Multi-Modal Approach for Melanoma Detection

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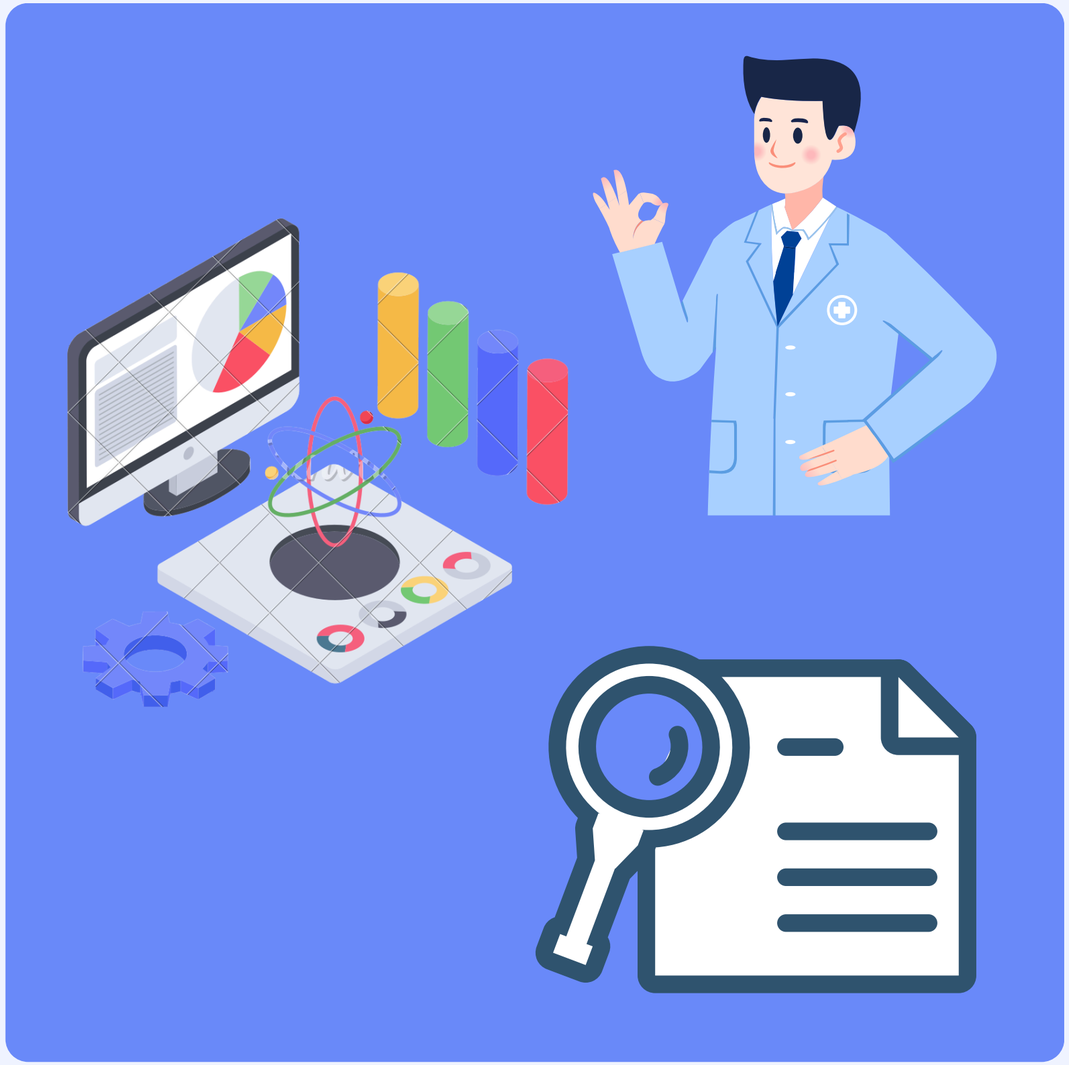

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Problem & Objective

Problem

Melanoma, a **deadly form of skin cancer**, accounts for 75% of skin cancer-related deaths. **Early detection** is vital for effective treatment.

Objective

To develop an advanced, **multi-modal approach** for early melanoma detection, surpassing the effectiveness of single-modality models.

Goal

Demonstrate the advantage in using multi-modal models to make accurate predictions by **considering additional, relevant** data.

Data & Preprocessing

Source

The dataset comes from the SIIM-ISIC Melanoma Classification Challenge on Kaggle.

