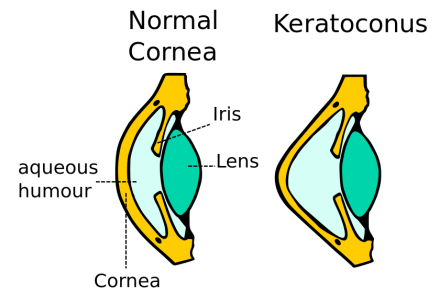


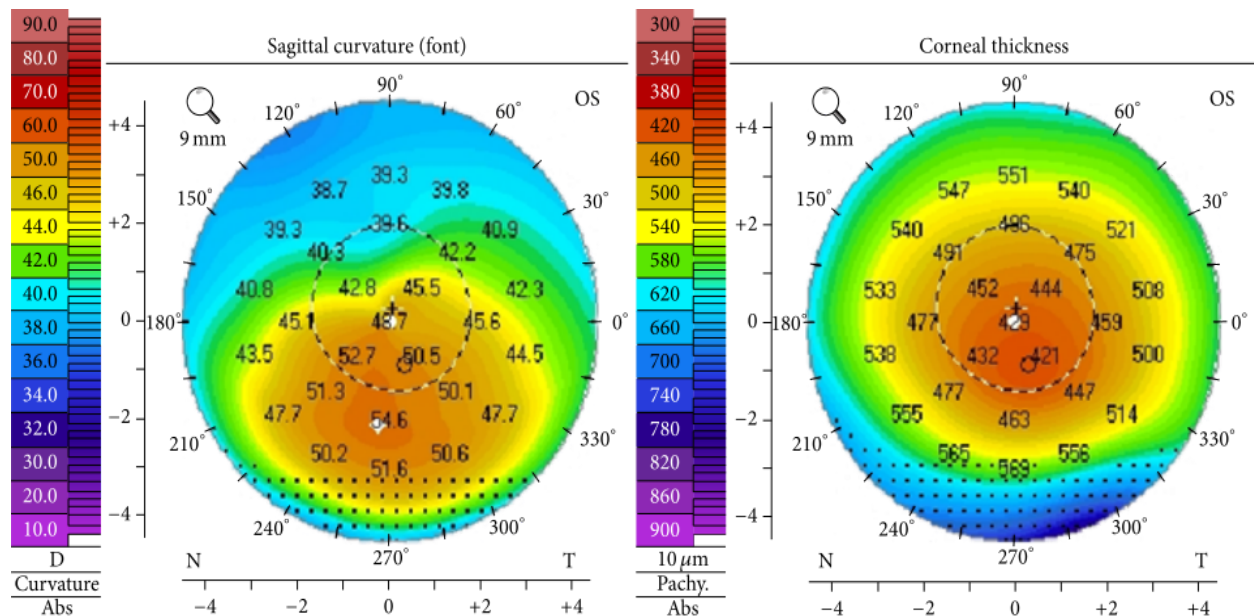
IDP/MA Project: Automatic Early Detection of Keratoconus

Chair for Computer Aided Medical Procedure (CAMP) + Augenklinik-Klinikum Rechts der Isar (MRI)

Keratoconus (KCN) is a bilateral, non-inflammatory, and degenerative disorder of the cornea in the eye with an incidence of approximately 1 per 2,000 in the general population [1,2], It is characterized by progressive thinning and cone-shaped bulge of the cornea (fig.1) leading to substantial distortion of the vision [2]. The early diagnosis of keratoconus is of a great importance for patients seeking eye surgery (i.e. LASIK), which can prevent the progression of pathology after surgery [3-4]. Rabinowitz [5] shows that his preliminary research using a Wavefront analysis together with Corneal topography demonstrates a good classification between early KCN subtypes and normals. Further, Jhanji et. al. [6] concluded that swept-source OCT may provide a reliable alternative for the parameters of corneal topography (fig.2). On the other hand, Pérez et. al. [3] shows that all of these surveyors including videokeratography, Orbscan, and Pentacam together with the indices can lead to early KCN detection, however, with an increase in false positive detection. Therefore, developing a highly specific diagnostic tool for KCN detection with few false positive is highly desirable.



In this IDP/MA project, the objective is to analysis data from approximately 500 patients, treated at the ophthalmology department at Klinikum Rechts der Isar / TUM. Using a retrospective corneal topographic data (fig.2) collected during follow-ups, the aim is to build an early predictive model for KCN detection.



Interested students will be provided access to a database of corneal topography of anonymized patients. The work will be supervised jointly by an interdisciplinary team from members at the chair for Computer Aided Medical Procedures (CAMP) at TUM and physicians at Ophthalmology department in Rechts der Isar hospital.

Your tasks:

- Extract relevant diagnostic information from a database.
- Perform basic quality and sanity check on data.
- Develop a predictive model of an early KCN detection.
- Perform extensive validations and experiments.
- Analyze the results based on the evaluation metrics.

Requirements:

- Good understanding of machine learning methods
- Very good programming skills in MATLAB or/and Python.
- Willingness to closely work with physicians and experts in machine learning.

if you are interested in this project, please send an email to shadi.albarqouni@tum.de

References:

- [1] Rabinowitz, Y. S. (1998). Keratoconus. *Survey of ophthalmology*, 42(4), 297-319.
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- [3] Pérez, J. F., Marcos, A. V., & Peña, F. J. M. (2014). Early diagnosis of keratoconus: what difference is it making?. *British Journal of Ophthalmology*, bjophthalmol-2014.
- [4] Bühren, J., Schäffeler, T., & Kohlen, T. (2013). Preoperative topographic characteristics of eyes that developed postoperative LASIK keratectasia. *Journal of Refractive Surgery*, 29(8), 540.
- [5] Rabinowitz, Y. S. (2007). Diagnosing Keratoconus and Patients at Risk. *Cataract and Refractive Surgery*, 85-87.