INTISARI

Pengelompokan mutu beras secara SNI diperlukan untuk memastikan kelayakan dan menstandarkan mutu beras di Indonesia. Pengelompokan beras secara otomatis dibutuhkan agar hasil pengelompokan akurat, objektif, cepat, dan murah, di samping merupakan pekerjaan yang repetitif. Sistem pengelompokan beras tersebut harus dapat mengelompokkan varietas beras yang beragam di Indonesia yang secara umum dibagi menjadi *short grain*, *medium grain*, dan *long grain*. Pengelompokan tersebut juga harus *robust* terhadap variasi varietas dan banyaknya butir beras dalam satu citra.

Penelitian dilakukan dengan pembuatan dataset *short grain* dan *long grain* yang mana masing-masing diwakilkan dengan beras menthik wangi dan beras basmati. Sementara itu, dataset beras *medium grain* (beras C4) yang sesuai SNI digunakan dataset yang telah ada di situs *online*. Selanjutnya, dataset tersebut dilatih dengan algoritma deteksi objek YOLOv5-x, YOLOv7-x, dan YOLOv8-x kemudian dianalisis dan dibandingkan performanya. Setelah itu, dilakukan penambahan dataset yang kompleks untuk mengetes model apakah model dapat mengelompokkan citra yang kompleks. Selanjutnya, dilakukan pengetesan *robustness* model dengan pemvariasian pencahayaan dan jumlah objek.

Pada penelitian ini, dihasilkan bahwa performa YOLOv7-x paling unggul dibandingkan performa YOLOv5-x dan YOLOv8x dengan model pada *short grain*-nya mencapai $mAP_{0.5}$ 99,39%, $mAP_{0.5:0.95}$ 88,61%, *average training loss* 0,0121, *average validation loss* 0,06808, *inference time* 0,239 detik, dan *training time* 55,56 menit. Penelitian ini juga telah meningkatkan performa *medium grain* dengan YOLOv4 yang sebelumnya dilakukan oleh Karlwillem [5]. Dataset yang sederhana dan berjumlah 120 citra menghasilkan performa paling baik. Model ini juga *robust* dengan variasi jumlah butir beras mulai 30 (0,63 gr) sampai 238 butir beras (5 gr) pada setiap gambar.

Kata kunci : kualitas/mutu beras SNI, YOLOv7 dan YOLOv8, varietas beras, deteksi objek, pembelajaran mesin

ABSTRACT

The classification of rice quality based on Indonesian National Standard (SNI) is necessary to ensure its suitability and standardize the quality of rice in Indonesia. Automated rice classification is needed to achieve accurate, objective, fast, and cost-effective results, as the task is repetitive. The rice classification system should be able to categorize diverse rice varieties found in Indonesia, generally divided into short grain, medium grain, and long grain. It also needs to be robust in handling variations in the number of rice grains within a single image.

The research conducted involved creating datasets for short grain and long grain, represented by fragrant menthik rice and basmati rice, respectively. Meanwhile, the dataset for medium grain (C4 rice) conforming to SNI was obtained from an online source. These datasets were then trained using the YOLOv5-x, YOLOv7-x, and YOLOv8-x object detection algorithms, and their performance was analyzed and compared. Additional complex datasets were also used to test whether the models could handle more intricate rice images. Furthermore, the robustness of the models was tested by varying lighting conditions and the number of objects.

The study found that YOLOv7-x outperformed YOLOv5-x and YOLOv8-x, with its short grain model achieving $mAP_{0.5}$ *99,39%,* $mAP_{0.5:0.95}$ *88,61%, average training loss 0.0121, average validation loss 0.06808, inference time 0.239 seconds, and training time 55.56 minutes. The research also improved the performance of medium grain classification using YOLOv4, a task previously undertaken by Karlwillem [1]. The best performance was achieved with a simple dataset consisting of 120 images. The model also demonstrated robustness in handling variations in the number of rice grains, ranging from 30 grains (0.63 g) to 238 grains (5 g) in each image.*

Keywords *: rice quality SNI, YOLOv7 and YOLOv8, rice varieties, object detection, machine learning*