Skin Cancer Detection with 3D-TBP

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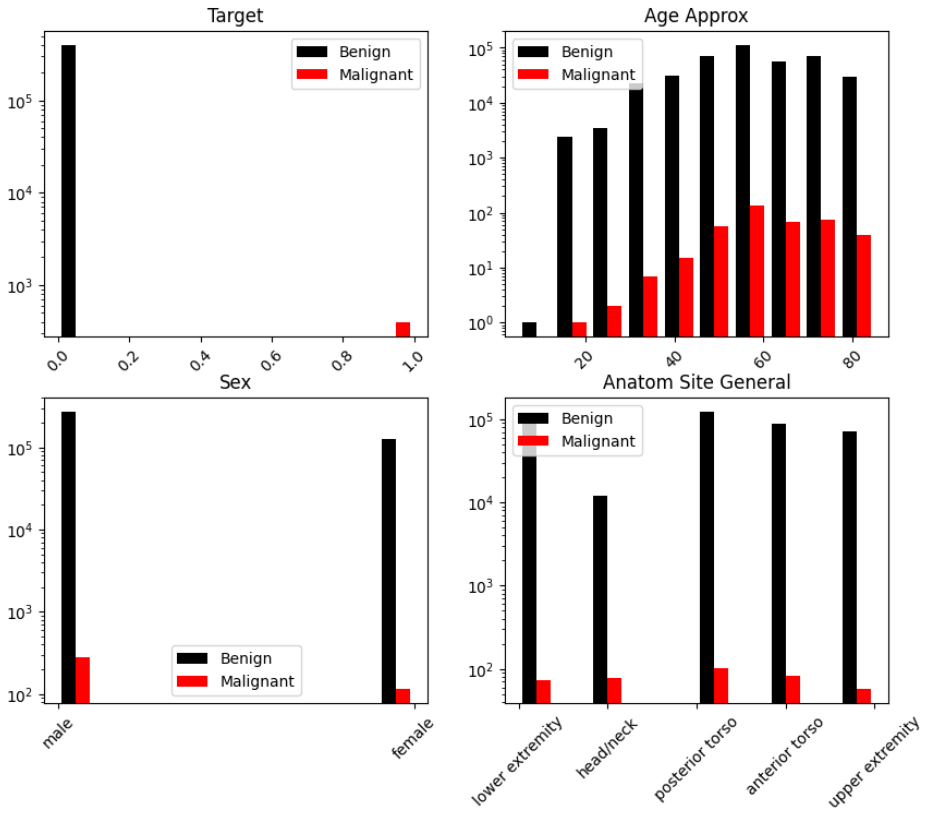
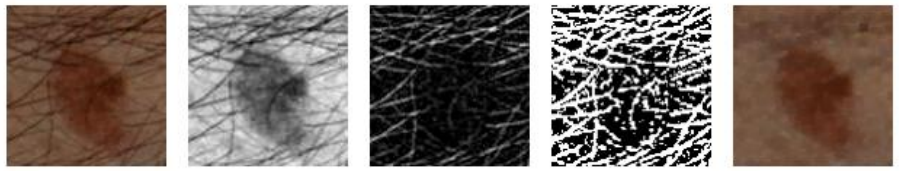
About the challenge

- Stored in ZIP (Dropbox)
- Images + metadata (hdf5 format + csv)
- Classification task + computer vision
  - Benign vs. Malignant
  - Unbalanced dataset

