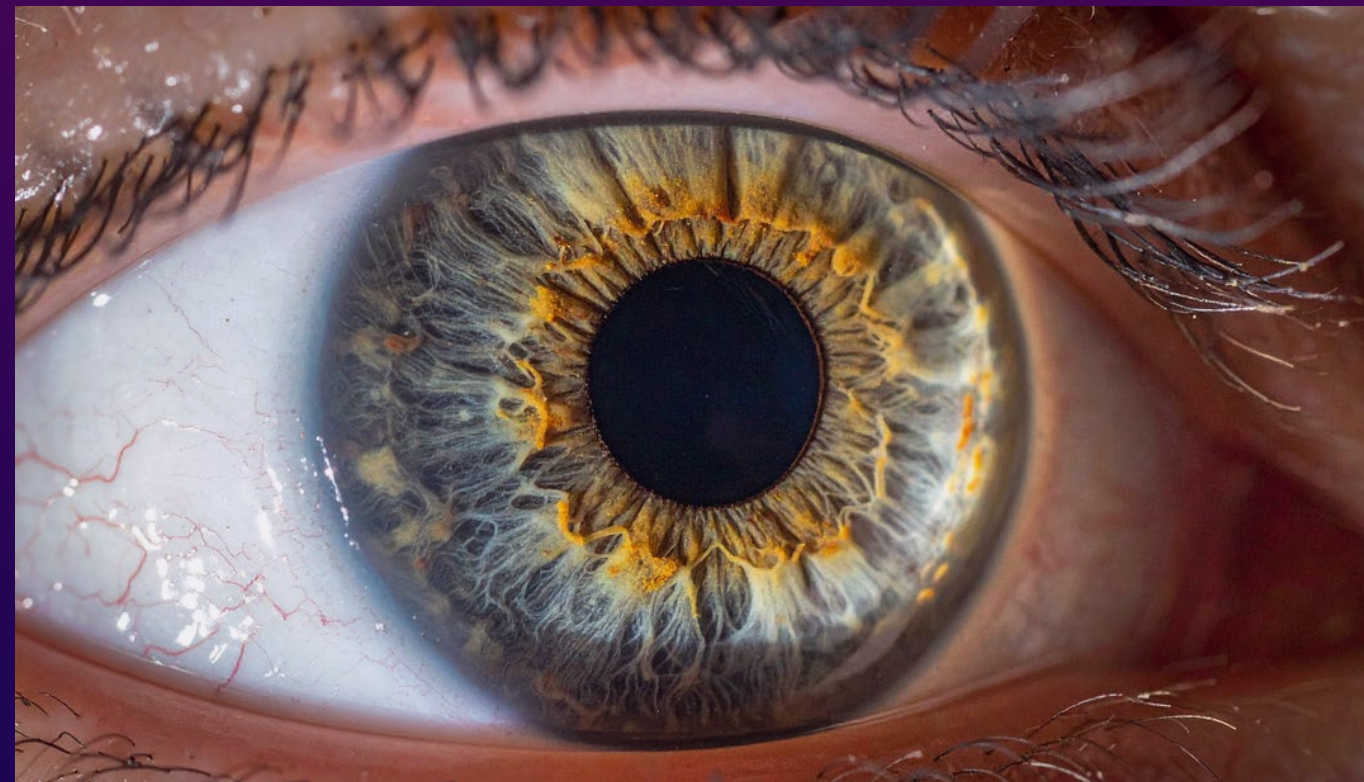




Edge - Deployed Vision Transformer Model for Automated Keratoconus Classification in Corneal Imaging



