Exploring the Bidirectional Relationship between Artificial Intelligence and Neuroscience

A Workshop

Monday, March 25, 2024: 2:00 pm – 5:00 pm ET
Tuesday, March 26, 2024: 9:30 am – 4:00 pm ET

Objectives

- Explore the bidirectional relationship between neuroscience and AI, including the contributions neuroscience has made to the development of AI and the utilization of AI to further understanding of the brain.
- Discuss the utility and limitations of AI in basic, translation, and clinical neuroscience research.
- Examine the potential for autonomy and agency in AI systems, and the associated implications for the field of neuroscience.
- Discuss the key role of neuroscience in equipping regulators and the public with knowledge and resources for the responsible use of AI in research, clinical, and general applications.
- Consider research priorities and public education needs regarding the role of neuroscience in AI and AI in neuroscience research.

MONDAY, MARCH 25, 2024

2:00pm **Introductory Remarks**

Frances Jensen, University of Pennsylvania, *Forum on Neuroscience and Nervous System Disorders Co-chair, Planning Committee Member*

John Krystal, Yale University, *Forum on Neuroscience and Nervous System Disorders Co-chair*

2:05pm **Workshop Overview**

Magali Haas, Cohen Veterans Bioscience, *Workshop Co-chair*

Terrence Sejnowski, Salk Institute for Biological Sciences, *Workshop Co-chair*

2:15pm **Keynote Presentation: Brains & AI**

Terrence Sejnowski, Salk Institute for Biological Sciences, *Workshop Co-chair*

2:35pm	**Session 1: The Bidirectionality of Neuroscience and Artificial Intelligence (AI)**

Objective:

- Explore the contributions that neuroscience has made to the development, utilization and understanding of AI and complex models such as LLMs.
- Discuss the utility and limitations of AI in basic, translation, and clinical neuroscience research.
- Consider how can advances in generative AI be harnessed to enhance our understanding of human affective, cognitive, and conative states, while ensuring responsible and ethical use in research and applications.
- Examine the potential for intelligence, autonomy, and agency in AI systems, and the associated implications for the field of neuroscience.

2:35pm **Session Overview**

Jonathan Cohen, Princeton University, *Session Moderator, Planning Committee Member*

Topic 1a - The Unique Role of Neuroscience in the Past, Present, and Future of AI

2:40pm **Speaker Presentations**

Ankit Patel, Rice University

Ellie Pavlick, Brown University

3:05pm **Moderated Panel and Audience Q&A**

3:20pm **BREAK**

Topic 1b - The Impact of AI on Neuroscientific Discoveries

3:30pm **Speaker Presentations**

Jim DiCarlo, Massachusetts Institute of Technology

Viktor Jirsa, Institut de Neurosciences des Systèmes; Human Brain Project; EBRAIN

3:55pm **Moderated Panel and Audience Q&A**

Topic 1c - Navigating the Intersection of AI and Neuroscience

4:10pm **Speaker Presentation**

Jay McClelland, Stanford University

4:20pm **Moderated Panel and Audience Q&A**

4:55pm **Recap of Day 1 Themes & Preview of Day 2**

Magali Haas, Cohen Veterans Bioscience, *Workshop co-chair*

Terrence Sejnowski, Salk Institute for Biological Sciences, *Workshop co-chair*

5:00pm **Adjourn Day 1**

TUESDAY, MARCH 26, 2024

9:30am **Day 2 Welcome**

Magali Haas, Cohen Veterans Bioscience, *Workshop co-chair*

Terrence Sejnowski, Salk Institute for Biological Sciences, *Workshop co-chair*

9:35am **Session 2: R&D Considerations for Neuroscience & AI**

Objectives:

- Discuss what methodologies should be established to assess the "co-evolution" of the human brain with AI models.
- Explore safeguards to ensure the responsible development and use of AI in neuroscience research.
- Explore the advantages of utilizing AI in drug development and generating more targeted therapies.
- Consider strategies to ensure the development and usage of representative datasets to generate AI algorithms that are applicable to diverse populations.

