system, *Engineering Structures*, 60, p.155-164.
2. Huang, Y., Beck, J.L., Wu, S. & Li, H. (2014), Robust Bayesian compressive sensing for signals in structural health monitoring, *Computer-Aided Civil and Infrastructure Engineering*, 29(3-SI), p.160-179.
3. Tamaribuchi, K., Yamada, M. & Wu, S. (2014), A new approach to identify multiple concurrent events for improvement of Earthquake Early Warning, *Zisin2*, 67(2), p.41-55. DOI:10.4294/zisin.67.41 [in Japanese]
4. Yamada, M., Tamaribuchi, K. & Wu, S. (2014), Faster and More Accurate Earthquake Early Warning System - Combination of Velocity and Acceleration-type seismometers, *Journal of Japan Association for Earthquake Engineering*, 14(4), p.21-34. [in Japanese]
5. Zuev, K.M., Wu, S. & Beck, J.L. (2015), General network reliability problem and its efficient solution by Subset Simulation, *Probabilistic Engineering Mechanics*, 40, p.25-35.
6. Mitrani-Reiser, J., Beck, J.L. & Wu, S. (2016), Virtual Inspector and its applications to immediate pre-event and post-event earthquake loss and safety assessment of buildings, *Natural Hazards*, 81(3), p.1861-1878.
7. Huang, Y., Beck, J.L., Wu, S. & Li, H. (2016), Bayesian compressive sensing for approximately sparse signals and application to structural health monitoring signals for data loss recovery, *Probabilistic Engineering Mechanics*, 46:62-79.
8. Arampatzis, G., Walchli, D., Angelikopoulos, P., Wu, S. & Koumoutsakos, P. (2016), Langevin diffusion Transitional Markov Chain Monte Carlo with an application to pharmacodynamics, *arXiv:1610.05660*.
9. Minson, S.E., Wu, S., Beck, J.L. & Heaton, T.H. (2017), Combining multiple earthquake models in real time for earthquake early warning, *Bulletin of the Seismological Society of America*, 107(4):1868-1882.

10. Yoshida, I., Tasaki, Y., Otake, Y. & Wu, S. (2018), Optimal sampling placement in a Gaussian random field based on value of information, *ASCE-ASME Journal of Risk and Uncertainty in Engineering Systems, Part A: Civil Engineering*, 4(3):04018018.
11. Huang, Y., Li, H., Wu, S. & Yang, Y. (2018), Fractal dimension based damage identification incorporating multitask sparse Bayesian Learning, *Smart Materials and Structures*, 27(7): 075020.
12. Arampatzis, G., Walchli, D., Angelikopoulos, P., Wu, S., Hadjidoukas, H. & Koumoutsakos, P. (2018), Langevin diffusion for population based sampling with an application in Bayesian inference for pharmacodynamics, *SIAM Journal on Scientific Computing*, 40(3):B788-B811.
13. Liu, Y., Ng, M.K.-P. & Wu, S. (2018), Multi-domain Networks Association for Biological Data using Block Signed Graph Clustering, *IEEE/ACM Transactions on Computational Biology and Bioinformatics*. [Accepted]
14. Lipkova, L., Angelikopoulos, P., Wu, S., Alberts, E., Wiestler, B., Diehl, C., Preibisch, C., Pyka, T., Combs, S., Hadjidoukas, P., Van Leemput, K., Koumoutsakos, P., Lowengrub, J.S. & Menze, B. (2018), Personalized Radiotherapy Planning for Glioma Using Multimodal Bayesian Model Calibration, *IEEE transactions on medical imaging*, 38:8, 1875-1884.
15. Huang, Y., Shao, C., Wu, S. & Li, H. (2018), Diagnosis and accuracy enhancement of compressive-sensing signal reconstruction in structural health monitoring using multi-task sparse Bayesian learning, *Smart Materials and Structures*, 28:3.