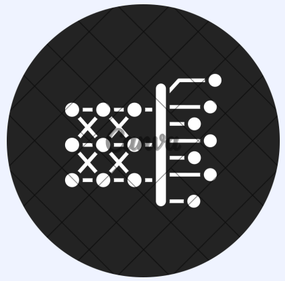
Data

Dermoscopic images with melanoma presence labels, alongside key patient metadata (age, gender, lesion location).

Preprocessing

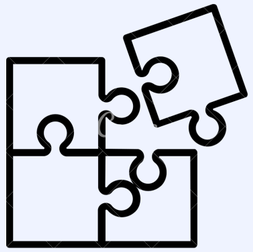
Image normalization and augmentation to increase model generalization, normalization of tabular data and one-hot encoding of categorical data.

Methodology



Transfer Learning

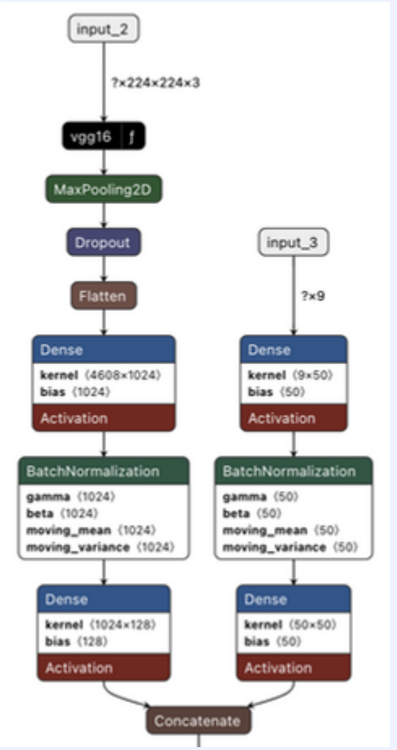
- utilized **pre-trained** VGG-16 model
- froze first two sets of convolutional layers, allowed rest of the layers to **retrain on our specific dataset**

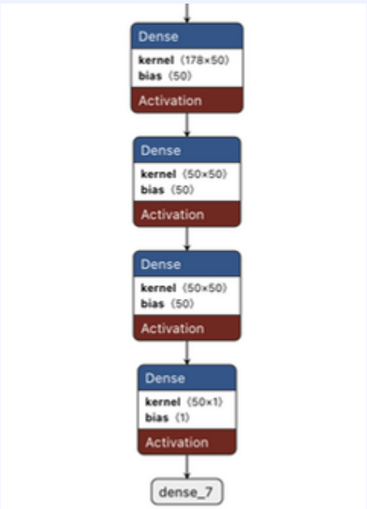


Multi-Input Data

- image data processes through VGG-16 layers
- tabular data processed through simple dense layers, then concatenated with VGG-16 output

Model Architecture





Results

MODEL	AUC	COMPUTATIONAL TIME
Baseline (CNN only)	0.79	1 hr per epoch
Multi-Modal Approach	**0.84** 	1 hr per epoch

Next Steps

Incorporate more granular patient level data

Using additional data such as previous medical history, doctor's notes, daily habits etc. , will we be able to build a more complex model to learn more?

Fine Tune class weights for better precision

Test different class weights ratio in training process to refine precision score of model - is the model learning biased from current weights selection?

