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変革を駆動する先端物理・数学プログラム（FoPM）

国外連携機関長期研修　報告書

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Introduction

As part of my ongoing research in advanced microscopy techniques, I sought potential international collaborations to further develop and apply my expertise. With this goal in mind, I contacted Dr. Shalin Mehta at Chan Zuckerberg Biohub San Francisco (CZ Biohub SF). Dr. Mehta's research aligns with my interests in computational imaging, making him a suitable collaborator for exploring new research directions. He kindly invited me to participate in the Computational Imaging Across Scales 2025 workshop, which was an invaluable experience. In addition to this workshop, I attended SPIE Photonics West 2025, one of the world's largest optics and photonics conferences, where I had the opportunity to learn about the latest research, present my work, and engage in discussions with leading scientists.

Participation in Computational Imaging Across Scales 2025

The Computational Imaging Across Scales 2025 workshop, organized by Dr. Mehta and his team at CZ Biohub SF, was a highly stimulating event that showcased cutting-edge developments in computational imaging. The workshop featured presentations by leading experts, providing insights into the latest advancements in the field. The discussions covered a wide range of imaging modalities and computational techniques.

During the workshop, I had the opportunity to observe advanced imaging systems developed at CZ Biohub SF. This experience allowed me to better understand the infrastructure and research environment of a pioneering institution in biomedical imaging. The visit provided valuable perspectives on how state-of-the-art facilities are utilized to accelerate scientific discoveries. Additionally, I engaged in discussions with researchers working at institutions funded by the Chan Zuckerberg Initiative (CZI), highlighting the collaborative and interdisciplinary nature of research at the institute. Dr. Mehta emphasized the importance of leveraging expertise from various fields to conduct high-impact, fast-paced research. Through these interactions, I experienced the effectiveness of the networking and collaborative culture that drives scientific innovation in the CZI community.

Participation in SPIE Photonics West 2025

Following the workshop, I attended SPIE Photonics West 2025, the largest conference dedicated to optics and photonics research. This conference provided an excellent opportunity to explore a broader range of research topics along with computational imaging. In addition to computational approaches, I learned about novel optical system designs, hybrid imaging techniques integrating

optics with other technologies, and recent advancements in biophotonics. The conference featured numerous high-quality presentations and discussions, offering valuable insights into emerging trends in the field.

One of the highlights of my participation was the opportunity to discuss my research with Dr. Mehta's research group and their collaborators during informal lunch meetings. These discussions helped me better understand the presented techniques and their applications while also providing constructive feedback on my research vision.

I also had the privilege of delivering an oral presentation on my research. This presentation attracted the interest of several researchers, leading to engaging conversations about potential applications and future directions. Moreover, I was honored to receive the Prospective Instruments Best Presentation Award. Receiving this award has increased the visibility of my work in the scientific community and motivated me to refine my research approach further.

Discussions on Potential Collaborations

Following the conference, I had another in-depth discussion with Dr. Mehta regarding possible research collaborations. Our conversation focused on the current trends in optical imaging research, particularly the dominance of deep learning-based approaches in the Bay Area. I had previously been hesitant to explore deep learning due to its highly competitive nature, but I realized that integrating these techniques into my research by myself is becoming increasingly important. This realization has motivated me to allocate more time to studying and incorporating computational methods into my work.

Through these discussions, I also gained a clearer understanding of potential career paths after completing my Ph.D. I recognized that the research environment in the United States places significant emphasis on interdisciplinary collaboration and rapid technological development. Exploring new research directions, including deep learning applications in optics, could open up additional career opportunities for me in both academia and industry.

Conclusion

My research visit to the United States, which included participation in the Computational Imaging Across Scales 2025 workshop and SPIE Photonics West 2025, was an immensely valuable experience. The exposure to leading-edge research, direct interactions with experts, and discussions on potential collaborations have significantly influenced my perspective on future research directions. I gained not only technical knowledge but also insights into the research culture and infrastructure of world-leading institutions. The recognition I received for my work further encouraged me to continue improving my research approach.

Moving forward, I plan to integrate computational imaging techniques more extensively into my research and explore collaborative opportunities with international researchers. My experiences at CZ Biohub SF and SPIE Photonics West have provided a strong foundation for my future research endeavors, reinforcing the importance of international collaboration in advancing scientific progress.

Figure 1 | Laboratory tour in CZ Biohub SF. Edited from the image in Chan Zuckerberg Biohub Network's LinkedIn post.