Skin Lesion Classification using PesiNet

People Behind the Project

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Introduction to Skin Lesion Classification

Skin lesion classification plays a crucial role in medical diagnosis, particularly in the early detection of diseases like melanoma.

Accurate classification of skin lesions can aid in identifying potential risks and guiding appropriate treatment plans.

However, skin lesion classification comes with its own set of challenges.

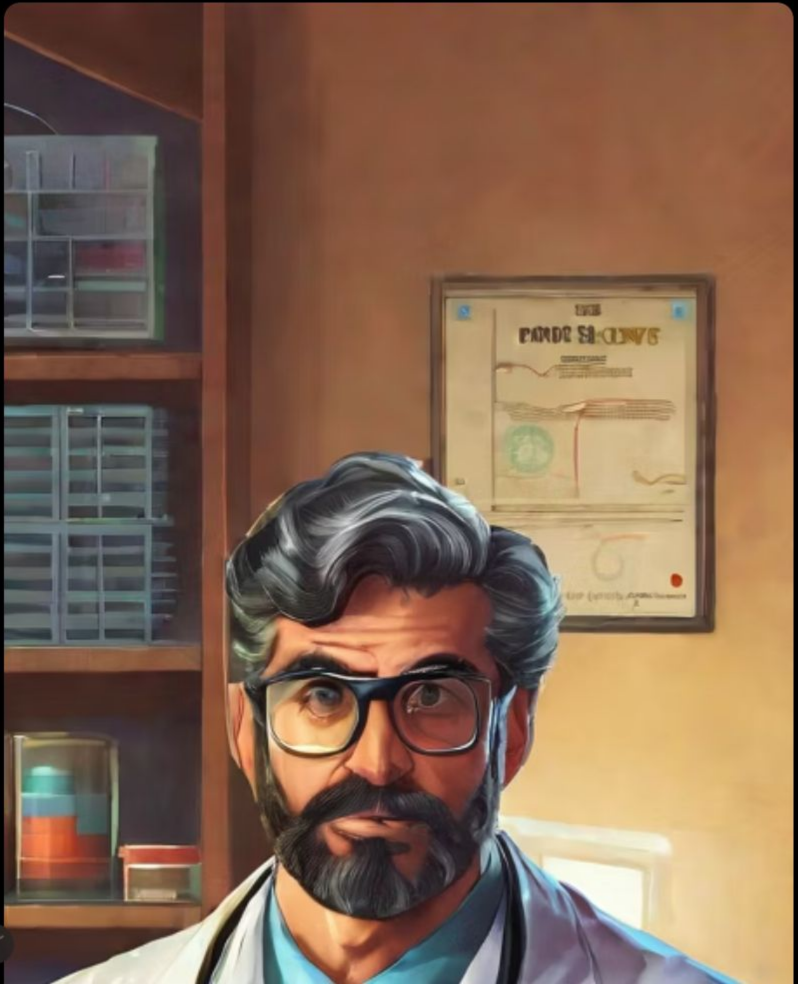
These challenges include the variation in lesion appearance, the complexity of differentiating between benign and malignant lesions, and the need for extensive training and expertise to achieve accurate classification.

Challenges in Skin Lesion Classification

Skin lesion classification is a complex task that involves identifying and categorizing different types of skin lesions. However, there are several challenges that researchers and practitioners face in this field.

Variations in Lesion Appearance

One of the main challenges in skin lesion classification is the wide range of variations in lesion appearance. Skin lesions can have different shapes, colors, and textures, making it difficult to accurately classify them. For example, melanoma, a type of skin cancer, can appear in various forms such as asymmetrical moles, irregular borders, and multiple colors. These variations require robust classification algorithms that can handle the complexity of lesion appearance.



Limited Availability of Labeled Data

Another challenge in skin lesion classification is the limited availability of labeled data. Collecting and annotating a large dataset of skin lesion images with

Overview of PesiNet

PesiNet is a deep learning model specifically designed for skin lesion classification. It addresses the challenges in skin lesion classification by leveraging advanced neural network architecture and state-of-the-art techniques.

Architecture

PesiNet utilizes a convolutional neural network (CNN) architecture with multiple layers. It consists of several convolutional layers followed by pooling layers to extract relevant features from the input images. The extracted features are then passed through fully connected layers to classify the skin lesions.

Advantages

PesiNet offers several advantages in skin lesion classification. Firstly, it achieves high accuracy in classifying different types of skin lesions, enabling accurate diagnosis. Secondly, it can handle a large variety of skin lesion images, making it versatile and applicable in various clinical settings. Lastly, PesiNet has a relatively fast inference time, allowing for efficient processing of skin lesion images.