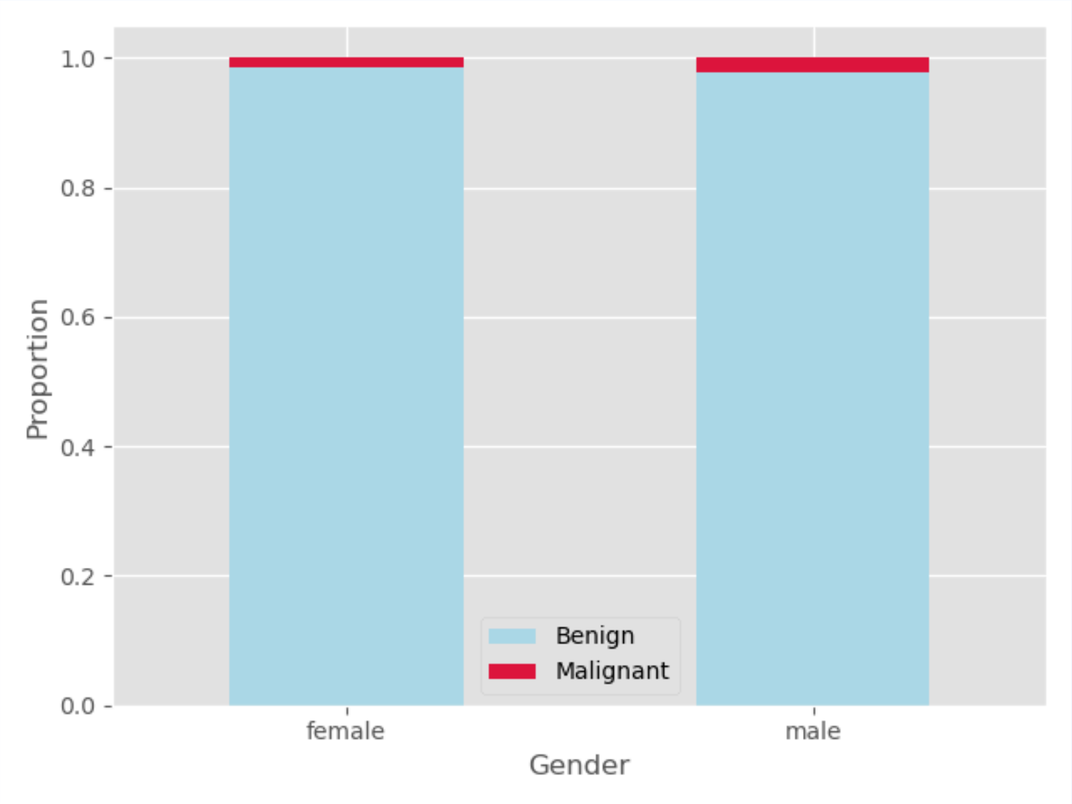
Adjust threshold according to most important objective

Picking a threshold due to hospital needs - are we okay with more false positives if it means we can accurately predicting all patients with Melanoma?

Thank you!

