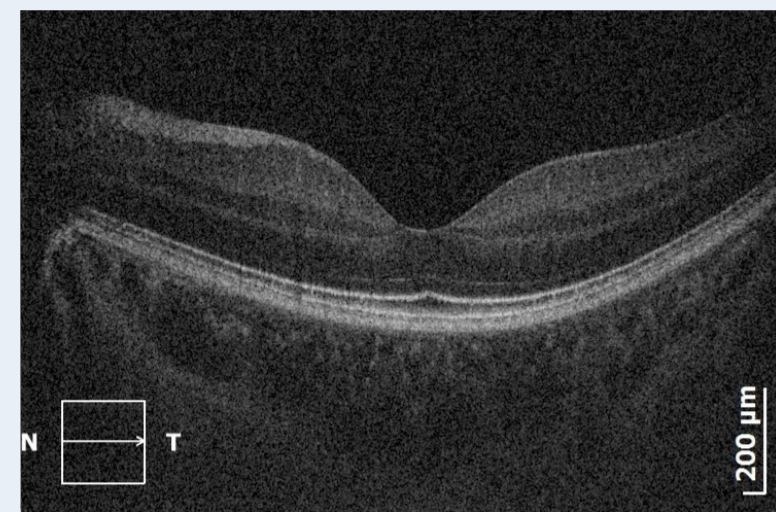


## Using Artificial Intelligence (AI) to detect Retinal Developmental Disorders.

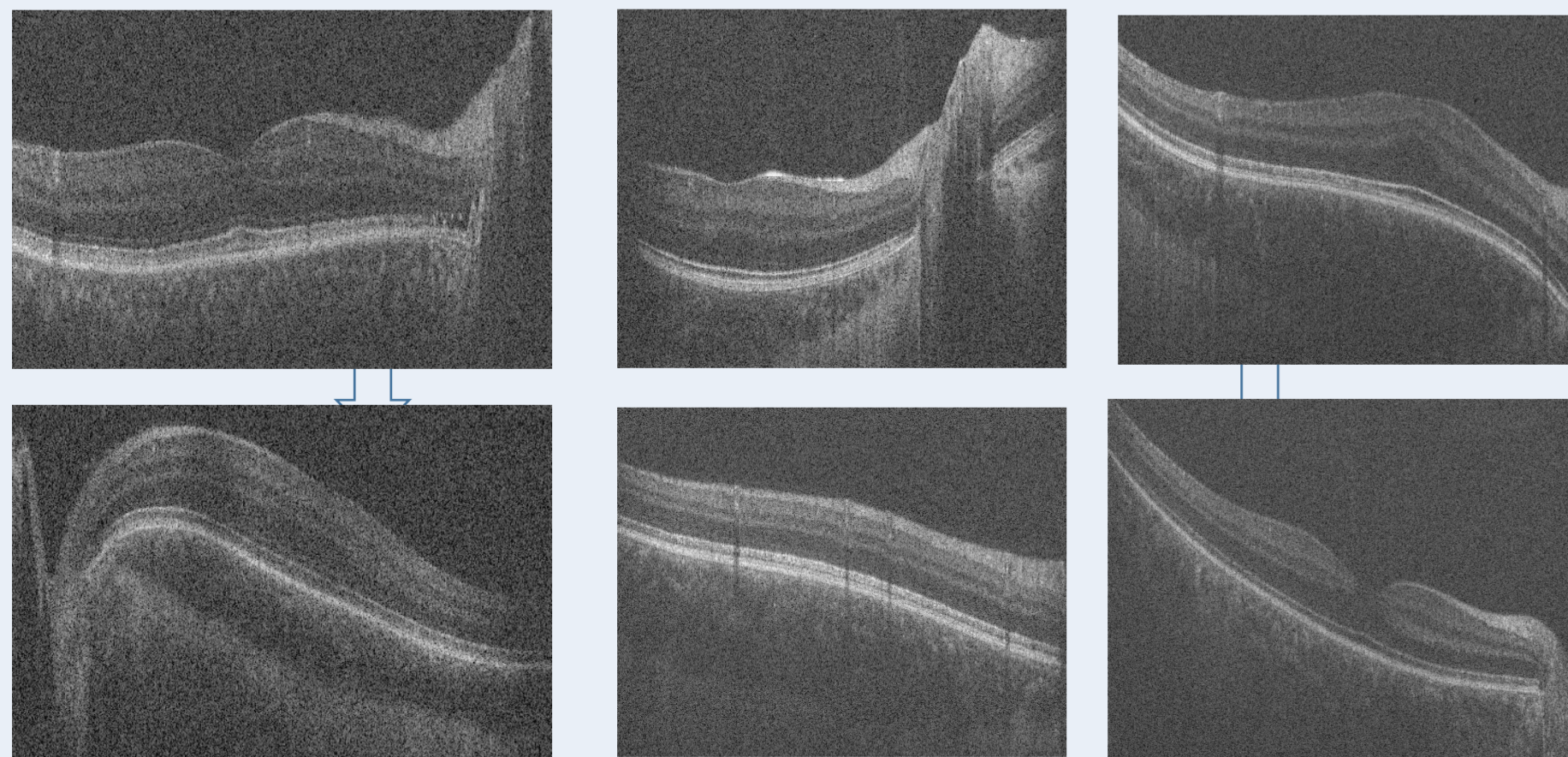
### What is the purpose of using AI in Retinal disorders?