Addressing Challenges

PesiNet addresses the challenges in skin lesion classification by leveraging advanced techniques. It incorporates data augmentation methods to increase the diversity and size of the training dataset, improving the model's ability to generalize to unseen skin lesion images. Additionally, PesiNet uses transfer learning, where pre-trained models are fine-tuned on skin lesion datasets, allowing for efficient and effective training with limited labeled data.

Data Collection and Preprocessing

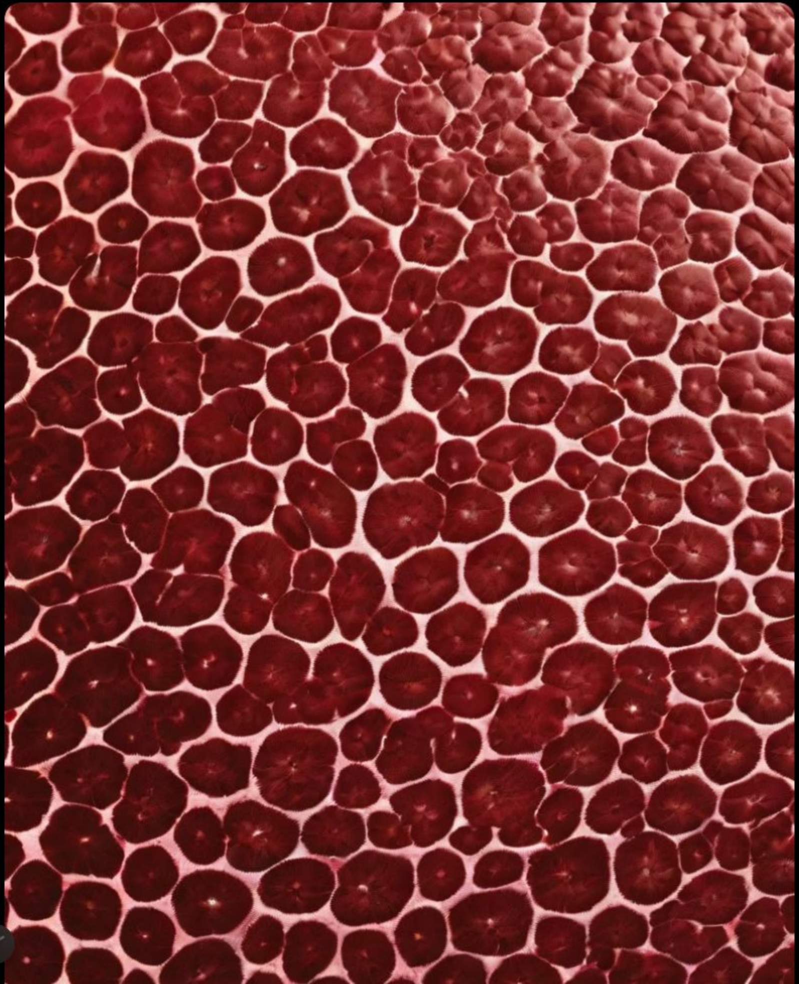
The process of data collection and preprocessing is crucial for training the PesiNet model for skin lesion classification. In this section, we will discuss the sources of the dataset, the data augmentation techniques used, and the challenges encountered during data preprocessing.

Dataset Sources

We have used both the ISIC and the HAM10000 dataset for this model. The segmentation is trained on the ISIC 2018 Dataset.

Challenges in Data Preprocessing

During the data preprocessing stage, several challenges were encountered. One of the main challenges was the presence of noise and artifacts in the skin lesion images. Many of the drawn masks were poor in quality, which made the overall performance of segmentation and hence the overall model worse.



