HyPhI Colloquium

Date: **24 Jan 2024, Wednesday**
Time: **16:00 Hrs (Tea/Coffee 15:45 Hrs)**
Venue: **TIFRH Auditorium**
Zoom Link: **https://shorturl.at/dMNRW**

Title: **Applications of Adaptive Optics in Vision Research**

Speaker: **Dr. Krishnakumar Venkateswaran, IMAI LLC / Oculotix Aliso Viejo, CA 92656 USA**

Abstract:

A potential approach to mitigating atmospheric turbulence on Earth and achieving high-resolution astronomical images with ground-based telescopes involves the implementation of adaptive optics (AO). An adaptive optics system comprises a wavefront sensor to quantify optical distortions in the wavefront and an optical element designed to counteract these distortions.

In 1953, Babcock introduced a technique to counteract Earth's atmospheric turbulence. However, it wasn't until 1977 that Hardy and his colleagues successfully showcased the application of adaptive optics (AO) in astronomy. Originally developed for military applications, AO has since become an integral component of nearly every high-resolution optical imaging system employed in astronomical telescopes.

Building on this foundation, vision scientists used Shack-Hartmann sensor to measure aberrations in the eye. Roorda et al. (2002) integrated a conventional scanning laser ophthalmoscope with adaptive optics, addressing both lower and higher-order aberrations. This innovative approach yielded images with remarkable lateral resolution, capable of resolving cones near the fovea. In 2003, Drexler et al. and Miller et al. further advanced the field by applying adaptive optics to optical coherence tomography, thereby enhancing both axial and lateral resolution.

Adaptive optics (AO) systems play a crucial role in understanding impact of optical aberrations of the human eye, facilitating the delivery of high-resolution images onto the retina. Real-time compensation for optical aberrations allows for a comprehensive exploration of their influence on various facets of human vision, including aspects such as depth of focus, myopia progression and novel intraocular lens designs for cataract surgery. This presentation will provide a broad overview of adaptive optics and its diverse applications in the realm of vision science research.