Artificial intelligence (AI) is particularly effective in image recognition as demonstrated in radiology, pathology and recently ophthalmology. We focussed on paediatric OCT Scans for the detection of disorder.

- Foveal hypoplasia (FH) is a group of disorders characterised by arrested retinal development and often associated with infantile nystagmus.
- Identifying the degree of arrested retinal development using optical coherence tomography (OCT) is paramount as this information provides both diagnostic and prognostic value.
- To date, there are no AI systems available for paediatric OCT or childhood nystagmus. We aimed to develop a quick, automated AI system to accurately differentiate normal foveal structure and grades of FH in paediatric retinal OCT images.

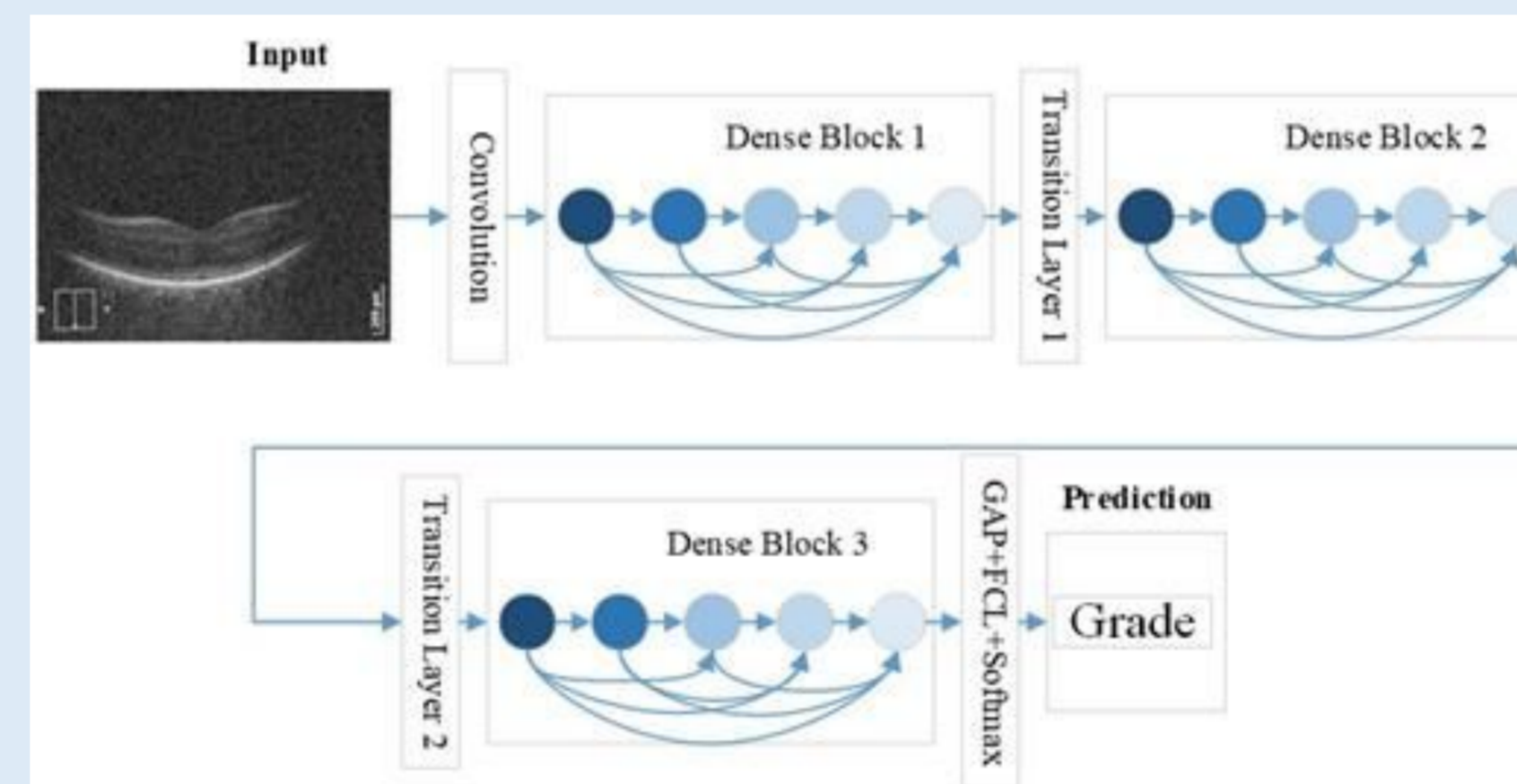
### Types of Retinal Developmental disorders



