

## Call for Papers & Invitation to Attend:

**2023 IEEE Western New York Image and Signal Processing Workshop (WNYISPW)**  
Friday, November 3rd, 2023 at the RIT Student Development Center (8:00 AM - 5:30 PM)

### Sponsors:

**Rochester Section of the IEEE, Rochester Chapters of the IEEE Signal Processing Society, Computer Society, Photonics Society, and Rochester Chapter of the Society for Imaging Science and Technology.**

**Support: Vanteon Wireless Solutions.**

[Registration Link](#)

[Detailed 2023 WNYISPW Information Link](#)

[Campus Map](#)

The 2023 IEEE Western New York Image and Signal Processing Workshop is a premier venue for promoting research involving applications of AI, image and signal processing in the Western New York region and for facilitating interaction between academic researchers, industry professionals, and students. Sponsored by local chapters of IEEE and IS&T, the workshop comprises both oral and poster presentations. Fully hybrid, all presentations are available in-person or via WebEx.



### Topics include, but are not limited to:

- Applications of Machine Learning & Deep Learning
- Applications of LLMs & Generative AI
- Medical Imaging & Signal Processing
- Pattern Recognition, Detection & Analysis
- Image & Signal Processing
- Image Compression & Segmentation
- Image & Color Science
- Computer Vision, Video Processing & Analysis
- Radar & Wireless Communications
- Synthetic Aperture Radar
- Remote Sensing
- Electronic Intelligence
- Waveform Detection & Parameter Estimation
- Speech, Audio Enhancement & Speech Recognition
- Human-Computer Interaction
- Object Recognition & Detection

### Important Dates:

- 13-October-2023 Paper and abstract-only submission closes
- 20-October-2023 Notification of Acceptance
- 25-October-2023 Submission of camera-ready paper, poster & virtual poster files
- 3-November-2023 Workshop

### Workshop Cost:

- \$50 In-person attendance, Non-IEEE member
- \$40 In-person attendance, IEEE member
- \$15 Virtual-only attendance, Non-IEEE member
- \$10 Virtual-only attendance, IEEE member
- \$0 Student attendance (with ID)

### Author Resources:

- **Full-paper, archival submissions:** Four-page previously unpublished paper for oral or poster presentation. All accepted full-papers will be submitted for publication in IEEE Xplore, as well as other abstracting and indexing databases.
- **Abstract-only, non-archival submissions:** Recent work for oral or poster presentation that is not quite ready for publication, is in review, or was recently accepted for publication elsewhere. (Abstracts will be included in Workshop proceedings (non-archival) but will not be published in IEEE Xplore or other abstracting and indexing databases.)
- Submissions accepted for Oral presentation should be 15 minutes or less in duration, including 3 minutes for Questions and Answers.
- Submissions accepted for Poster presentation will be provided with wall or easel space for in-person presentation and are requested to also submit a short MP4 presentation (less than 12 minutes duration) for remote participants to view.
- All poster presentations will be promoted at the workshop for remote viewing, and the MP4 videos will become available on the Workshop web-site for viewing and questions by remote viewers on November 3rd AM. Corresponding authors are requested to answer e-mail questions.
- Submissions are peer reviewed by a panel of academic and industry professionals, according to IEEE norms, for inclusion in the Workshop.
- **Full-paper submissions and Abstract-only submissions for the 2023 WNYISPW should be attached in an e-mail to [WNYISPW@gmail.com](mailto:WNYISPW@gmail.com).**
- Awards will be given for best student full-paper and best student abstract-only presentations.
- IEEE resources and tools for authors are located at [Resources](#).
- IEEE manuscript templates are located at [Templates](#).

