

Learning to Predict Autism Spectrum Disorder Based on the Visual Patterns of Eye-Tracking Scanpaths

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<https://mahmoud-elbattah.github.io/ML4Autism/>

Background: Autism Spectrum Disorder

- Autism Spectrum Disorder (ASD) is a pervasive developmental disorder characterised by a set of impairments including social communication problems. ¹
- ASD has been considered to affect about 1% of the world's population (US Dep. of Health, 2018). ²
- The hallmark of autism is an impairment of the ability to make and maintain eye contact. ³

¹ L. Wing, and J. Gould, "Severe Impairments of Social Interaction and Associated Abnormalities in Children: Epidemiology and Classification". *Journal of Autism and Developmental Disorders*, 9(1), pp.11-29, 1979.

² U.S. Department of Health & Human Services. Data and statistics | autism spectrum disorder (asd) | ncbddd | cdc, 2018.
URL: <https://www.cdc.gov/ncbddd/autism/data.html>.

³ Coonrod, E. E. and Stone, W. L. (2004). Early concerns of parents of children with autistic and nonautistic disorders. *Infants & Young Children*, 17(3), 258–268.

Background: Eye-Tracking Technology

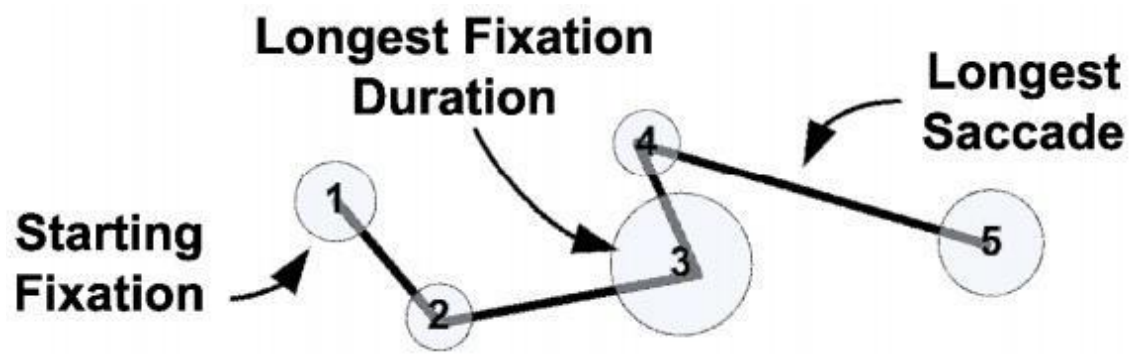
Screen-based eye trackers



Glasses

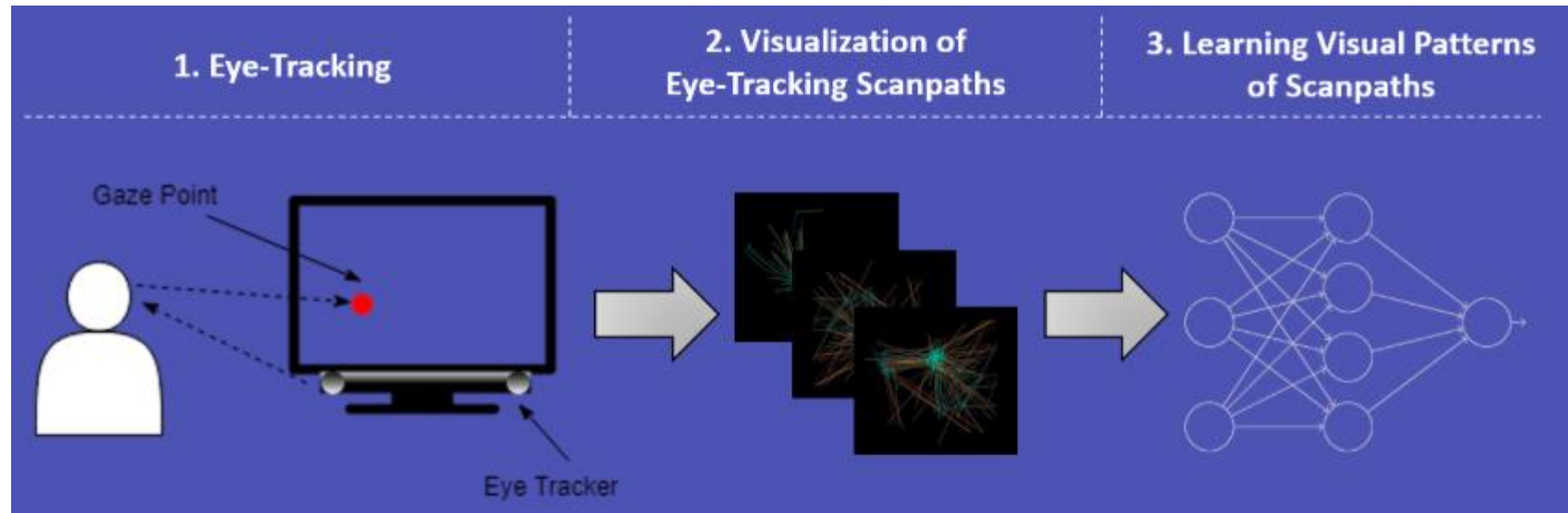


Gaze Scan-path →



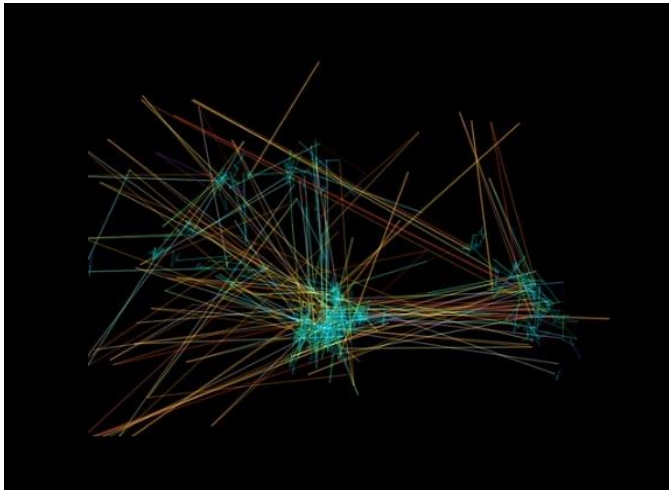
Key Idea:

Learning the Visual Patterns of Eye-Tracking Scanpaths

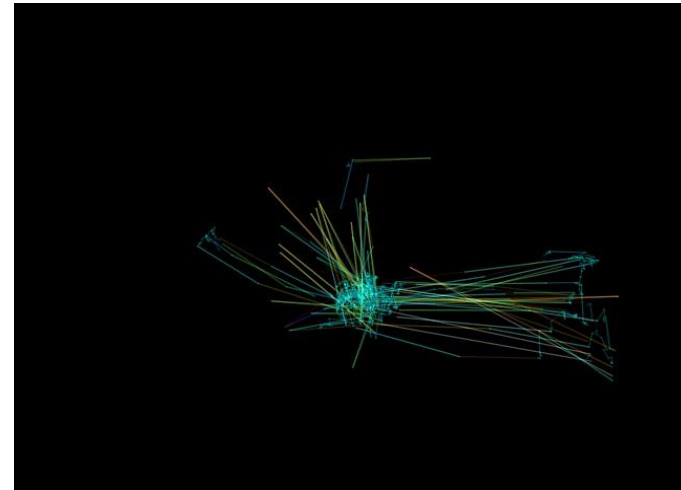


Data Description

- 59 participants.
- Avg age ≈ 7.88 years old.
- 547 images: 328 (Non-ASD), 219 (ASD)
- Image dimensions: 640x480
- Dataset available on [Figshare](#)