Model Architecture

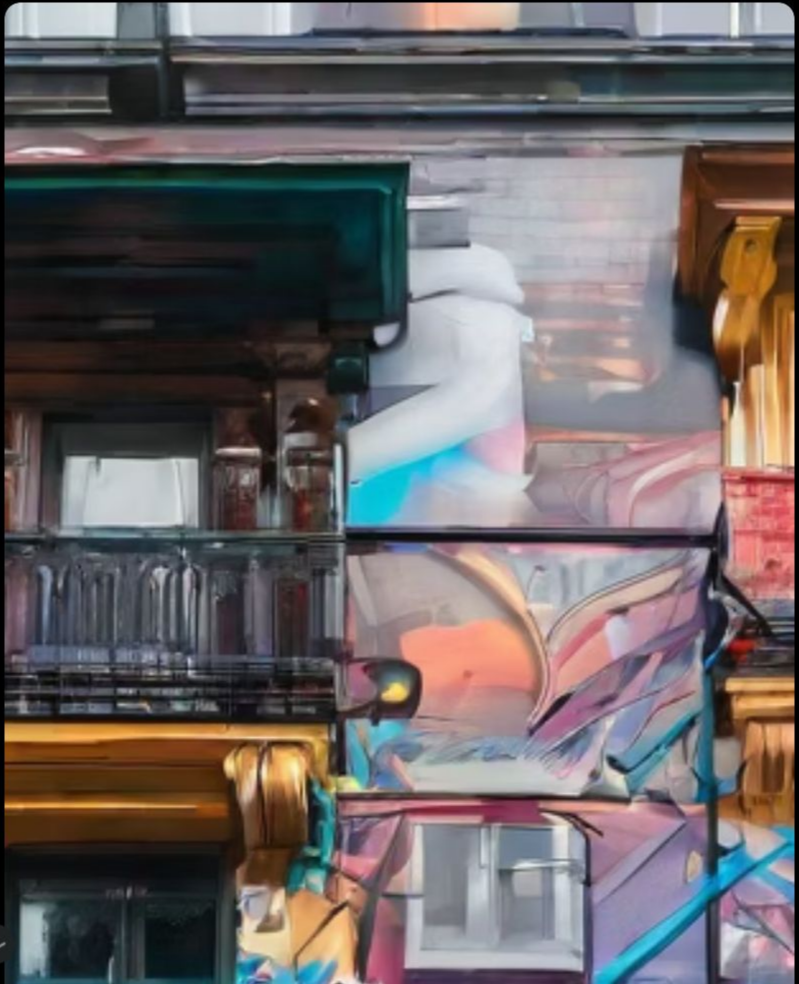
PesiNet is a deep learning architecture designed for accurate skin lesion classification. It consists of several layers and components that work together to achieve high performance.

Layers

PesiNet includes multiple layers, including convolutional layers, pooling layers, and fully connected layers. The convolutional layers are responsible for extracting features from the input images, while the pooling layers downsample the feature maps to reduce dimensionality. The fully connected layers perform the final classification based on the extracted features.

Activation Functions

PesiNet uses the ReLU (Rectified Linear Unit) activation function in the convolutional and fully connected layers. ReLU is known for its ability to introduce non-linearity into the network, allowing it to learn complex patterns and improve the model's performance.



Training and Evaluation

The training process of PesiNet involved several steps to ensure accurate classification of skin lesions.

Optimization Algorithm

PesiNet utilized the Adam optimization algorithm to train the model. Adam combines the benefits of two other optimization algorithms, AdaGrad and RMSProp, to provide efficient and adaptive learning rates.

Hyperparameter Tuning

To optimize the performance of PesiNet, hyperparameters such as learning rate, batch size, and number of layers were tuned. This involved experimenting with different values and selecting the combination that yielded the best results.

Performance Evaluation Metrics

The performance of PesiNet was evaluated using several metrics, including accuracy, precision, recall, and F1 score. These metrics provided insights into the model's ability to correctly classify different types of skin lesions.