### Workshop Agenda:

8:00	Check-in & Coffee		
8:20	Introduction		
8:30	Keynote	Dr. John J. Foxe	Innovations in Neurophysiology and Approaches for the Development of Objective Inter-species Disease Neuromarkers
9:15	Invited Presentation	Dr. Emily Knight	Uncovering Neural Signatures of Sensory Processing in Autism
9:45	Coffee break		
10:00	Submitted Paper	Your name	Your submitted paper or abstract may appear here
10:15	Submitted Paper	Your name	Your submitted paper or abstract may appear here
10:30	Submitted Paper	Your name	Your submitted paper or abstract may appear here
10:45	Submitted Paper	Your name	Your submitted paper or abstract may appear here
11:00	Invited Presentation	Dr. Ross Maddox	Investigating attention across the auditory system using forward modeling of brain activity
11:30	Invited Presentation	Dr. Samuel Norman-Haignere	*Inferring the computations and organization of human auditory cortex
Noon	Lunch & Poster Session	Your name	Your submitted paper or abstract may appear here
13:30	Invited Presentation	Dr. Michael Giacomelli	Real-time assembly of gigavoxel mosaics using two-photon microscopy during surgery
13:45	Submitted Paper	Your name	Your submitted paper or abstract may appear here
14:00	Submitted Paper	Your name	Your submitted paper or abstract may appear here
14:15	Submitted Paper	Your name	Your submitted paper or abstract may appear here
14:30	Submitted Paper	Your name	Your submitted paper or abstract may appear here
14:45	Coffee break		
15:00	Invited Presentation	Dr. Christopher Kanan	The Current Capabilities and Limitations of Generative AI
15:15	Invited Presentation	Dr. Jonathan Herington	The Current Capabilities and Limitations of Generative AI
15:30	Invited Presentation	Dr. Andrew D. White	Language is the Future of Chemistry
15:45	Invited Presentation	Dr. Kathleen Fear	Accountability and Generative AI in Healthcare
16:00	Panel Discussion and Debate	Dr. Kanan, Dr. Herington, Dr. White, and Dr. Fear	Large Language Models & Generative AI: Capabilities, Liabilities and Guardrails
17:00	Awards & Wrap-up		
17:30	Workshop ends		

### Keynote & Invited presentation details:

#### Introduction:

The WNYISPW is designed to provide an opportunity for students in the Western New York region to present their research, as peer-reviewed full-paper or abstract-only submissions to the workshop on a wide variety of topics, in a one-hour morning oral presentation session (4, 15-minute talks), a one-hour Poster presentation session, coordinated with lunch, and a one hour afternoon oral presentation session (4, 15-minute talks). The Keynote and invited presentations surrounding the oral and poster presentations focus on particular topics.

**Morning session:** *Submitted presentations with invited talks on Neuroscience advances in analysis, image & signal processing, statistical, and experimental design techniques to uncover neural functions of the human brain and development of techniques for identifying anomalous neural behavioral patterns (neuromarkers) based on the acquisition and analysis of inherently noisy multi-dimensional signals.*

In developing an understanding of brain function, we are generally constrained to the use of indirect, non-invasive experiments that treat the brain as a "black box". In these indirect experiments, developing an effective stimulus - experiment - response group (a neuromarker) has involved the development and use of a broad spectrum of analysis, image processing, signal processing, statistical, and experimental design techniques to coax signal out of inherently noisy data. Response data include multi-dimensional behavioral measurement, sampled measurements from multiple EEG channels, and three-dimensional fMRI voxel data (with both functional and anatomical components).

The level of inherent noise and high dimensionalities in response data have led to innovative pattern recognition techniques, significant advances in the burgeoning field of bio-statistics, and novel experimental designs that exploit the statistical properties of stimulus structures for digging significant signal out of noise.

In this morning session, in addition to a broad range of topics presented in papers accepted for this workshop, we will explore many of the tools used in neurophysiological research, and examples of how some of these tools have been used in understanding the behavior and function of the human brain.

**Lunch and Poster session** (a diverse set of topics addressed by in-person Poster presentations along with a catered Lunch menu).