ASD

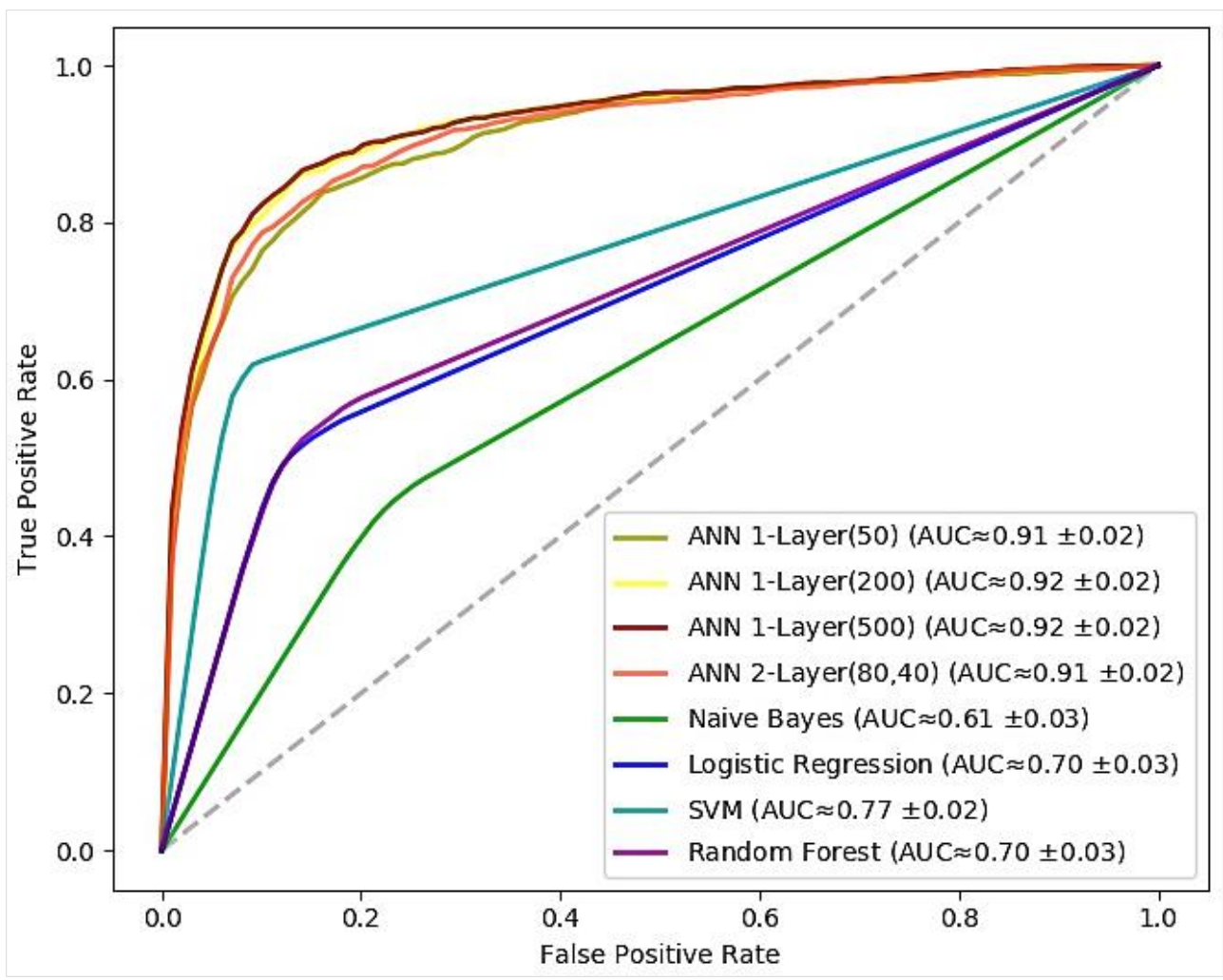


Non-ASD

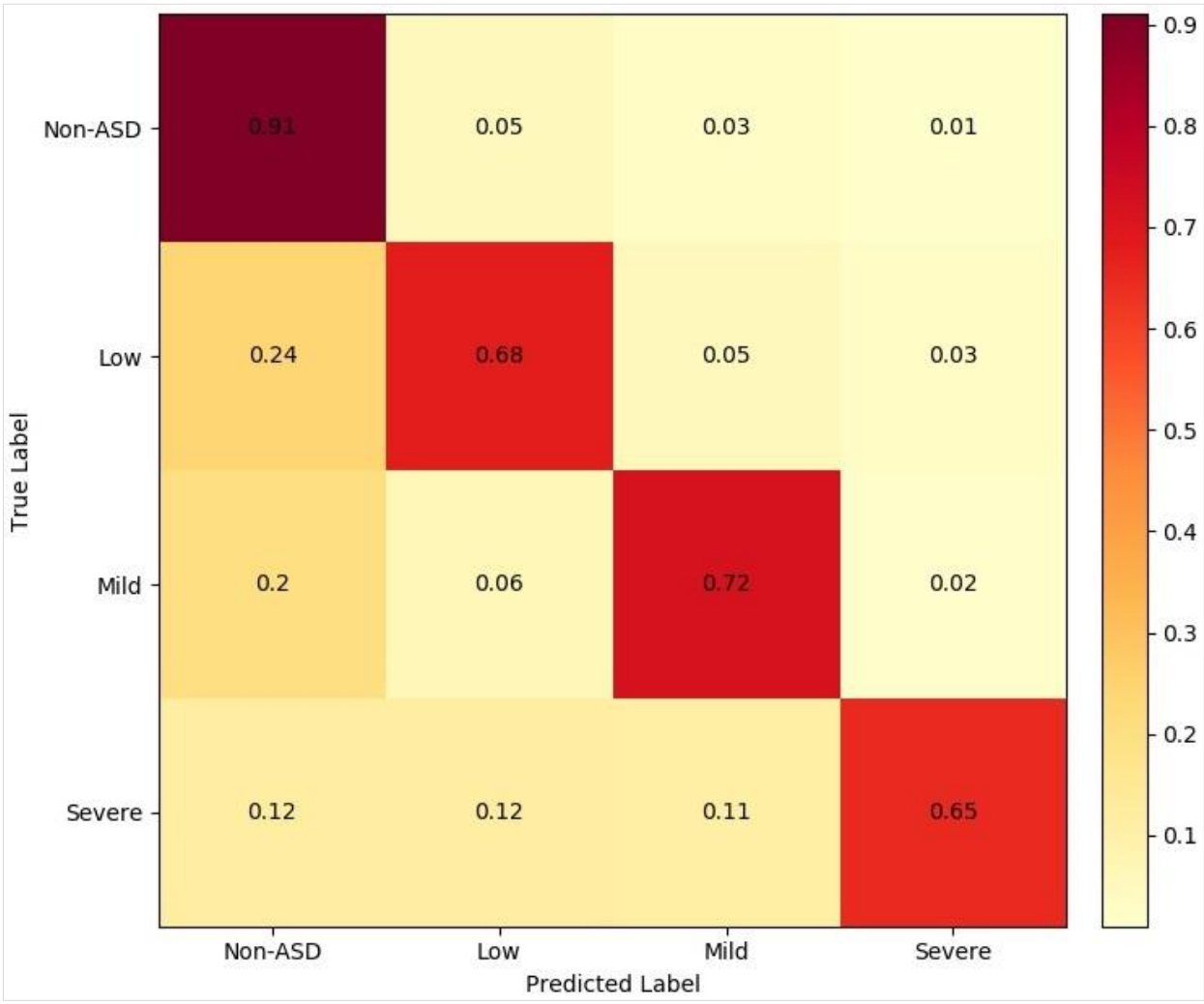
Image Augmentation

- Augmentation was applied to produce variations of images based on a random set of transformations (e.g. rotation, shearing).
- The augmented dataset contained more than 3K samples.
- Implemented using Keras.

