

# Melanoma Detection Using CNNs

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- Skin cancer is the most common form of cancer, with melanoma being the deadliest type.
- Early and accurate detection of melanoma is crucial for successful treatment.
- Convolutional Neural Networks (CNNs) have shown remarkable performance in image classification tasks.
- We propose a CNN-based approach for melanoma detection using dermoscopic images.
- Our model leverages transfer learning from pre-trained CNNs to improve accuracy and efficiency.

# Problem Statement

- Melanoma is the deadliest form of skin cancer, responsible for the majority of skin cancer deaths.
- Early detection is key to improving survival rates for melanoma patients.
- We aim to build a CNN model capable of accurately detecting melanoma.
- This model will automate image evaluation, aiding dermatologists and reducing manual effort.



## Dataset Overview

- Dataset: HAM10000 (ISIC)
- Images: 2,357 (malignant and benign)
- Skin Cancer Types: 9 classes (e.g., Melanoma, Nevus)
- Image Size: Resized to 180x180 pixels
- Split: Training and validation sets



# CNN Architecture

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- Input Layer: Rescales images to (180, 180, 3)
- Convolutional Layers: Extract spatial features
- MaxPooling Layers: Downsample feature maps
- Fully Connected Layer: Flattened output for classification
- Output Layer: Softmax function for 9-class classification

# CNN Model Performance

- Data Augmentation: Random flips, rotations, and crops to increase diversity.
- Regularization: L1/L2 regularization and dropout to prevent overfitting.
- Optimizer: Adam optimizer for efficient gradient descent.
- Performance Metrics: Accuracy, sensitivity, specificity, and AUC-ROC curve.



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# IT Solutions for Melanoma Detection

- High accuracy in classifying melanoma images, outperforming traditional methods.
  - Efficient and automated image evaluation, aiding dermatologists in diagnosis.
  - Potential for early detection, leading to improved patient outcomes and survival rates.
  - Scalable solution for widespread use in clinical settings.
  - Further research can explore model interpretability and generalization to other skin lesions.
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# Model Performance

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- Training accuracy steadily increased while validation accuracy plateaued.
- Training loss decreased consistently but validation loss increased.
- These trends indicate overfitting, where the model performs well on training data but poorly on unseen data.
- Class imbalance and small dataset size likely contributed to overfitting.

