Avinia Ersafitri Anwar, 2019. **Glaucoma Identification on Fundus Retinal Images Using Generalized Additive Model (GAM) Approach Based On Penalized Spline Estimator.** This final project is guided by Dr. Nur Chamidah, M.Si. and Drs. Suliyanto, M.Si, S1 Study Program of Statistics, Department of Mathematics, Faculty of Science and Technology, Airlangga University, Surabaya

ABSTRACT

Glaucoma is an eye disease characterized by progressive deterioration of the optic nerve head and a broad view that can cause blindness. The Population-Based Survey in 2010 indicates that glaucoma was the second leading cause of blindness after cataracts, which was about 8% of 36 million sufferers of blindness worldwide. Symptoms of glaucoma that arise usually cannot be felt directly. So it is necessary to do an eye examination to find out glaucoma, one of which is to look at the size of the optic disk in the digital fundus photo. The previous studies about glaucoma identification were done by Tobias using mathematical computation approach named K-Nearest Neighbor method that has accuracy 50%. The purpose of this research is to identify glaucoma using statistical modeling approach. The steps which have to be done are image processing using MATLAB software, dimension reduction with Discrete Wavelet Transform (DWT) and Principal Component Analysis (PCA) method, and identify definition by using nonparametric approach based on penalized spline estimator. The data used in this research are 30 fundus retinal images obtained from internet High-Resolution Fundus (HRF) Image Database that consisting of 15 normal images and 15 glaucoma images. The response variable used are categorical data on glaucoma ($Y=0$) and normal retina ($Y=1$), while the predictor variables used are the reduced dimension data by DWT and PCA method as many as 4 predictors. Based on 24 in sample and 6 out sample data images, we obtain the accuracy value is 90%. Based on the value of the accuracy, it can be concluded that the resulting model by using nonparametric logistic regression is good and can be used to identify glaucoma on fundus retinal images.

Keywords: Glaucoma, Image Processing, Discrete Wavelet Transform, Principal Component Analysis, *Penalized Spline*