

APAO INTERNATIONAL FELLOW REPORT

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21st Sep 2021 to 20th Sep 2022



VISUAL NEUROSCIENCES RESEARCH GROUP

SINGAPORE EYE RESEARCH INSTITUTE (SERI), SINGAPORE

SUPERVISOR: PROFESSOR DAN MILEA

RESEARCH EXPERIENCE

Development of research skills

My scientific skills have been encouraged and enhanced throughout the program. Thank you to my supervisor, Professor Dan Milea, who greatly supported and taught me, and my wonderful colleagues, who shared valuable perspectives with me. As part of my development and growth, I have learned the following skills:



Apply critical thinking in literature review and problem-solving



Develop study protocol for AI-related research



Communicate with multidisciplinary experts



Plan, evaluate, and monitor research project



Apply clinical knowledge to improve the deep learning system



Provide scientific presentation and discussion



Prepare manuscript and create visualization



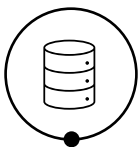
Figure 1 Visual Neurosciences Research Group, SERI, Singapore. From Left: Megan Tay Mei Chen (research technologist), Jodi Ling Wen Yan (clinical research coordinator), Raymond P. Najjar (neuroscientist), myself, Professor Dan Milea (my supervisor), Janie Tay Hwee Ching (associate research coordinator), Zhiqun Tang (engineer)

Collaboration with international and multidisciplinary teams

Working with a wonderful team of neuro-ophthalmologists, engineers, neuroscientists, and research associates provided me with a great opportunity to brainstorm and discuss interesting and different perspectives. In addition, I received great experience working with glaucoma specialists, SERI staffs, and several enthusiastic medical students. Moreover, one of the greatest experiences from this program was the opportunity to work and collaborate with the *Brain and Optic Nerve Study with Artificial Intelligence (BONSAI) Group*, a consortium of expert neuro-ophthalmologists from 43 centers across 23 countries (updated October 2022).

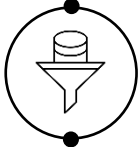
Gained insights into the application of AI in medical imaging research

My hands-on experience and close collaboration with engineers in more than five AI-related fundus imaging projects have allowed me to understand the process comprehensively. Below are examples of skills I gained through the program.



Dataset Preparation

- Labeled fundus images using dedicated software “ClassifEye.”
- Organized large data sets using advanced Excel functions and Python.
- Established criteria for evaluating image quality.
- Designed dataset divisions in collaboration with engineers.



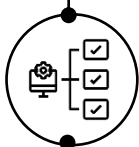
Data Preprocessing

- Learned principles and common methods of data preprocessing such as data augmentation, including spatial transformation, color distortion, and information dropping.



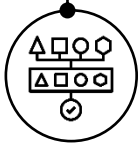
Machine Learning Model Training

- Learned the application of recent advanced algorithms, especially EfficientNet, for the model training.



Machine Learning Model Evaluation

- Investigated and solved problems to improve the model’s classification performance.
- Worked with engineers to choose an appropriate model.



Machine Learning Model Testing

- Interpreted model’s performance metrics.
- Analyzed errors occurring in the model’s prediction.

Oral presentations and publications

As a result of this program, I had the opportunity to present my project with the BONSAI consortium at international conferences. My first presentation was at the 48th annual North American Neuro-Ophthalmology Society (NANOS) 2022; I was honored to be nominated for the best abstract award. Additionally, the upcoming scientific presentations include the 38th Asia-Pacific Academy of Ophthalmology (APAO) Congress 2023 and I have the chance to share my experiences related to AI at the 11th Asian Neuro-Ophthalmology Society (ASNOS) meeting in November 2022 titled "Challenges and Opportunities of AI in Neuro-Ophthalmology".

Moreover, I was able to complete two manuscripts with the encouragement and support of Professor Dan Milea, including one descriptive review and one original article.

SINGAPORE CULTURE & CITY EXPLORATION

My first impression of Singapore is that it is a harmonious multicultural country. During the program, I made new friends from various countries and gained a deeper understanding of their cultures. Singapore is also very famous for its food culture. "Hawker centers" are my favorite places since there are a wide variety of delicious local dishes at low prices.

Additionally, the bicycle paths in Singapore are well-connected, and rental bikes are affordable throughout the country. Because of this, bicycling has become my favorite outdoor activity. It has allowed me to see the city and its extraordinary sights.

Moreover, I enjoy visiting many fascinating heritage areas and museums in Singapore. But most importantly, I met many amazing people who supported and helped me generously and kindheartedly. These experiences will always be part of my memory as an APAO international fellow in Singapore.



Figure 2 me on the bicycle path around Marina Bay in Singapore.

IN SUMMARY

Through the APAO fellowship program at SERI, I was nourished and developed as an analytical and scientific thinker. In the meantime, I have developed strong communication skills with the multidisciplinary team and international collaborators, enhancing my confidence as a global citizen. The experiences and skills I gained from this program are invaluable assets to achieve my goal of applying AI to improve the healthcare system. My vision is to reduce the gap between patients and consultants and healthcare costs. Finally, I want to share my knowledge and experiences with my peers and junior colleagues, hoping this will inspire them to pursue their dream of improving healthcare.