

Introduction

Artificial Intelligence (AI)

Artificial Intelligence refers to the field of computer science aimed at creating machines capable of mimicking human intelligence. These machines can perform tasks such as reasoning, learning, perception, and decision-making. AI technologies are currently used in a variety of domains ranging from finance and autonomous vehicles to healthcare and smart assistants. In healthcare, AI enables automation of diagnostics and analysis of complex medical images. AI can continuously learn from data, improving its performance over time. The significance of AI in this project is its ability to interpret dermoscopic images and predict skin conditions with near-human accuracy. AI serves as the brain behind our classification engine, ensuring precision and consistency in diagnosis.

Machine Learning (ML)

Machine Learning is a subset of AI that involves teaching machines to learn from data rather than programming them with explicit rules. ML algorithms improve performance as they are exposed to more data, making them highly adaptable. In supervised learning, models learn from labeled datasets to perform classification or regression tasks. In the case of skin cancer detection, we utilize supervised learning to classify lesion images into specific categories based on previously annotated data. ML empowers our system to not only identify patterns but also generalize them to unseen data. Techniques like feature extraction, data augmentation, and hyperparameter tuning are key to improving ML performance.

Deep Learning (DL)

Deep Learning is a specialized branch of ML that utilizes deep neural networks composed of multiple layers. These layers allow the system to learn abstract features from raw data. DL has revolutionized image processing, enabling tasks like object detection, segmentation, and medical imaging classification. Convolutional Neural Networks (CNNs), a type of DL model, are especially well-suited for analyzing visual imagery. In our system, DL plays a critical role by providing models that can learn intricate patterns from dermoscopic images. The layered architecture helps isolate visual features such as shape, color, and texture, contributing to accurate classification.

Convolutional Neural Networks (CNNs)

CNNs are a class of deep learning algorithms specifically designed to work with visual data. They are composed of convolutional layers that apply filters to input images to capture features such as edges, curves, and textures. Pooling layers follow to reduce the spatial dimensions, making the model computationally efficient. The final fully connected layers perform classification based on the extracted features. CNNs excel in skin cancer classification as they can identify and weigh subtle patterns unique to different skin lesions. They are widely used in healthcare for analyzing X-rays, MRIs, and dermoscopic images, making them ideal for our project.