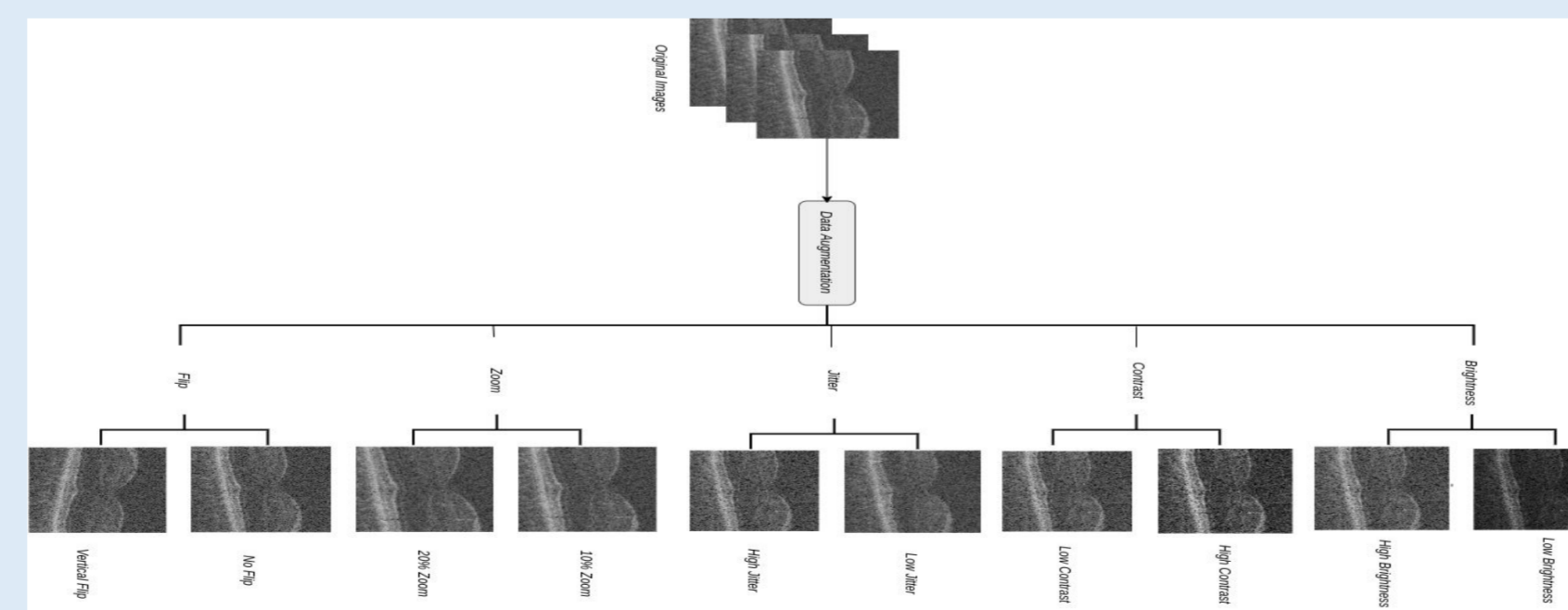
- \*Atypical
- \*Grade 1-4
- \*Normal

### Algorithm (Model used)

- We used the Leicester paediatric OCT database to obtain normal and abnormal developmental scans.
- This included scans with varying degrees of arrested retinal development (Grades 1-4 FH and atypical FH).
- Representative high yield training datasets (3040 foveal B-scans) were extracted from >20,000 volumetric B-scans.
- The foveal B-scans were subsequently segmented and annotated.

