

# Convolutional Neural Network Binary Image Classifier via Mobile Devices: EZ Autism Screener

Catherine M. Ata  
atacatherine@cityuniversity.edu

Sam Chung  
chungsam@cityu.edu

Brian Maeng (corresponding author)  
maengjooyol@cityu.edu

School of Technology & Computing  
City University of Seattle

## Abstract

Autism is a neurological and developmental disability caused by changes in the brain's development that also affects the facial tissues. Thus, children with autism show distinct facial features that are not present in average children. Studies reveal increasing prevalence of autism; however, acquiring affordable, trouble-free, and practical early screening tools is a current concern. This impacted early detection and diagnosis of autism which also influenced effective intervention. How can we employ innovative technology, like computer vision and deep learning to build an inexpensive and universally accessible autism screener to prevent late detection and diagnosis of autism? How can we enhance public access to this initial screening tool and minimize the difficulties involved in the assessment process? We built a basic Convolutional Neural Network (CNN) binary image classifier with seven (7) layers including the input and output layers. This initial model produced positive outcomes with a specificity score of 90.38%; the specificity score is the most important evaluation metric for health-related problems like screening for autism. This model is optimized by performing hyperparameter tuning using a cloud machine learning platform, Amazon SageMaker. The tuning job on this platform produced a superior and robust model as reflected in the F1 score of 94.74%. Tuning the best model using the cloud platform took less than 6 and a half minutes. The model's specificity indicates it correctly identified 100% of those without autism as non-autistic; the recall indicates it correctly identified 90% of those with autism as autistic while its precision indicates a 100% probability that those identified by the model as autistic have autism. We integrated this best-tuned model into a simple iOS application for mobile devices.

**Keywords:** autism screener, autism detection, autism screening, autism facial recognition, AWS SageMaker image classifier, CNN image classifier

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