UNIVERSITY OF MINNESOTA

Minnesota Robotics Institute

ROB 8970 **ROBOTICS COLLOQUIUM** **FALL 2025**

Class Report – Lecture 5 (10/03/2025)

Speaker : Dr. Suhasa Kodandaramaiah

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Dr. Kodandaramaiah talked on the topic ***Robotics for Multi-scale Biological Interfacing***, showing how robotics and computer vision can help scientists explore the brain across multiple levels, from single neurons to entire brain activity. He explained how automation can make delicate biological experiments more accurate and consistent, reducing the dependence on human skill and error. He described how robots can record signals from individual brain cells, inject genetic material into tiny embryos, and assist in observing brain function while animals perform natural behaviors. By combining robotics, imaging, and artificial intelligence, researchers can now carry out experiments that were once too complex or sensitive to perform manually. The overall message of the talk focused on the fact that robotics can bridge engineering and neuroscience, helping researchers better understand how living systems work while improving precision and repeatability in biological research.

Questions

- What are the main limitations of using optical imaging for monitoring neural activity at deeper regions of the brain?
- Are similar robotic or imaging experiments being conducted on other species besides mice, or are there plans to expand to different biological models?
- Given the progress in brain to machine interfacing, is it possible to connect robotic devices directly to an animal's brain or nervous system similar to how Dr. Octopus in Spider-Man 2 controlled his robotic arms through a spinal interface?

Comments

- The speaker showed very clearly how biological research has evolved from manual work to more automated, robot-assisted methods, step by step. It made me understand how robotics is becoming an essential part of biology.
- I liked how the speaker explained the difficulties of working with living systems and why automation is important to reduce human error.
- It was interesting to see how ideas from engineering and computer vision can directly help in studying the brain and understanding behavior.
- I liked the honest point that the real challenge often lies in the biology itself, not in the robotics. It explained well why creating reliable robotic systems for living organisms is both difficult and meaningful.

What I Liked

- The lecture was very engaging and kept us curious throughout. Prof. explained complex ideas in a way that was easy to follow and often added humor, which made the session lively and enjoyable.
- I liked how he showed that the same robotic principles can be used in very different areas, from studying the brain to working with embryos. It showed how powerful and adaptable robotics can be.

Overall Assessment

This was an inspiring, interdisciplinary lecture showing how careful robotics and modern vision turn manual methods into scalable science filled with new data. The work combines micro-scale precision and studying brain behavior, with careful acknowledgment of limits (depth, invasiveness, generalization). It introduced a compelling path where roboticists can contribute directly to neuroscience and bioengineering by building reliable and adaptable instruments.