**Afternoon session:** *Submitted presentations with an invited talk involving photonics, imaging and real-time computational processes, then invited talks on the capabilities, limitations, ethical risks, accountability, and guardrails of Large Language Models and Generative AI from four perspectives, followed by a panel discussion and debate on how these technologies may be optimized to augment, rather than detract from, the human experience.*

The afternoon session begins with an invited presentation involving the major workshop themes of imaging, signal processing, computing, and photonics.

Additional topics will be addressed in the afternoon set of papers accepted for presentation at this workshop, and then we will shift focus to address questions involving extremely large AI systems.

Extremely large Generative AI applications such as ChatGPT are also treated as a "black box" where questions must be carefully formulated and responses must be examined critically to ensure that the "black box" has provided an answer to the question that is appropriate, meets the goal of the question, and appears to be trustworthy. Refinement of the question is often required to obtain a useful response. The characteristics of Generative AI applications are undergoing rapid development that reflect many concerns about their use. The United States, the European Union, and China have developed Norms and Regulations for Generative AI applications.

The invited presentations towards the end of this session will examine Generative AI applications from four different perspectives, leading to a discussion and debate of how Generative AI applications can be optimized to augment, rather than detract from, the human experience.

### Detailed Workshop Agenda:

Nov 3 - Nov 5 Registrant access to all in-person and virtual Poster MP4 presentations  
Q&A with corresponding authors via e-mail

8:00 - 8:20 AM Check-in, coffee, tea & bagels  
8:20 - 8:30 AM Welcome to the 2023 IEEE Western New York Image and Signal Processing Workshop

8:30 - 9:15 AM **Keynote by Dr. John J. Foxe**  
**Innovations in Neurophysiology and Approaches for the Development of Objective Inter-Species Disease Neuromarkers**  
**Abstract:** Developing objective neuromarkers (endophenotypes) of disease in humans presents a unique challenge for researchers and clinicians in that, unlike most other organs in the body, we cannot readily take a biopsy of tissue or easily sample the fluids that bathe the brain. So, for example, it is only post-mortem that a definitive diagnosis of Alzheimer's disease can be made when brain tissue can be examined for the telltale neurofibrillary tangles and amyloid-beta plaques. Nonetheless, developments in neuroimaging and neurophysiological approaches are allowing neuroscientists unprecedented ability to observe both functional and structural outcomes non-invasively, and much progress has been made in the development of objective measures for many diseases of the brain, both neurodevelopmental diseases and psychiatric conditions. In parallel, genetic engineering advances have allowed for the development of animal models of many of these human diseases, providing exquisite ability to measure disease processes in neural tissue. As extraordinary as this latter development has been, a second major challenge arises, and that is how to bridge the gap between the measures we can reasonably make non-invasively in human patients, with the detailed outcomes we are capable of in mouse models. In this presentation, I will describe some of the new technologies we have available in both the human and animal neurophysiological toolbox, and I will describe new approaches to bridging the inter-species "translational gap" through combined electrophysiological approaches.

9:15 - 9:45 AM **Invited presentation by Dr. Emily Knight**  
**Uncovering Neural Signatures of Sensory Processing in Autism**  
**Abstract:** Biological motion imparts rich information related to the movement, intentions and affective state of others, which can provide foundational support for various aspects of social cognition and behavior. Given that atypical social communication and cognition are hallmark symptoms of autism spectrum disorder (ASD), many have theorized that a potential source of this deficit may lie in dysfunctional neural mechanisms of biological motion processing. Synthesis of existing literature provides some support for biological motion processing deficits in autism spectrum disorder, although high study heterogeneity and inconsistent findings complicate interpretation. Here, we attempted to reconcile some of this residual controversy through the use of signal processing analysis. This methodology allowed us to uncover a previously unrecognized modulating role for attention in biological motion processing in ASD. We employed high-density electroencephalographic (EEG) recordings while participants observed point-light displays of upright, inverted and scrambled biological motion under two task conditions to explore spatiotemporal dynamics of intentional and unintentional biological motion processing in children and adolescents with ASD (n=27), comparing them to a control cohort of neurotypical (NT) participants (n=35). Behaviorally, ASD participants were able to discriminate biological motion with similar accuracy to NT controls. However, electrophysiologic investigation revealed reduced automatic selective processing of upright biological vs. scrambled motion stimuli in ASD relative to NT individuals, which was ameliorated when task demands required explicit attention to biological motion. Together, these data suggest that individuals with ASD are able to discriminate, with explicit attention, biological, from non-biological motion but demonstrate diminished automatic neural specificity for biological motion processing. This may have cascading implications for the development of higher order social cognition. The results highlight the superior neural specificity of neurophysiologic measurement over behavioral measures in the identification of differential neural network recruitment in clinical populations.