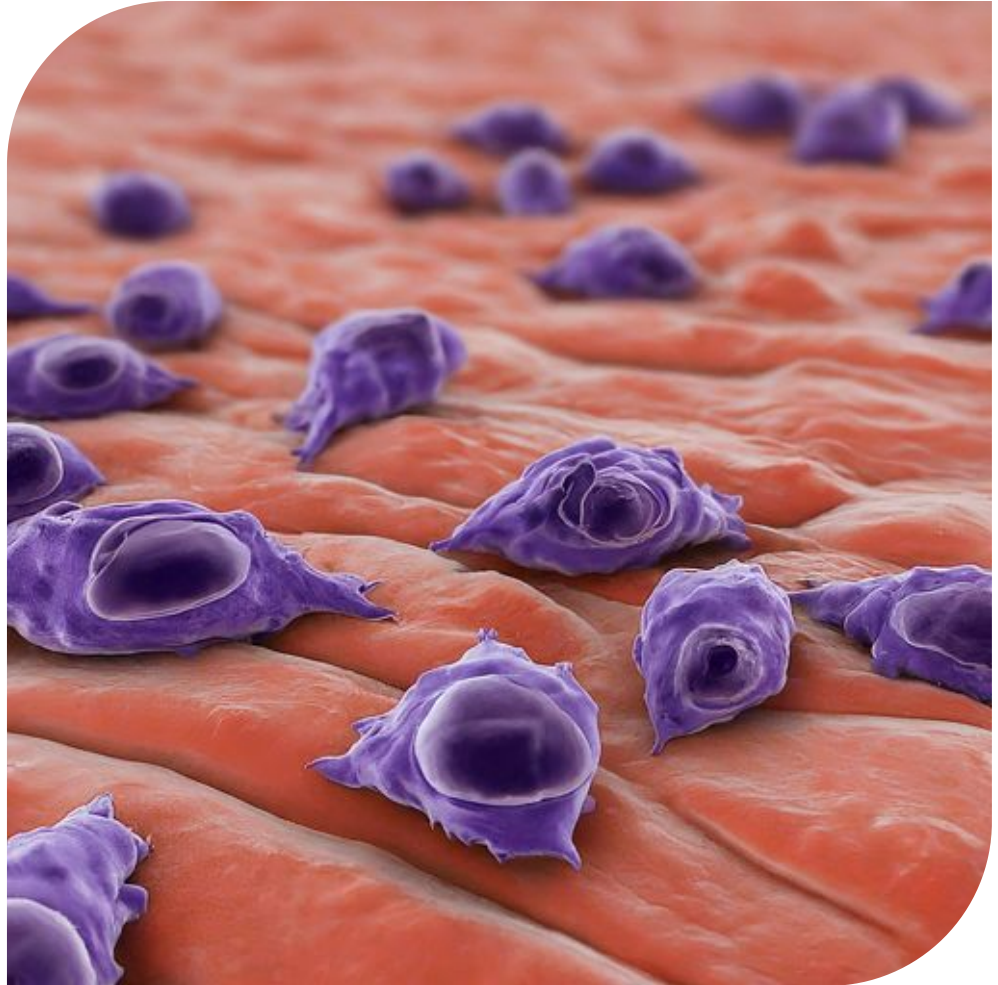
# Addressing Overfitting

- Overfitting due to small dataset and class imbalance.
- Applied Augmentor library to balance class distribution.
- Added dropout layers to regularize model.
- Reduced model complexity to prevent overfitting.