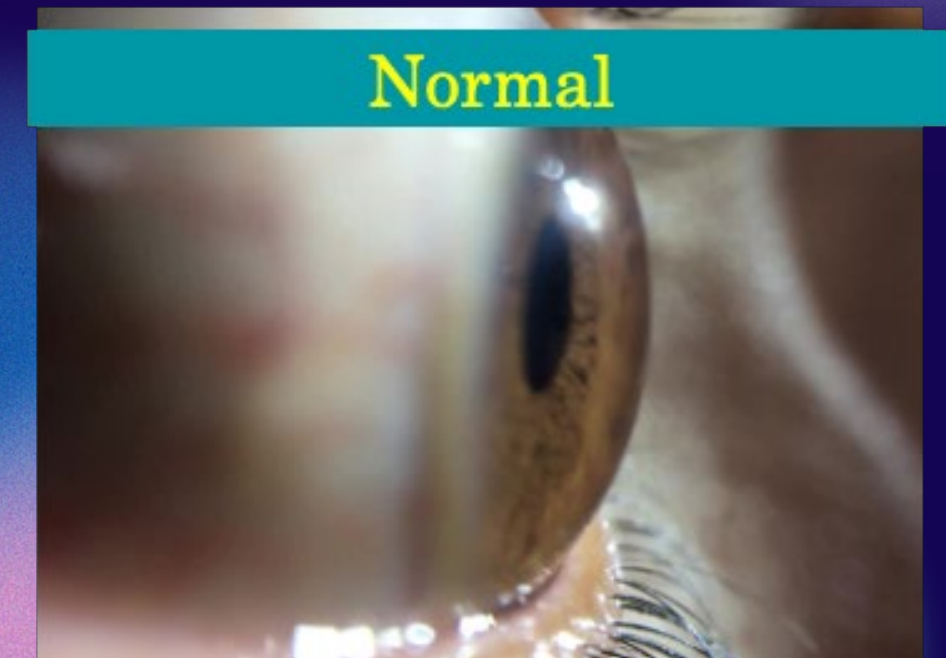
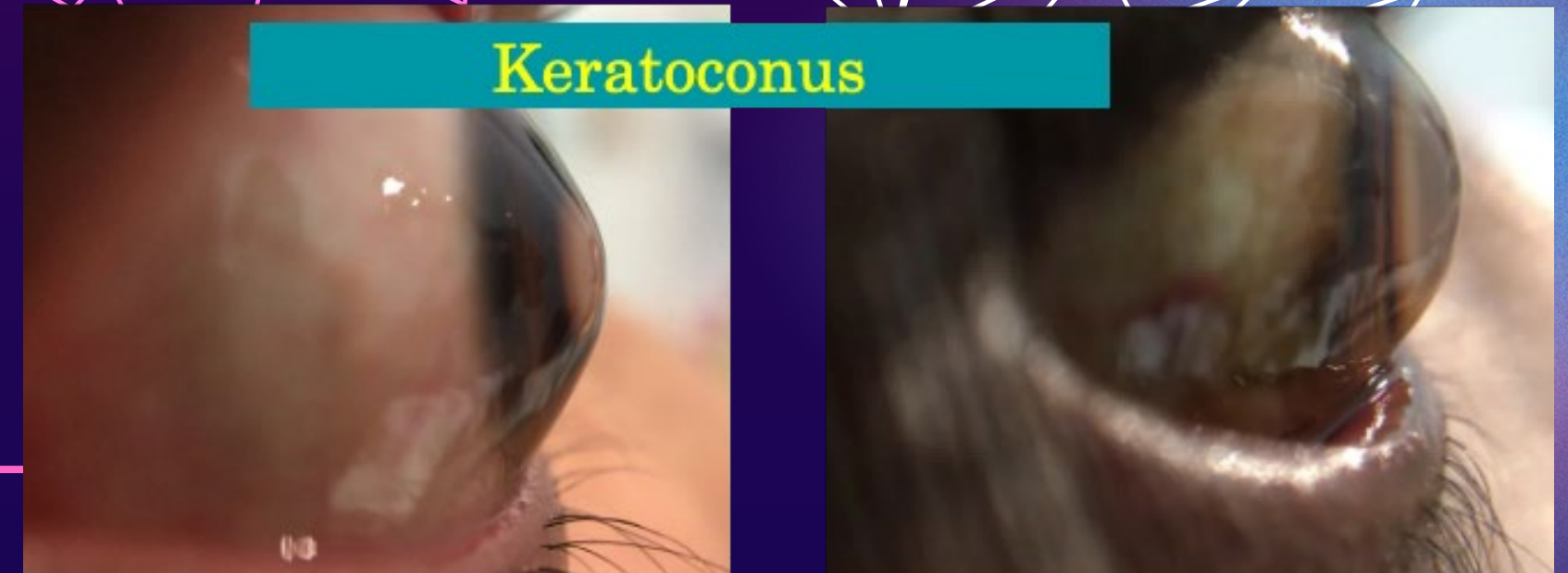
Presented By:

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INTRODUCTION

What is Keratoconus

- Ocular disease involving the progressive & non-inflammatory corneal thinning and steepening of the corneal curvature
- Uncommon disease with 1 case out of 2000 individuals
- Recent research indicates its impact on 2 to 479 individuals per 100,000, with 1.5 to 25 new cases annually



Problem Statement

Keratoconus eye disease increasing year by year

Medical imaging devices are bulky

Accessibility of Early Detection

Rural and semi -urban areas: Keratoconus were diagnosed late

Literature Review

Authors	Title	Input images	Mobile
Askarian [8]	Novel Keratoconus Detection Method Using Smartphone	2D images	Yes
Gairola [9]	SmartKC: Smartphone-based Corneal Topographer for Keratoconus Detection.	Corneal topography image	Yes
Nokas [10]	Preventing keratoconus through eye rubbing activity detection: a machine learning approach	Gyroscope – IMU data	No
Zaki [11]	A mobile solution for lateral segment photographed images based deep keratoconus screening method.	2D images	Yes
Mat Daud [12]	Keratoconus detection using the fusion features of anterior and lateral segment photographed images.	2D images	Yes

Objectives

To classify Keratoconus
using deep learning model

To evaluate the results from
hyperparameter tuning

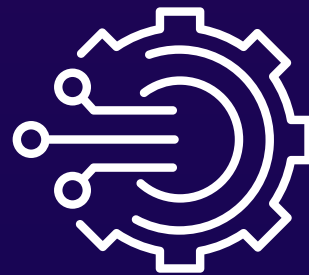
Methodology & Process

Data collection and preparation



- Resolution: 1920 x 1080 pixels 96 dpi
- Total 1286 images: 722 normal and 564 KC

Model design & architecture



- Vision transformer

Model Training



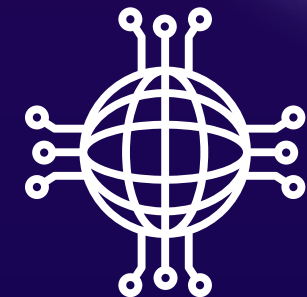
- Optimizer: SGD & Adam
- Learning rate: 0.01, 0.001, 0.005
- Epochs: 50

Model Evaluation & Testing



- Accuracy: indicates the overall correctness of predictions, precision measures the model's ability to correctly identify positive cases. Recall, assesses the model's capacity to capture all positive instances.

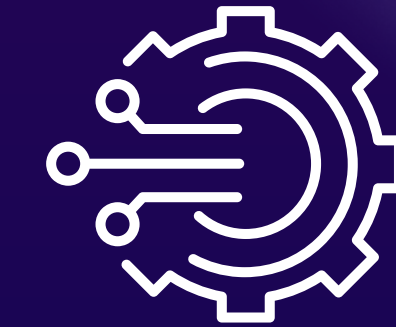
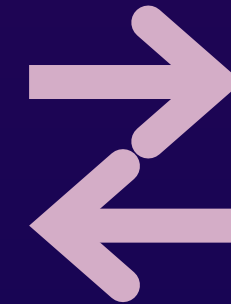
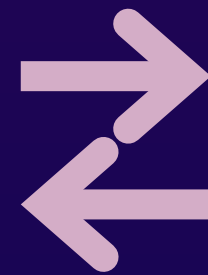
Deployment and integration



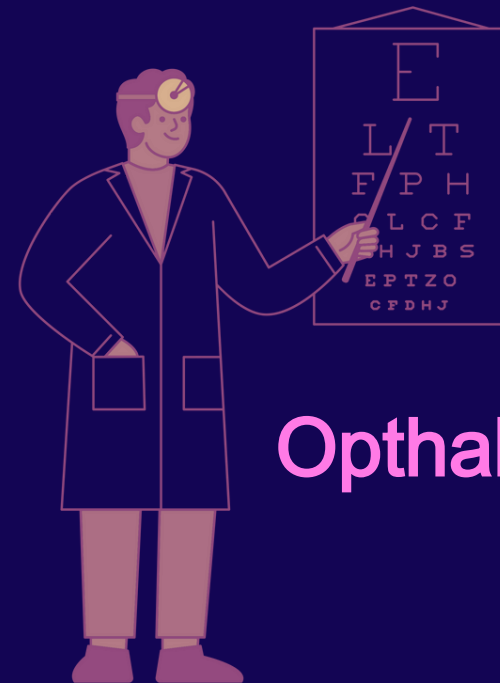
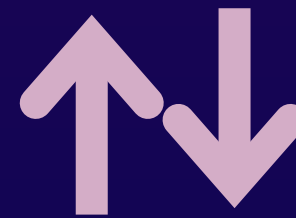
Overview of the Deployment



