

## Advanced Technologies for Prediction of Myopia Progression

### Principal Investigators

PolyU : Chea-su Kee, Ho-lung Henry Chan

UW : Daphne Lynne McCulloch, Benjamin Thompson

Co-I : Vivian Choh, Vivek Maheshwari, Stanley Woo, Kai-yip Choi,

Elizabeth Irving, Mingguang He, Tsz-wing Jeffrey Leung, Jeremy Kang,

Elie de Lestrage

### Aims

Myopia is a major vision health concern. Accurate prediction of which patients will progress to high myopia would enable early and targeted treatment to preserve sight. AI algorithms have significant potential to enable the prediction of high myopia progression. This project will utilize AI for high myopia prediction and will simultaneously develop novel technologies to assess eye structure and function that will enable even greater predictive accuracy. In addition, we will adopt structured light technology for the early detection and monitoring of myopia.

### Background

Myopia is a significant vision health issue, with an estimated 50% of the global population expected to be affected by 2025. About 20% of those with myopia will develop high myopia. By 2050, high myopia is projected to affect 1 billion people, placing major stress on economies and healthcare systems. Early and accurate prediction of high myopia progression could enable targeted treatments to preserve sight.

### Work to be Done

The first phase focuses on the development and clinical validation of a Digital Myopia Control (dMC™) platform that incorporates patented predictive algorithms based on ocular biometrics for monitoring eye growth, offering a novel approach to managing myopia. The dMC™ platform aims to provide personalized treatment plans to slow down the progression of myopia, thereby reducing the risk of severe ocular complications. In parallel to the embodiment of the predictive algorithm, the project team will develop and evaluate the potential of structured light technology as a tool for predicting and monitoring myopia progression. During the first five years, the team conducted extensive research on the interaction between structured light and the human eye. While the original findings were primarily aimed at advancing the understanding of age-related macular degeneration (AMD), there are significant opportunities to apply the same underlying principles to other ocular diseases, such as myopia.

### Benefits

The potential beneficiaries encompass all children at risk of developing myopia. The potential beneficiaries encompass all children at risk of developing myopia. Present clinical protocols rely only on age and refractive error, lacking objective clinical information derived from the neural system of the eye. The addition of structured light technology offers a unique and valuable alternative to the limited number of technologies currently available for the management of myopia. The new technologies developed in this project, which combine AI and structured light, will provide a more comprehensive approach to examining myopia progression and evaluating the effectiveness of novel treatment strategies.

### Impact

Identify individuals at risk of high myopia-related retinal degeneration, allowing appropriate early intervention to halt or slow myopia progression. This approach will allow comprehensive myopia management to offer a personalized approach to treatment. Consequently, to prevent the onset of severe ocular complications, such as retinal detachment, macular degeneration, cataracts, and glaucoma, preserving the vision of individuals with myopia and enhancing their quality of life.



AI and novel imaging tools to enhance myopia treatment