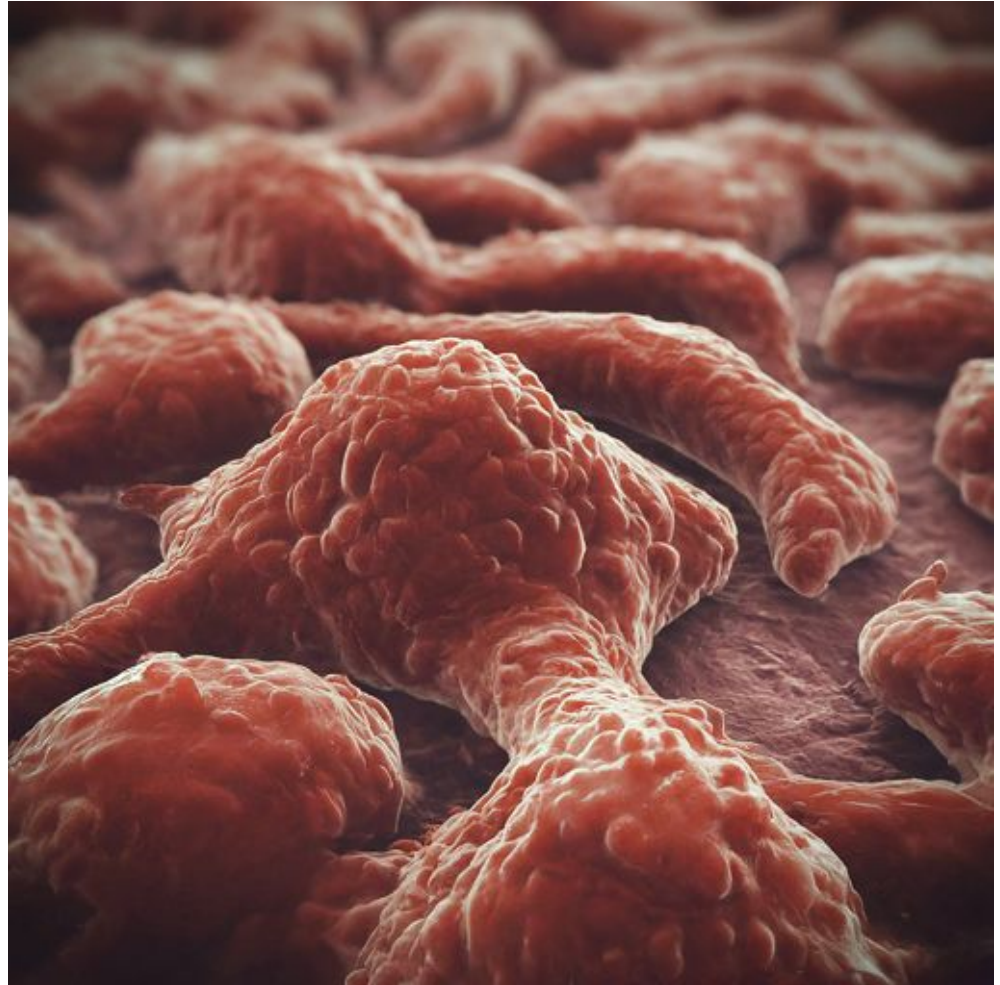
# Class Imbalance Handling

- Class Distribution: Imbalanced classes (e.g., Melanoma had fewer images).
- Solution: Used Augmentor to increase the sample size for underrepresented classes.
- Result: Achieved a more balanced dataset, improving model's ability to learn from all classes.



# Final Model Results

- Improved validation accuracy after applying data augmentation and regularization.
- Model generalized better on unseen validation data.
- Further improvements possible with transfer learning and advanced augmentation techniques.




# Conclusion

- CNNs are effective for melanoma detection.
- Overfitting is a challenge due to small datasets and class imbalance.
- Data augmentation and regularization are crucial to combat overfitting.
- Future work: explore deeper architectures or transfer learning for further improvement.

# Final Model

1.3326 - learning\_rate: 0.0010

Epoch 25/30

**113/113**  **96s** 853ms/step - accuracy: 0.7627 - loss: 0.6418 - val\_accuracy: 0.6511 - val\_loss: 1.0409 - learning\_rate: 0.0010


Epoch 26/30

**113/113**  **91s** 804ms/step - accuracy: 0.7724 - loss: 0.6154 - val\_accuracy: 0.7444 - val\_loss: 0.6899 - learning\_rate: 0.0010

Epoch 27/30

**113/113**  **90s** 798ms/step - accuracy: 0.7853 - loss: 0.5582 - val\_accuracy: 0.6500 - val\_loss: 1.0227 - learning\_rate: 0.0010

Epoch 28/30

**113/113**  **90s** 800ms/step - accuracy: 0.8039 - loss: 0.5163 - val\_accuracy: 0.6722 - val\_loss: 1.0243 - learning\_rate: 0.0010