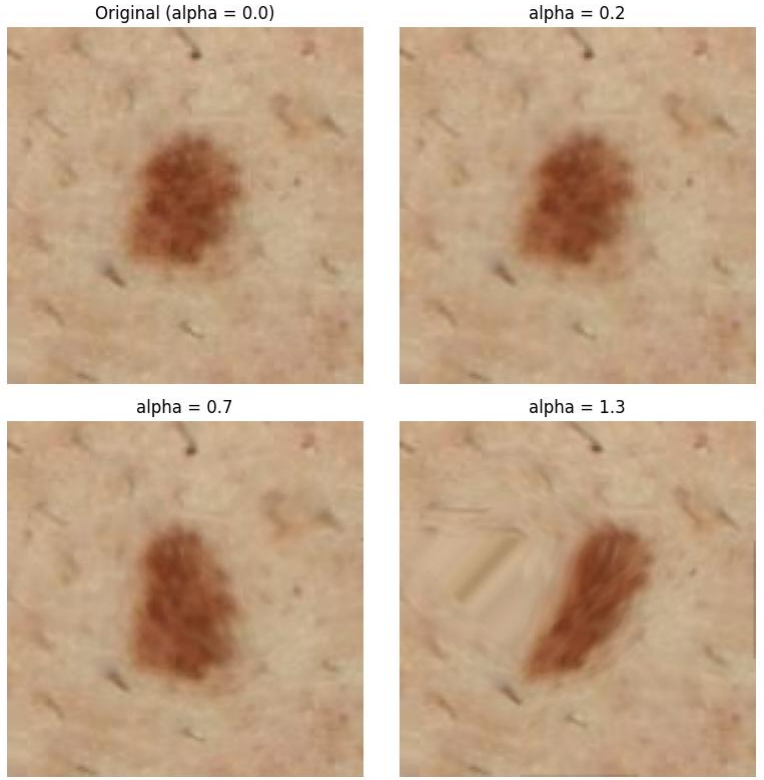


Preprocessing the dataset

- PytorchLightningDatamodule for dataloading
- Data augmentation with transforms
- Resampling and balancing dataset
  - 75-75 positive and negative samples in test
  - 75-75 positive and negative samples in validation
  - resampled and balanced samples in train



Squeeze algorithm (Shinde R. *etal.*)