9:35am **Session Overview**

Bill Martin, The Janssen Pharmaceutical Companies of Johnson & Johnson, *Session Moderator, Planning Committee Member*

9:40am **Speaker Presentations**

Jana Schaich Borg, Duke University

Olga Troyanskaya, Princeton University (*Zoom*)

Edward Chang, University of California, San Francisco (*Zoom*)

Lee Lancashire, Cohen Veterans Bioscience

Gayle Wittenberg, The Janssen Pharmaceutical Companies of Johnson & Johnson

10:20am **Moderated Panel and Audience Q&A**

10:50am **BREAK**

11:00am **Session 3: Impact of AI in Medical & Clinical Environments**

Objectives:

- Discuss what health professionals and individuals with lived/living experience would need and/or want from the medical application of AI.
- Explore neuroscience-related health professionals can contribute to developing representative, innovative, and effective AI systems for healthcare.
- Consider the role of causal AI in healthcare.

11:00am **Session Overview**

Frances Jensen, University of Pennsylvania, *Session Moderator, Forum on Neuroscience and Nervous System Disorders co-chair, Planning Committee Member*

11:05am **Speaker Remarks**

Ruogu Fang, University of Florida

Michael Abràmoff, University of Iowa; Digital Diagnostics (*Zoom*)

Brian Litt, University of Pennsylvania

Alison Darcy, Woebot Health

Brian Anderson, Coalition for Health AI (CHAI)

11:30am **Moderated Panel and Audience Q&A**

12:10pm **LUNCH BREAK**

12:50pm **Session 4: Communication & Engagement with the Public & Lived/Living CNS Disorder Experience**

Objectives:

- Discuss how individuals with lived/living experience and the general public perceive AI and what they hope to see achieved with AI in the future.
- Consider how neuroscientists and artificial intelligence engineers can collaborate to educate the public regarding artificial intelligence and its use in research, clinical care, and general applications.
- Explore how communication campaigns can be designed to reach underrepresented populations and rural communities.

12:50pm **Session Overview**

Katie Sale, American Brain Coalition, *Session Moderator, Planning Committee Member*

12:55pm **Speaker Remarks**

Jennifer French, Neurotech Network

Matthew Guggemos, iTherapy LLC

Ehsan Hoque, University of Rochester; *Planning Committee Member*

Susan Gonzales, AI and You (*Zoom*)

John Wilbanks, The Broad Institute of MIT and Harvard

1:20pm **Moderated Panel and Audience Q&A**

2:00pm **BREAK**

2:10pm **Session 5: Regulatory & Policy Advocacy and Engagement**

Objectives:

- Review the current and proposed regulatory frameworks governing the use of AI in neuroscience.
- Discuss the key role of neuroscience in equipping regulators and policymakers with knowledge and resources for the responsible use of AI in research, clinical, and general applications.

2:10pm **Session Overview**

Michael Littman, National Science Foundation; *Session Moderator, Planning Committee Member*

2:15pm **Speaker Remarks**

John Ngai, BRAIN Initiative

Nita Farahany, Duke University; *Planning Committee Member*

Eva Weicken, Fraunhofer HHI

Wade Shen, White House Office of Science, Technology, and Policy; ARPA-H (*Zoom*)

2:35pm **Moderated Panel and Audience Q&A**

3:10pm **Session 6: Synthesis & Opportunities to Move Forwards**

Objectives:

- Examine the core themes that have been highlighted during the workshop.
- Discuss which topics may not have been examined during previous discussions and should be considered in the future.
- Consider what opportunities and collaborations may be needed to continue to bolster the relationship between neuroscience and artificial intelligence to inspire innovation.

3:10pm **Session Overview**

Magali Haas, Cohen Veterans Bioscience, *Workshop co-chair*

Terrence Sejnowski, Salk Institute for Biological Sciences, *Workshop co-chair*

3:15pm **Moderated Panel Discussion**

Pat Churchland, University of California San Diego (*Zoom*)

Sean Hill, Centre for Addiction and Mental Health; EPFL; University of Toronto

Jesús Mantas, Biogen; IBM

Kevin Miller, Google Deepmind, *Planning Committee Member*

Anindita Saha, Food and Drug Administration

3:55pm **Concluding Remarks**

Magali Haas, Cohen Veterans Bioscience, *Workshop co-chair*

Terrence Sejnowski, Salk Institute for Biological Sciences, *Workshop co-chair*

4:00pm **Adjourn Workshop**