

ABSTRAK

IMPLEMENTASI *BACKEND* RESTFUL API MENGGUNAKAN EXPRESS.JS UNTUK INTEGRASI MODEL CNN PADA SISTEM MULTI-PLATFORM KLASIFIKASI SPESIES LEBAH MADU (INDO MALAYAN)

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Pengembangan sistem klasifikasi citra berbasis kecerdasan buatan memerlukan sistem *backend* yang handal dan mampu mengelola komunikasi antar layanan, pengolahan data, serta penyediaan API secara stabil. Penelitian ini bertujuan untuk merancang dan mengimplementasikan sistem *backend* berbasis Express.js yang terintegrasi dengan model CNN dalam bentuk RESTful API guna mendukung layanan klasifikasi citra lebah madu. Metode yang digunakan adalah *Rapid Application Development* (RAD) yang terealisasi dengan dua iterasi selama rentang empat bulan hingga ke tahap *cutover*. Sistem dikembangkan dengan menggunakan Express.js dengan integrasi Cloud Firestore, Firebase Storage, dan Google Cloud Platform sebagai lingkungan *deployment*. *Backend* yang dibangun menghasilkan 26 *endpoint* untuk mendukung autentikasi, manajemen informasi dan profil, dan klasifikasi citra. Hasil pengujian menunjukkan bahwa seluruh *endpoint* memperoleh validitas 100% pada 93 skenario pengujian fungsional. Pada pengujian performa, sistem mampu menangani hingga 44.400 *request* dengan *throughput* 75,07 *request*/detik dan rata-rata *response time* sebesar 89-165 ms ($P90 < 300$ ms) tanpa *error*. Hasil tersebut menunjukkan bahwa sistem *backend* yang dikembangkan memiliki performa yang responsif, stabil, dan mampu menangani variasi beban (*fixed load*, *ramp-up load*, *peak load*, dan *spike load*) melalui mekanisme *auto-scaling*. Dengan demikian, sistem *backend* yang dikembangkan dinyatakan layak digunakan sebagai layanan klasifikasi citra berbasis kecerdasan buatan yang dapat diakses melalui sistem *web* dan *mobile*.

Kata kunci: *Backend*, Express.js, RESTful API, GCP, Klasifikasi Citra

ABSTRACT

THE IMPLEMENTATION OF THE RESTFUL API BACKEND USES EXPRESS.JS FOR THE INTEGRATION OF THE CNN MODEL ON THE MULTI-PLATFORM SYSTEM OF CLASSIFICATION OF HONEY BEE SPECIES (INDO MALAYAN)

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The development of an artificial intelligence based image classification system requires a reliable backend system that is able to manage communication between services, data processing, and API provision stably. This study aims to design and implement a Express.js-based backend system that is integrated with the CNN model in the form of a RESTful API to support honey bee image classification services. The method used is Rapid Application Development (RAD) which is realized in two iterations over a period of four months until the cutover stage. The system was developed using Express.js with the integration of Cloud Firestore, Firebase Storage, and Google Cloud Platform as a deployment environment. The built backend generates 26 endpoints to support authentication, information and profile management, and image classification. The test results show that the entire endpoint obtained 100% validity on 93 functional test scenarios. In performance testing, the system was able to handle up to 44,400 requests with a throughput of 75.07 requests/second and an average response time of 89-165 ms ($P_{90} < 300$ ms) without errors. These results show that the developed backend system has responsive, stable performance, and is able to handle load variations (fixed load, ramp-up load, peak load, and spike load) through an auto-scaling mechanism. Thus, the developed backend system is declared feasible to be used as an artificial intelligence-based image classification service that can be accessed through web and mobile systems.

Keyword: Backend, Express.js, RESTful API, GCP, Image Classification