ThingsSentral



Vision
Transformer
Model

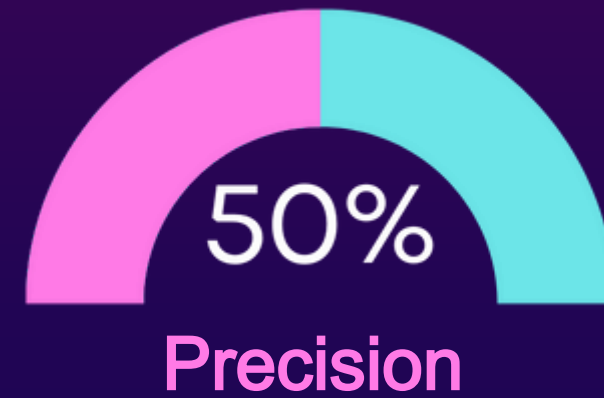
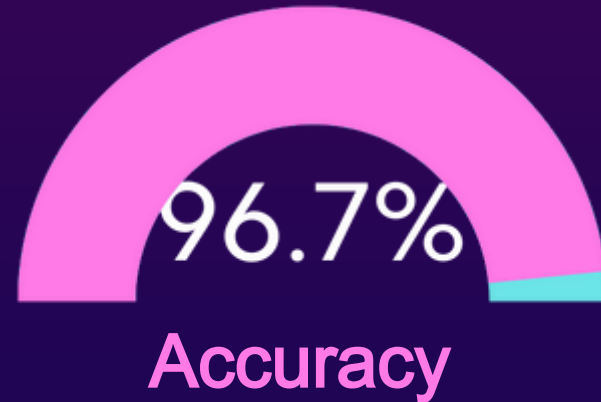


Ophthalmologist

Results & Discussion

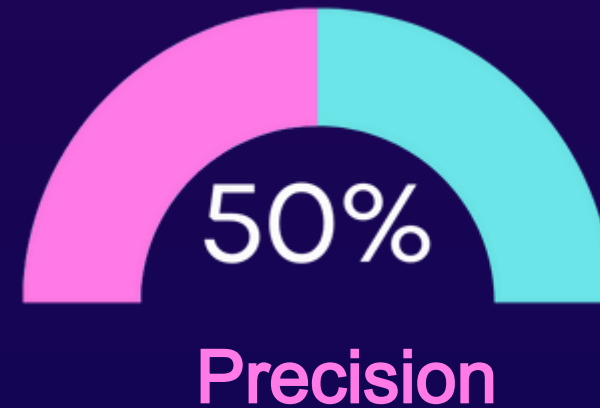
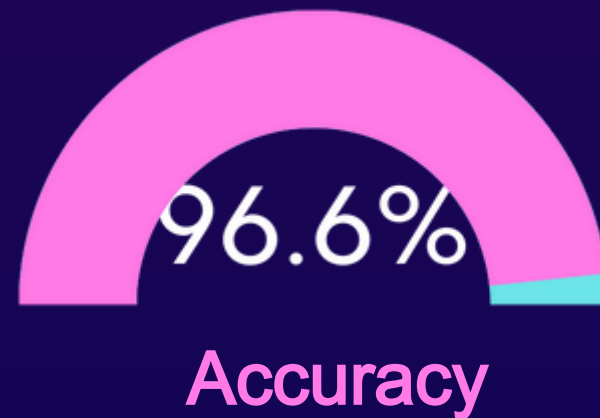
SGD

LR =
0.005



Adam

LR =
0.001



SGD achieved only
slightly higher accuracy
than Adam overall

How precise the model
to detect predicted KC
cases

How sensitive the model
to detect all true KC
cases





Conclusion & Future Works

This research presented a streamlined, mobile -centric framework for keratoconus classification employing a Vision Transformer (ViT) model, integrated with a cloud -based processing system. The proposed method employs ThingsSentral to analyze eye photographs captured with a smartphone and remote AI technology.

Get more bigger &
diverse data

scalable, real -time
keratoconus
screening



Thank
You

