A Deep Learning Food Recognition System for Nutritional Assessment and Disease Risk Management in American Samoa

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This research aims to address the high prevalence of obesity and diabetes in American Samoa by developing a deep learning–based food recognition system tailored to local dietary habits. The purpose of this study is to create an AI model capable of recognizing both global and Samoan traditional foods to provide nutritional assessments, disease-risk warnings, and lifestyle recommendations. The hypothesis proposed that training on a combined dataset of global and Samoan foods would improve recognition accuracy and enhance public health awareness through accessible AI tools. The methodology involved five stages: dataset construction, preprocessing, model training, evaluation, and mobile deployment. Using the Food-101 global dataset and an additional Samoan food dataset of 19 local dishes, the EfficientNet-B2 architecture was trained with transfer learning and data augmentation. The model achieved a Top-1 accuracy of 84.1% and a Top-5 accuracy of 95.1%, validating the hypothesis that inclusion of local foods improves recognition accuracy. The resulting mobile application operates offline, providing calorie, macronutrient, and disease-risk feedback, including health alerts for high-fat or high-sugar foods such as turkey tail and panikeke. Results demonstrated that AI can effectively support nutritional awareness in underserved regions. However, misclassifications among visually similar foods highlight the need for expanded datasets and multimodal recognition. Future work will focus on community-driven data collection, integration of user health profiles, and multilingual accessibility. This research demonstrates that culturally adaptive AI systems can empower healthier lifestyles and contribute to combating obesity-related diseases in American Samoa.

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