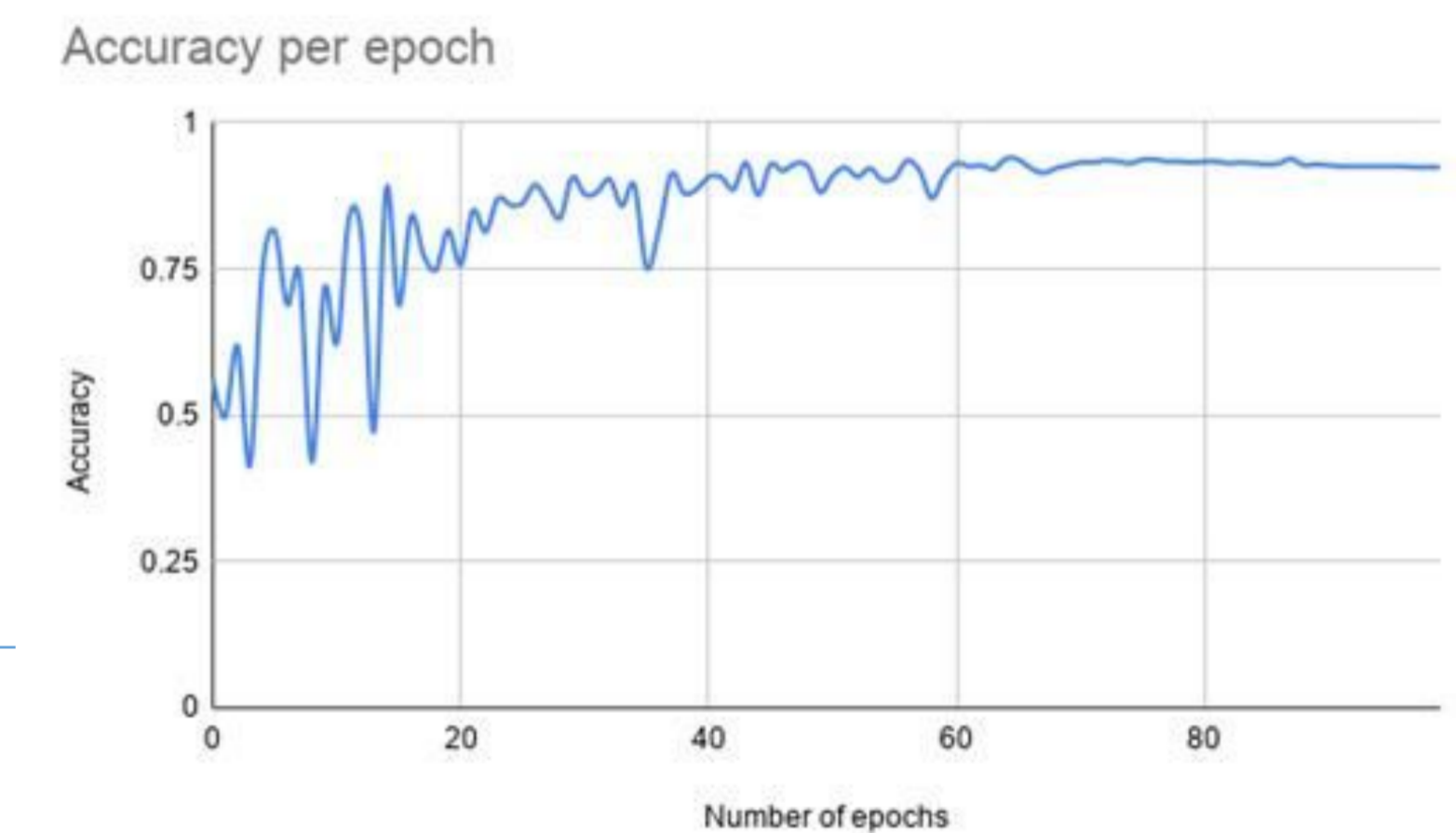


- A series of convolutional neural networks (AI algorithms: Densenet201 and Resnet50) were used to train and validate the AI system to differentiate between normal, grade 1-4 FH and atypical FH.



### Results

- Following training of the AI system, we performed validation on different pathologies.
- We achieved a binary and 6-point classification, by replacing the 1000-neuron fully connected (FC) layer with a new 2-neuron FC.
- The AI system was able to successfully differentiate normal and abnormal scans with a 97.68% accuracy.
- Furthermore, the six point classification system (normal, grade 1-4 FH and atypical FH) achieved a 93.54% validation accuracy.



- Our study has, for the first time, demonstrated a successful outcome for classification of retinal developmental disorders using AI.
- These results provide proof-of-concept for the use of AI in paediatric ophthalmology.
- The introduction of this system will help to eliminate inter-examiner variability with interpretation of scans and increase time efficiency on busy clinics.
- This work has provided a strong foundation for prospective testing using our AI algorithm, thus bringing us closer to implementation of a real-time intelligent diagnostic system for paediatric OCT.