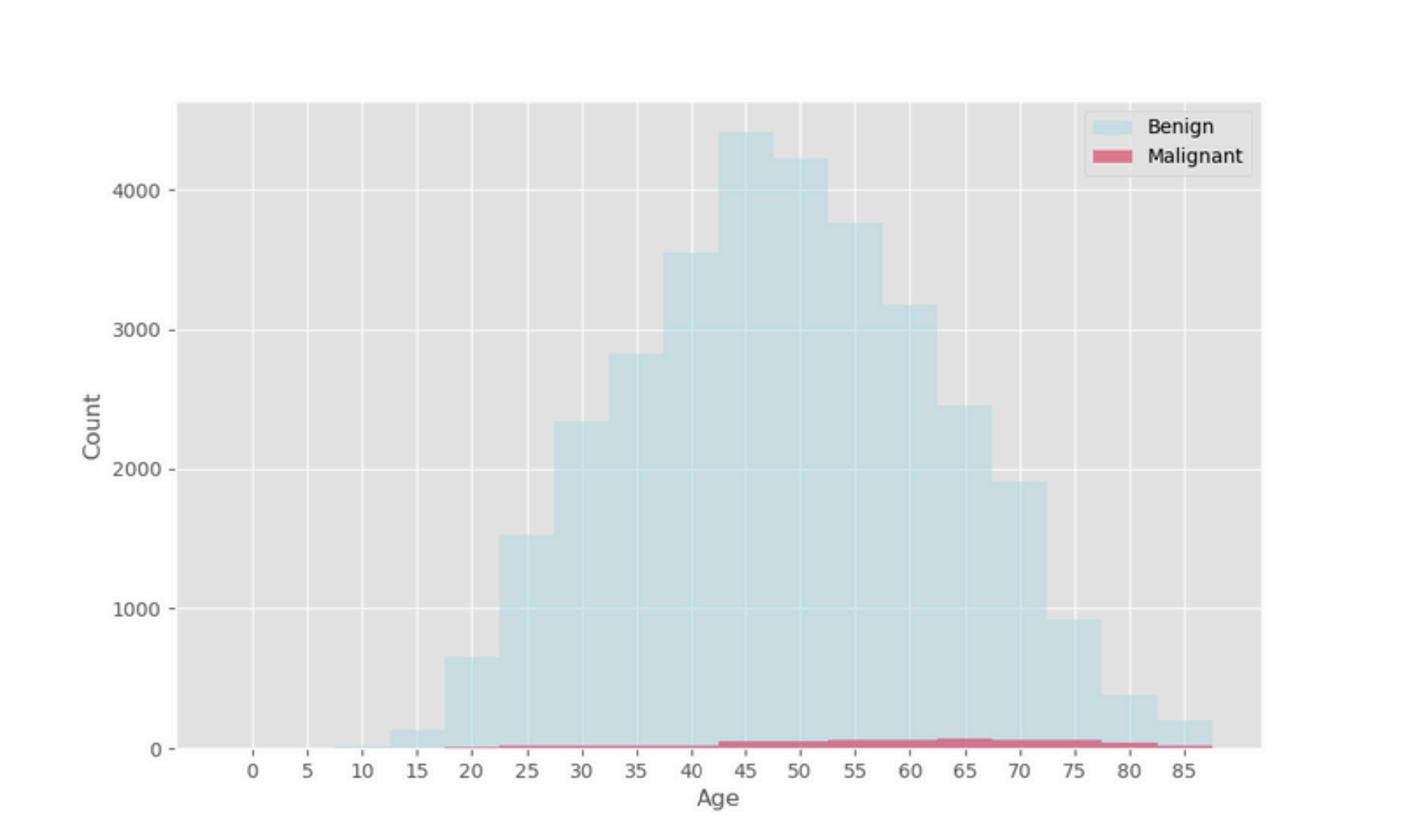
Appendix A

The proportion of melanoma cases for different genders



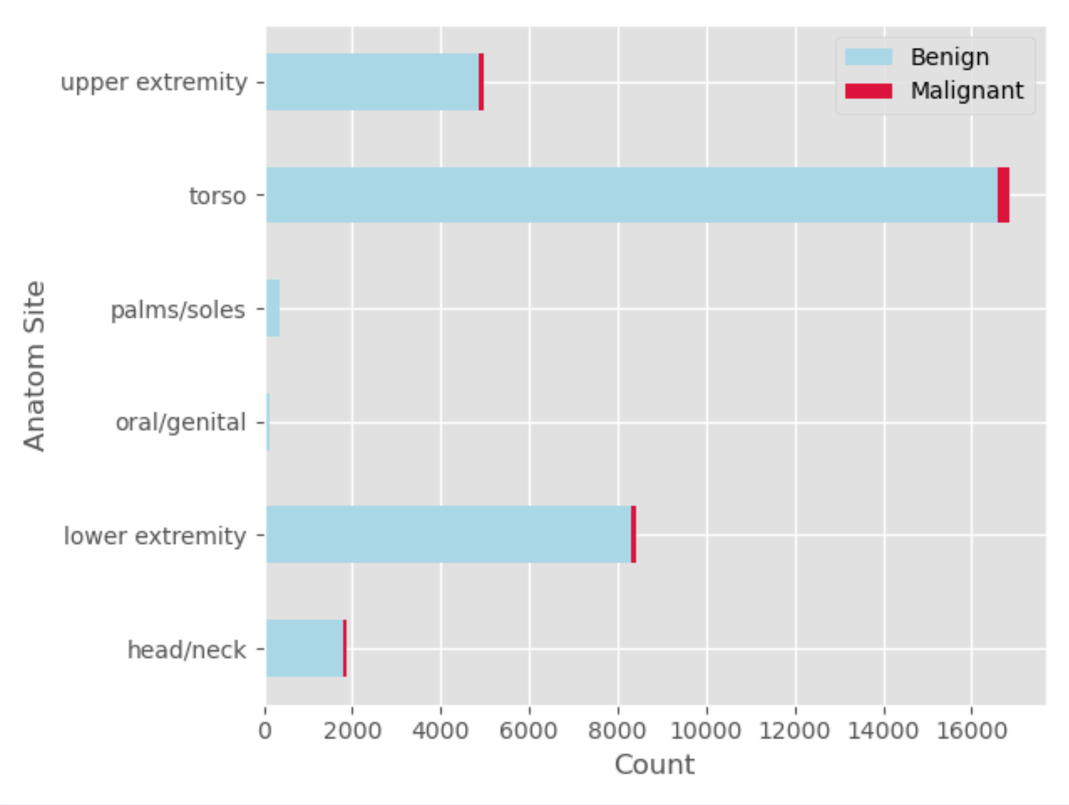
Appendix B

The distribution of melanoma cases for different ages



Appendix C

The distribution of melanoma cases for different body parts



Model Architecture