10:00 - 10:15 AM Accepted Oral Paper - **Your Submitted Paper Here**  
10:15 - 10:30 AM Accepted Oral Paper - **Your Submitted Paper Here**  
10:30 - 10:45 AM Accepted Oral Paper - **Your Submitted Paper Here**  
10:45 - 11:00 AM Accepted Oral Paper - **Your Submitted Paper Here**

11:00 - 11:30 AM **Invited presentation by Dr. Ross Maddox**  
**Investigating attention across the auditory system using forward modeling of brain activity**  
**Abstract:** Selective auditory attention—the ability to focus on one sound source in the presence of many others—is an essential part of humans' ability to communicate verbally. Many studies have demonstrated a strong effect of attention on the way speech is encoded by the auditory cortex. The results of similar studies investigating attention in the auditory brainstem, which receives signals from the inner ear, extracts features such as pitch and location, and passes them on to the cortex, have been much more mixed. Part of what has made these studies difficult is that traditional methods for measuring brainstem responses involve thousands of repetitions of short, artificial sounds, which makes engaging attentional mechanisms difficult. Our lab has developed new methods for using natural, un-repeated speech to measure brainstem activity and investigate attention while listeners perform the ecologically relevant task of listening to one audiobook while ignoring another. Using these methods, along with custom electrodes which can be placed on the eardrum, we tested the effects of selective attention on the responses of distinct areas of the auditory system, from its initial encoding by the auditory nerve through the brainstem and cortex. We find a strong effect of attention in the cortex, replicating previous studies, but find no evidence of attentional effects in earlier areas of the brain.

11:30 - 12:00 AM **Invited presentation by Dr. Samuel Norman-Haignere**  
**Inferring the computations and organization of human auditory cortex**  
**Abstract:** To understand the meaning of a sentence, recognize a familiar voice in a crowd, or pick out the melody in a song, the brain must rapidly recognize, remember, and synthesize information across timescales spanning milliseconds to seconds. Human auditory cortex is essential to this process, but many basic questions about its organization and computational properties have remained unanswered, in part due to the inherent challenge of probing responses to high-dimensional natural stimuli using coarse and noisy neuroimaging methods. In this talk, I will describe two methodological advances that make it possible to: (1) infer brain organization from responses to high-dimensional natural stimuli (2) test whether a computational model can explain a neural response by comparing natural and "model-matched" stimuli. By applying these methods to neuroimaging data and human intracranial recordings, we have uncovered some of the dominant response dimensions that organize human auditory cortex and inferred computational principles that underlie their response.

12:00 - 12:30 PM Lunch

12:00 - 1:30 PM **Poster Session (in-person)**  
Remote registrant access to all Poster presentations via MP4 videos w. Q&A via e-mail.  
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1:30 - 1:45 AM **Invited presentation by Dr. Michael Giacomelli**  
**Real-time assembly of gigavoxel mosaics using two-photon microscopy during surgery**  
**Abstract:** Two-photon microscopy can image and diagnose cancer in fresh tissue, but is challenging to perform fast enough to provide real-time diagnosis during surgical procedures or biopsies where billions of voxels must be imaged in order to evaluate a specimen. In this talk, I present an overview of the hardware and software solutions we developed to rapidly image very large (centimeter scale) tissues at sub-wavelength resolution and then assemble those images into a virtual histology that can be used to diagnose a patient or guide surgery

