ABSTRACT

In West Java, Indonesia, where rice consumption is a primary source of nutrition for the population, the Balai Pengawasan dan Sertifikasi Benih Tanaman Pangan dan Hortikultura (BPSBTPH) plays a crucial role in ensuring the quality and distribution of rice seeds (Oryza sativa) through certification. The certification process involves determining whether the rice seeds exhibit normal, abnormal, fresh, or dead germination. Currently, this evaluation is performed manually by seed researchers, which can be time-consuming and labor-intensive.

To enhance the efficiency of seed germination evaluation and simplify seed selection, we propose a computer system utilizing a multi-label Classification using Deep Neural Network architecture. Our proposed system aims to empower BPSBTPH with automated agricultural tasks using advanced image classification techniques. We created a dataset of rice seed germination data captured on days 3, 5, 7, and 14, and classified the seeds into four distinct categories: normal germination, abnormal germination, fresh germination, and dead germination.

This research evaluates our proposed architecture STR-Net, where SINTANUR Rice Seeds. The SINTANUR refers to rice variety and Neural Network represents the model's architecture. These studies yield optimal results, which are achieved through three simulations conducted on two distinct datasets. The first dataset, as seed growth, impressive accuracy rates of 96.00% on day 5, 94.00% on day 7, and 91.00% on day 14, utilizing fixed hyperparameters. The second dataset, the Quality dataset, achieves a notable accuracy of 92.59% through a comprehensive analysis involving four distinct scenarios. Furthermore, in the analysis with Different Layer of STR-Net, the highest accuracy is obtained using a seven-layer convolutional approach, resulting in an accuracy of 93.83%. The final simulation utilizes data balancing techniques and achieves an effectiveness accuracy of 99% on day 5, 97% on day 7, and 98% on day 14. When using the quality dataset, the STR-Net architecture attains an accuracy of 97.38%.

Keywords: Rice Seed Germination, Deep Neural Network, Multi-Label Classification, STR-Net