# Machine Learning in Quantitative Stereology and Neurohistology

Society for Neuroscience Satellite Event (SAT40)
October 19, 2019, 6:30 PM – 9:30 PM
Chicago McCormick Convention Center Room: N227

***Event Description***

Accurately quantifying nervous system composition is critical for evaluating significant changes over time or after injury/treatment, but numbers are traditionally obtained by human observation. With machine learning, it becomes possible to train software to recognize and quantify cells of interest. This symposium features talks on automated acquisition of image data sets and subsequent analysis by machine learning-assisted image analysis and stereology.

***Speakers***

6:30 – 6:45 *Introduction*
Daniel A. Peterson, Ph.D.

6:45 – 7:15 *Overview of Design-Based Stereology- Rigor and Reproducibility in Data consistent with NIH Guidelines*
Daniel A. Peterson, Ph.D.

7:15 – 7:45 *Automated delineation of anatomies and characterization of cellular populations in mouse brain*
Nathan J. O'Connor, Ph.D.

7:45 – 8:15 *Automating High-Throughput Acquisition of Data Sets for Cell Counting*
Daniel A. Peterson, Ph.D.

8:15 – 8:45 *Principles of Machine Learning for Cell Counting*
Brain S. Eastwood, Ph.D.

8:45 – 9:15 *Establishing Best Practices Workflow for Automated Stereology*
Daniel A. Peterson, Ph.D.

9:15 – 9:30 *Conclusion and Round Table Discussion*
All

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***Speaker Bios***

***Daniel A. Peterson, Ph.D.***
Prof. Peterson received his Ph.D. from the University of Otago, New Zealand, was a Postdoctoral fellow at the Salk Institute, and has been a professor at the Chicago Medical School since 1998, where he is Director of the Center for Stem Cell and Regenerative Medicine. His research focuses on recruiting stem cells for brain repair. He has served as Chairman for NIH Study Sections, serves on several Editorial Boards, is Past-President of the American Society for Neural Therapy and Repair and presently serves as a Board Member of the International Society for Stereology and Image Analysis. Prof. Peterson is also President of NeuroRenew, Inc., which offers training and consulting in microscopy and quantitative analysis for biomedical research.

***Nathan J. O'Connor, Ph.D.***
Dr. O'Connor received his MS in electrical engineering at Rensselaer Polytechnic Institute and his Ph.D. in Physiology and Biophysics at Cornell University. He currently leads NIMH funded research and development of MBF Bioscience's technologies for managing and analyzing big data in the cloud, and for automatically mapping anatomies and brain measures into standardized reference spaces. His past roles include Director of Engineering at AutoQuant Imaging where he led the development of statistical three-dimensional image restoration software, and implementing automated image management and analysis strategies as an engineer at Molecular Devices.

***Brian S. Eastwood, Ph.D.***
Dr. Eastwood received his Ph.D. in Computer Science from the University of North Carolina at Chapel Hill. His research involves using computer vision and machine learning to tackle challenging problems in microscopy image analysis. His current research at MBF Bioscience includes techniques for automated cell segmentation, atlas-based anatomic region segmentation, and large-scale content-based and semantics-based image search and retrieval. Dr. Eastwood was previously an HHMI postdoctoral research fellow at Colby College.

***Sponsor Descriptions***

**NeuroRenew, Inc.** *www.neurorenew.com*
Advanced confocal microscopy and stereology are critical for cutting-edge qualitative and quantitative histological analysis for biomedical research. To promote greater rigor and reproducibility in science, NeuroRenew, Inc. conducts intensive, multi-day, hands-on training workshops in the use of confocal microscopy and design-based stereology. A week-long workshop is held every August in Chicago. Customized one-day or multiple-day short courses can also be arranged on-site for Industry or Academia upon request. Additional consultation in quantitative approaches is available.

**MBF Bioscience, Inc.** *www.mbfbioscience.com*
We design quantitative imaging and visualization software for stereology, neuron reconstruction, vascular analysis, *C. elegans* behavior analysis and medical education - integrated with the world's leading microscope systems - to empower your research. Our development team and staff scientists are actively engaged with leading bioscience researchers, and constantly work to refine our products based on state-of-the-art scientific advances. Our products have helped researchers publish over 15,000 peer reviewed papers.

**International Society for Stereology and Image Analysis** *www.issia.net*
The International Society for Stereology & Image Analysis (ISSIA) is an international scientific society aiming to promote stereology and image analysis in a wide range of disciplines, such as mathematics, biomedicine, physics, geology, metallurgy, plant biology, etc. ISSIA continues from the well-established International Society for Stereology, with expanded scope to all aspects of image analysis. The ISSIA organizes alternating International and European Conferences every two years.