**Title:** A Comparative Study of Machine Learning Algorithms for Complex Image Classification under Microscope with Limited Data

**Authors:** Supawit Marayat, Archirawit Prasom

**School:** Princess Chulabhorn Science High School Chiang Rai, THAILAND

**Supervisor:** Acting Sub Lt. Satit Thamkhanta

Mrs. Manatchanok Tamwong

**Abstract**

The Purpose of this study was 1.) Compares machine learning Algorithms in Image Classification Task 2.) Study way to using Data augmentation to Improve data for training with 4 following steps, 1.) Data preparation in this step extracting data from BCCD dataset 2.) Data augmentation using Geometric and Color space transformations technique for increase data set size and unbalance problem, 3.) Training with data set image that converted to vectorize and labeled image 4.) Hyperparameter tunning with specific parameter for each Model 5.) Evaluate form prediction value form every algorithm, Metric and scoring with those value.

The dataset consisted of 352 images with unbalance problem, subsequently after data augmentation, the dataset was expanded to 10,028 images with result of 9957% of images increase. The best performance algorithms were eXtreme gradient boosting with 3 parameters, AUC of 0.93 and F-measure of 77%. Second place with light gradient-boosting machine with 8 parameters, AUC of 0.91 and F-measure of 74% and Gradient boosting with 3 parameters, AUC of 0.91 and F-measure of 74% and the third place is Cat Boost with AUC of 0.91 and F-measure of 66%.

**Keywords**: Machine learning, Data augmentation, Hyperparameter tunning, Image Classification