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The NO-Age and NO-AD Seminar Series # 74

Miniature two-photon microscopes for studying brain microcircuits in freely moving animals

by

Dr. Weijian Zong

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14:00-15:00 (CET), Monday, 06th May. 2024

Location: Auditorium L-200, Domus Medica, Sognsvannsveien 9,Oslo

On-line:

https://uio.zoom.us/webinar/register/WN_YUUK4M74T92BHD1t_M2o5g

Organizers:

Evandro F. Fang (UiO), Jon Storm-Mathisen (UiO), Asgeir Kobro-Flatmoen (NTNU), Lene Juel Rasmussen (KU), W.Y. Chan (CUHK)

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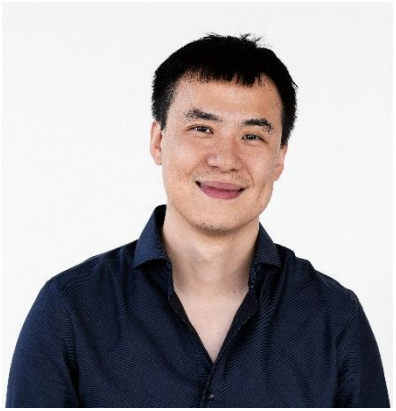
Previous recorded talks are available here: https://noad100.com/videos-previous-events/



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Speaker: Dr. Weijian Zong

Title: Miniature two-photon microscopes for studying brain microcircuits in freely moving animals

Abstract:
Understanding complex cognitive functions starts with elucidating how information is encoded and transmitted within individual brain microcircuits. To achieve this goal, we need recording techniques capable of capturing the activity of large populations of neurons with a temporal precision close to the timescale of spikes and a spatial resolution high enough to resolve their spatial organization. Moreover, these techniques should be compatible with well-established and well-validated behavioral paradigms. Traditional extracellular recording techniques have drawbacks regarding their ability to identify genetically defined cell types and are of limited use for studies of subcellular dynamics. Two-photon (2P) functional imaging stands out by offering subcellular spatial resolution and near-spike temporal resolution, so it has emerged as one of the workhorses to study neural populations' coding and computational properties. However, its application had been limited by the bulky nature of conventional 2P imaging systems, restricting studies to head-fixed animals. Over the last two decades, considerable progress has been made in developing portable microscopes specifically tailored for freely-moving-animal functional imaging. This talk introduces our recent work in developing new generations of 2P miniscopes with resolution, field of view, speed, and z-scanning capability similar to that of 2P benchtop microscopes. I will highlight key applications from my group and our collaborators, showcasing how this technology contributes to studying the neuronal computation rulesets in cortical microcircuits. Additionally, I'll discuss the current limits and perspective for future developments.

Biography:
Weijian Zong is currently the group leader of the neurophotonics lab at the Kavli Institute for Systems Neuroscience, Norwegian University of Science and Technology in Trondheim, Norway. He holds a BSc in Electrical Engineering from Peking University and a Ph.D. from the Academy of Military Medical Sciences, supervised by professors Heping Cheng and Ming Fan. He had his post.doc training in the lab of Prof. Edvard Moser and Prof. May-Britt Moser. Dr. Zong's research is focused on pushing the boundaries of optical technologies to monitor and perturbate neuronal activity in freely behaving animals, with the aim of providing insights into the neural mechanisms underlying a wide range of brain functions. His research has contributed significantly to the development of miniature two-photon microscopy for brain imaging in freely behaving mice. Additionally, he has developed a series of advanced fluorescence imaging tools across broad topics, including light-sheet microscopy, super-resolution, and TIRF microscopy.