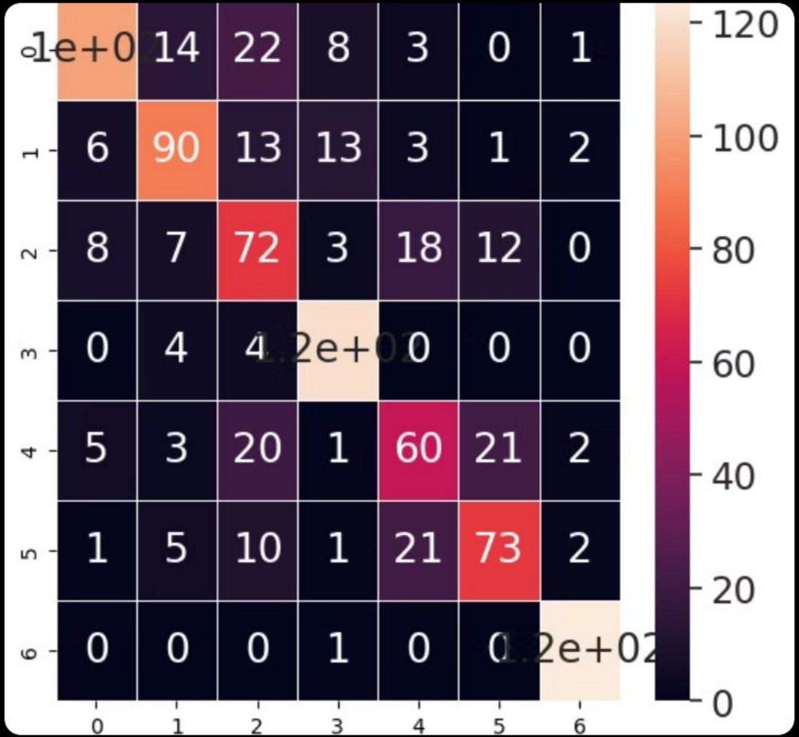
Training and Validation

The model was trained and validated using a large dataset of labeled skin lesion images. The dataset was split into training and validation sets, with a portion of the data reserved for validation purposes. The model was trained on the training set and evaluated on the validation set to ensure accurate classification.

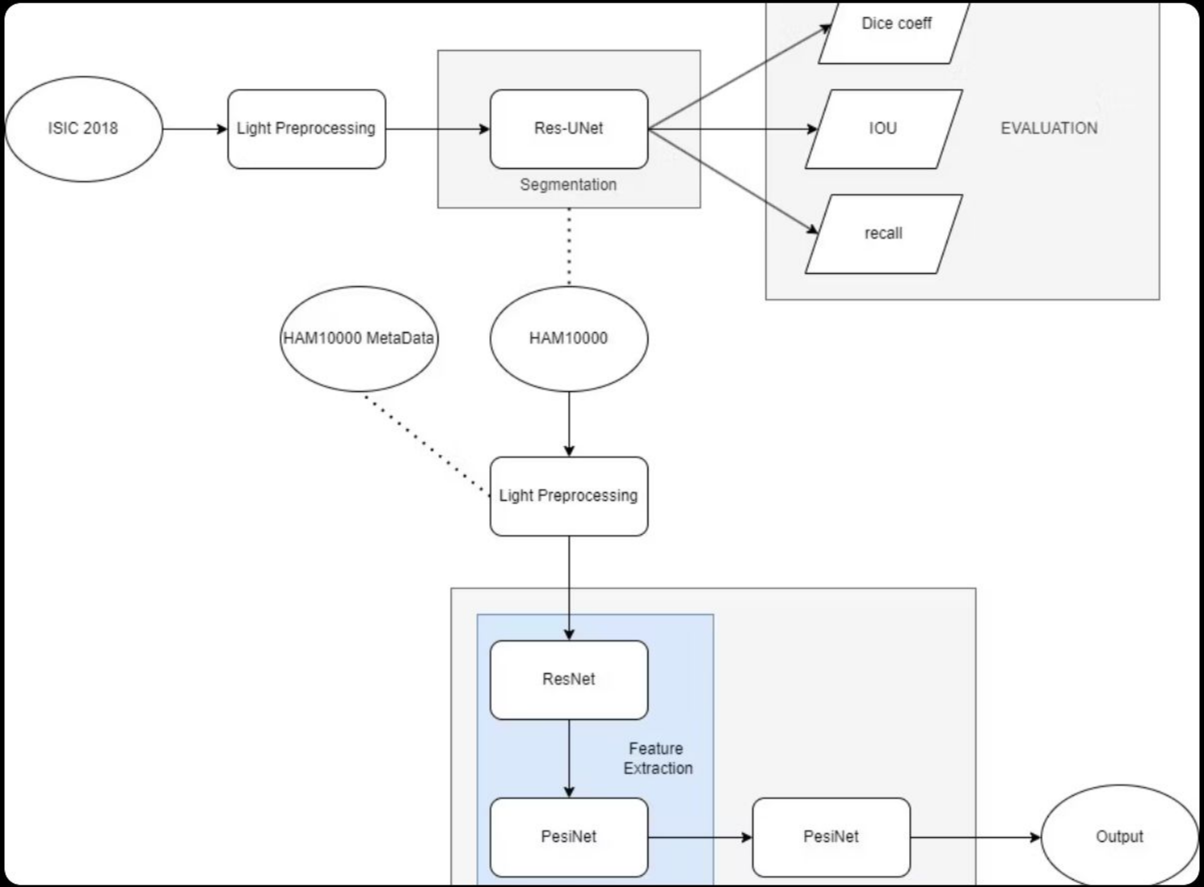
Results and Performance Metrics

Performance Metrics

The skin lesion classification using PesiNet achieved impressive performance metrics.



Flow Chart



ISIC 2018
Light Preprocessing
Res-UNet
Segmentation
Dice coeff
IOU
recall
EVALUATION
HAM10000 MetaData
HAM10000
Light Preprocessing
ResNet
Feature Extraction
PesiNet
PesiNet
Output


Thank you