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Comprehensive evaluation of Pentacam tomographic parameters for automatic detection of subclinical keratoconus

CENTRE FOR Eye Research Australia

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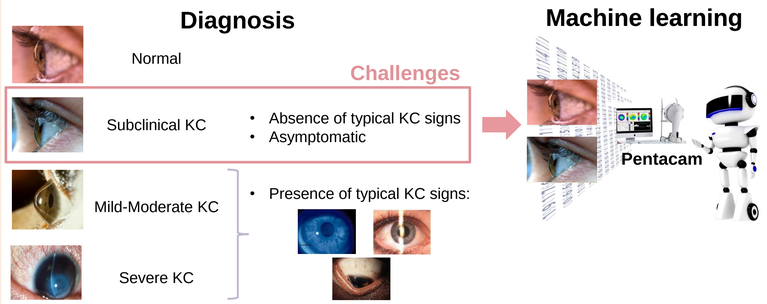
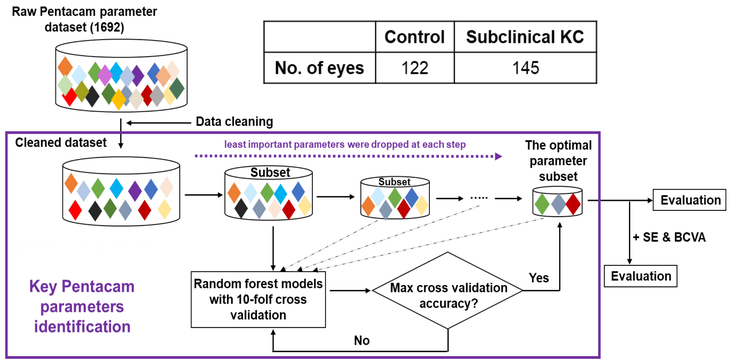
Purpose

Developing a Artificial Intelligence (AI) model to automatically detect **subclinical keratoconus (KC)** [1] from a comprehensive Pentacam parameter set.



Methods

Figure 1: Flowchart for selecting the best performing Pentacam parameters and model built with additional clinical parameters

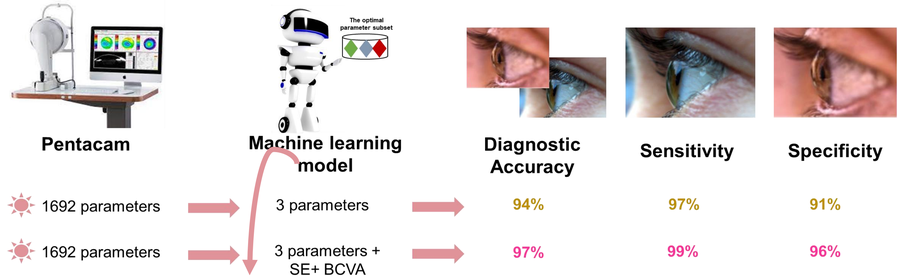


	Control	Subclinical KC
No. of eyes	122	145

***SE: Sphere equivalent; BCVA: Best corrected visual acuity**

Results

Figure 2: Performance of the models



3 novel key Pentacam parameters identified by machine learning:

- Ecc_f: Eccentricity_front
- Eccsph: Eccentricity spherical
- I-S value: Inferior-Superior value

Figure 3: Availability of 3 key Pentacam parameters in other corneal tomography systems

Conclusions

- An automatic, accurate and fast performance AI model for the early detection of subclinical KC has been developed using a compact tomography parameter set.
- This AI model has the potential to aid diagnostic screening of at-risk individuals in an objective and timely manner to aid clinical decision making as well as enable affected individuals to be offered appropriate monitoring and treatment.

Discussion

- This represents the first application in identifying the optimal parameter set for subclinical KC detection **in an unbiased manner** [2] from a **comprehensive Pentacam dataset of 1692 parameters** (Figure 1).
- This model achieved high discriminative accuracy using the 3 novel identified Pentacam parameters (Figure 2&3).
- Inclusion of routinely collected clinical measures such as BCVA and refraction improved the performance of the model to discriminate subclinical KC and control eyes (Figure 2).
- **The current findings offer the opportunity to extend subclinical KC diagnosis to a range of imaging systems beyond that of the Pentacam (Figure 3).**

Bibliography

[1] Sahebjada S, Xie J, Chan E, Snibson G, Daniel M, Baird PN. Assessment of anterior segment parameters of keratoconus eyes in an Australian population. Optom Vis Sci. 2014;91(7):803-809.

[2] Ruiz Hidalgo I, Rodriguez P, Rozema JJ, et al. Evaluation of a Machine-Learning Classifier for Keratoconus Detection Based on Scheimpflug Tomography. Cornea. 2016;35(6):827-832.

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Hope in sight