Results: Binary Classifier Accuracy (10-fold Cross-Validation)

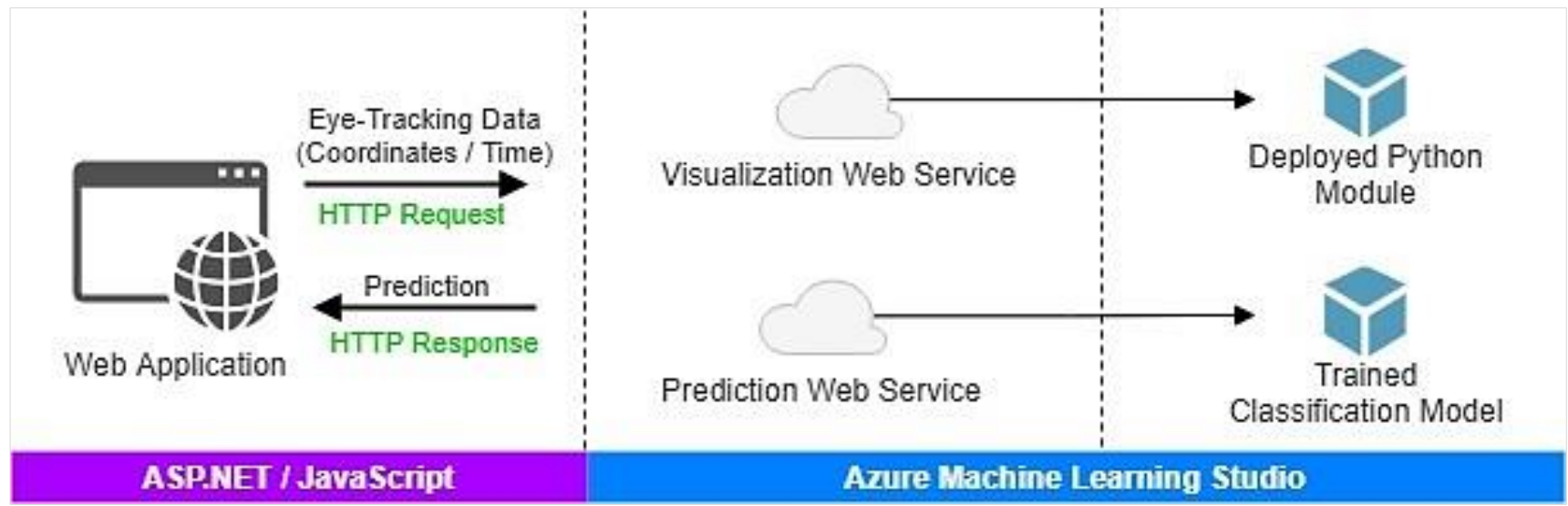


Results: Multi-Label Classifier Accuracy (10-fold Cross-Validation)



Demo Application:

<https://goo.gl/i4N7Zj>



THANK YOU!

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Find the original publication on:

- https://www.researchgate.net/publication/331784416_Learning_to_Predict_Autism_Spectrum_Disorder_based_on_the_Visual_Patterns_of_Eye-tracking_Scanpaths
- <http://www.insticc.org/Primoris/Resources/PaperPdf.ashx?idPaper=74026>

Dataset available on Figshare:

- https://figshare.com/articles/Visualization_of_Eye-Tracking_Scanpaths_in_Autism_Spectrum_Disorder_Image_Dataset/7073087

Project Website:

- <https://mahmoud-elbattah.github.io/ML4Autism/>
- <https://www.researchgate.net/project/Predicting-Autism-Spectrum-Disorder-Using-Machine-Learning-and-Eye-Tracking>