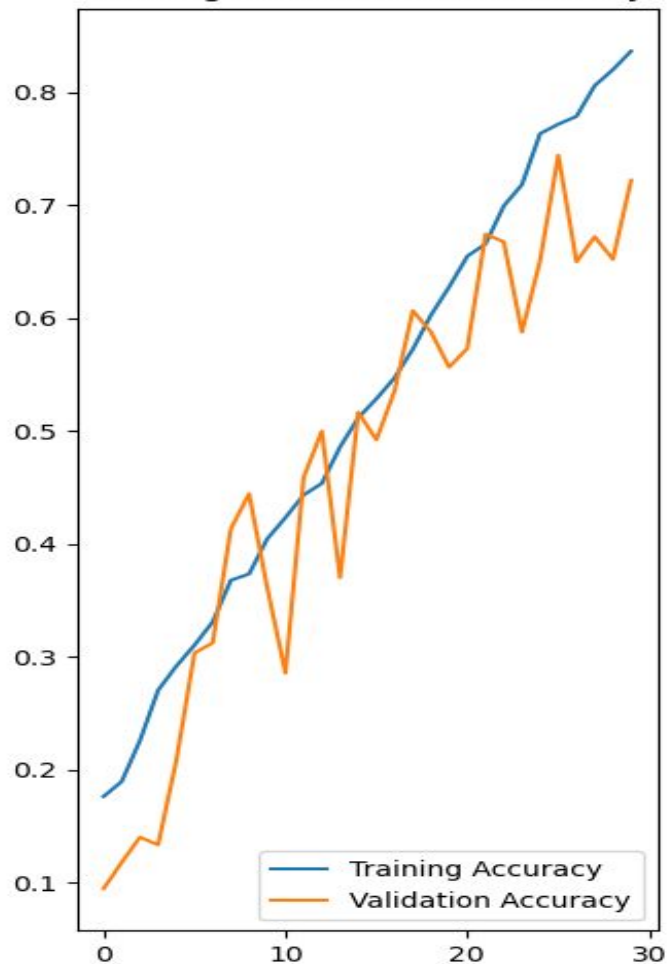
Epoch 29/30

**113/113**  **91s** 810ms/step - accuracy: 0.8138 - loss: 0.4774 - val\_accuracy: 0.6522 - val\_loss: 1.1420 - learning\_rate: 0.0010

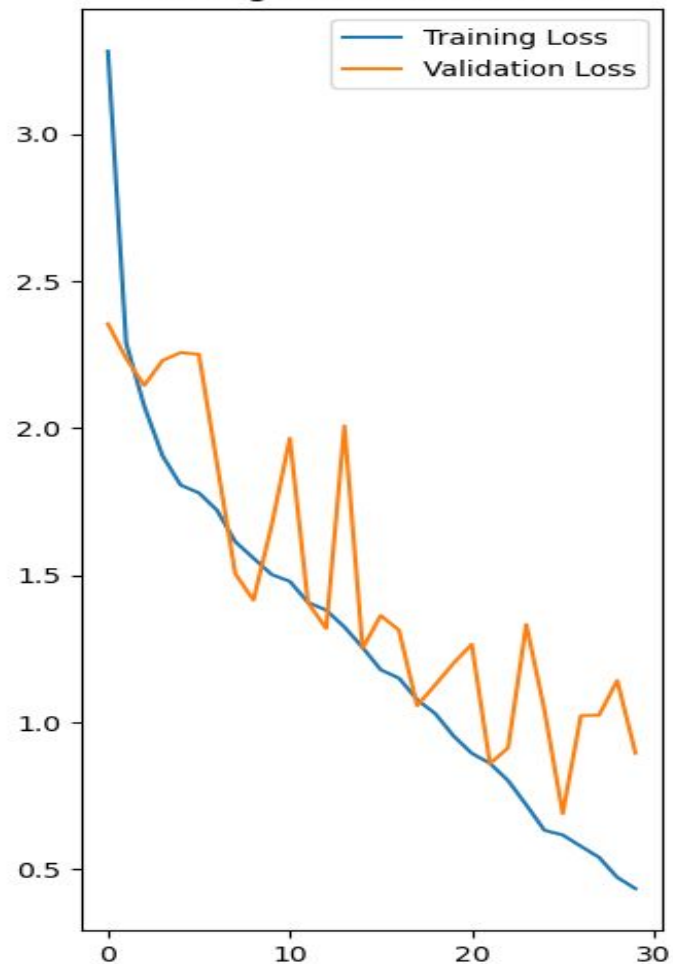
Epoch 30/30

**113/113**  **91s** 801ms/step - accuracy: 0.8384 - loss: 0.4286 - val\_accuracy: 0.7222 - val\_loss: 0.8954 - learning\_rate: 0.0010

Training and Validation Accuracy



Training and Validation Loss



data/Test/melanoma/\*

1/1  0s 24ms/step

Actual Class: melanoma

Predictive Class: melanoma