1:45 - 2:00 PM Accepted Oral Paper - **Your Submitted Paper Here**  
2:00 - 2:15 PM Accepted Oral Paper - **Your Submitted Paper Here**  
2:15 - 2:30 PM Accepted Oral Paper - **Your Submitted Paper Here**  
2:30 - 2:45 PM Accepted Oral Paper - **Your Submitted Paper Here**

2:45 - 3:00 PM Coffee break

3:00 - 3:15 PM **Invited presentation by Dr. Christopher Kanan**  
**The Current Capabilities and Limitations of Generative AI**  
**Abstract:** Generative AI systems are now being used across all sectors of the economy. They have enabled fundamental advances in editing and drafting documents, programming, creating art, chat bots, automation, and much more. They have democratized skills that previously required years of training, and can greatly enhance the productivity of individuals and organizations. These systems have been dubbed "Foundation Models" because they are extremely large AI systems that can be used for many tasks, where these systems learn through self-supervised learning objectives. In this talk, I describe how some of the most influential systems work. I describe their current capabilities and limitations, and discuss some of the missing ingredients needed to further advance them.

3:15 - 3:30 PM **Invited presentation by Dr. Jonathan Herington**  
**High-Level Ethical Risks for Generative AI**  
**Abstract:** The rapid advancement of generative AI poses exciting possibilities but also raises critical ethical challenges around what it means to be a human being. There has been much focus on familiar ethical risks: (1) models train on massive datasets scraped without consent, potentially undermining individual privacy and profiting off of public datasets, (2) training data reflects societal prejudices which can propagate unfair outputs that marginalize vulnerable groups, and (3) as systems become more autonomous, unpredictable behaviors beyond developer intentions could emerge. These risks are real and immediate, but generative models also raise more existential ethical questions: what does it mean to "create" something in the context of generative AI? Should we worry about the atrophy of creative and analytic skills in the face of tools that can do those tasks for most of us? What is it that humans are distinctively good at in a world with advanced generative models? In this talk, I explore a simple philosophical framework for thinking about these risks that focuses on (i) promoting human welfare, (ii) respecting human autonomy, and (iii) justly distributing the benefits and burdens of these systems

3:30 - 3:45 PM **Invited presentation by Dr. Andrew D. White**  
**Language is the future of Chemistry**  
**Abstract:** Large language models (LLMs) are beginning a new era of chemistry, where LLMs can connect and reason about experiments, tools, and databases to accomplish open-ended tasks in chemistry. This is exciting both new opportunities in accelerating chemistry, but also increasing the challenge of interpretation of model outputs. I will summarize our recent work on applying LLMs to authentic chemical challenges, their ability to use tools, access scientific literature, and how we can force them to explain themselves.

3:45 - 4:00 PM **Invited presentation by Dr. Kathleen Fear**  
**Accountability and Generative AI in Healthcare**  
**Abstract:** This presentation will explore the transformative potential of large language models (LLMs) and generative AI tools in addressing problems within the healthcare sector. The focus will be on leveraging these advanced technologies to streamline time-consuming procedures, reduce administrative burden, and enhance patient care. This talk will delve into how to effectively identify the appropriate problem spaces for the application of generative AI, with an emphasis on minimizing risks and ensuring the utmost safety and privacy for patients. Furthermore, we will touch on the ethical, regulatory, and accountability issues that come with the implementation of AI in healthcare.

4:00 - 5:00 PM **Discussion and Debate: Large Language Models and Generative AI: Capabilities, Liabilities and Guardrails**  
**Panelists: Dr. Christopher Kanan, Dr. Jonathan Herington, Dr. Andrew White & Dr. Kathleen Fear**

5:00 - 5:30 PM **Awards and Wrap-up**  
5:30 PM End of Workshop