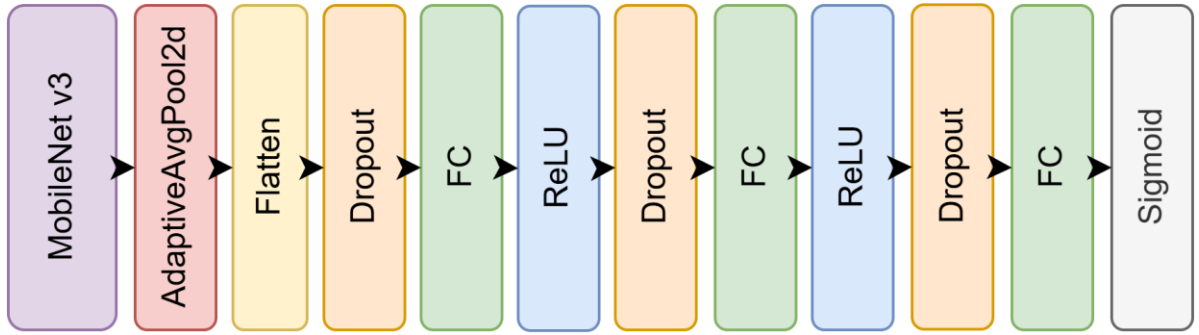


Free-form deformation

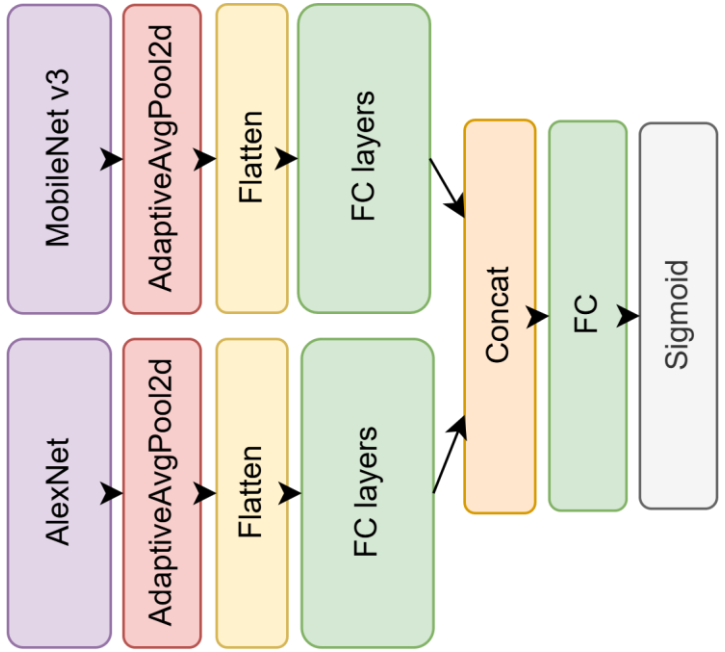
Related works

- **Review about solutions** (Naqvi, M., *etal.* (2023). Skin Cancer Detection Using Deep Learning-A Review.)
  - AlexNet, MobileNet, ResNet, etc.
- **Hair removing (**Shinde, R. K., etal. (2023). Squeeze-MNet: Precise Skin Cancer Detection Model for Low Computing IoT Devices Using Transfer Learning.)
  - Squeeze algorithm + MobileNet
- **Data preprocessing** (Thomas W. Sederberg and Scott R. Parry. 1986. Free-form deformation of solid geometric models)
- **Balancing dataset** (Yun-Chun Wang, Ching-Hsue Cheng, A multiple combined method for rebalancing medical data with class imbalances, Computers in Biology and Medicine)
- etc.

Architecture I.

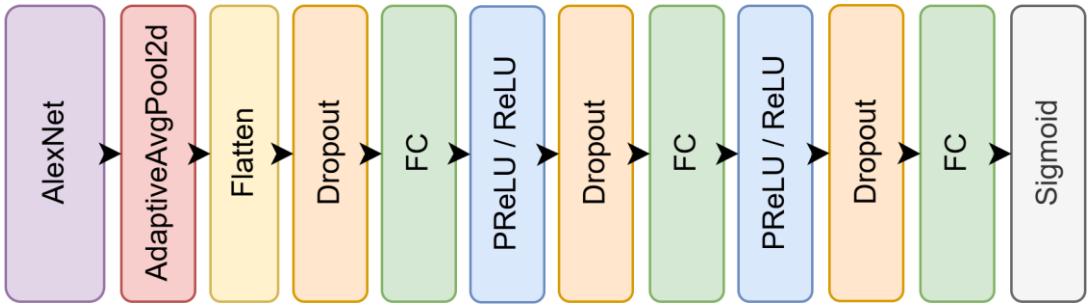


MobileNetv3-based

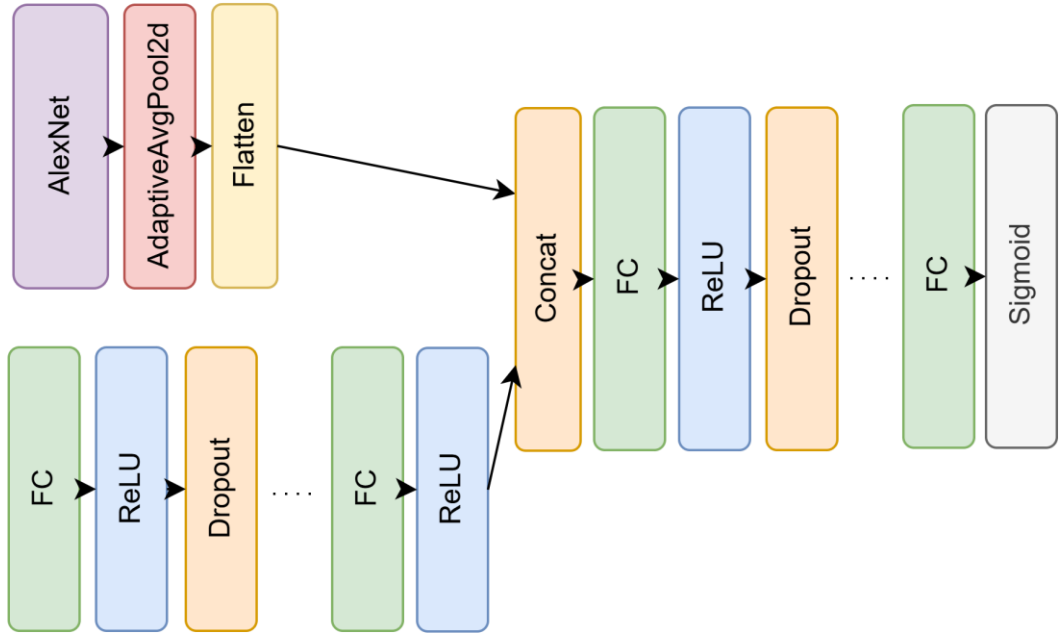


combined models

Architecture II.

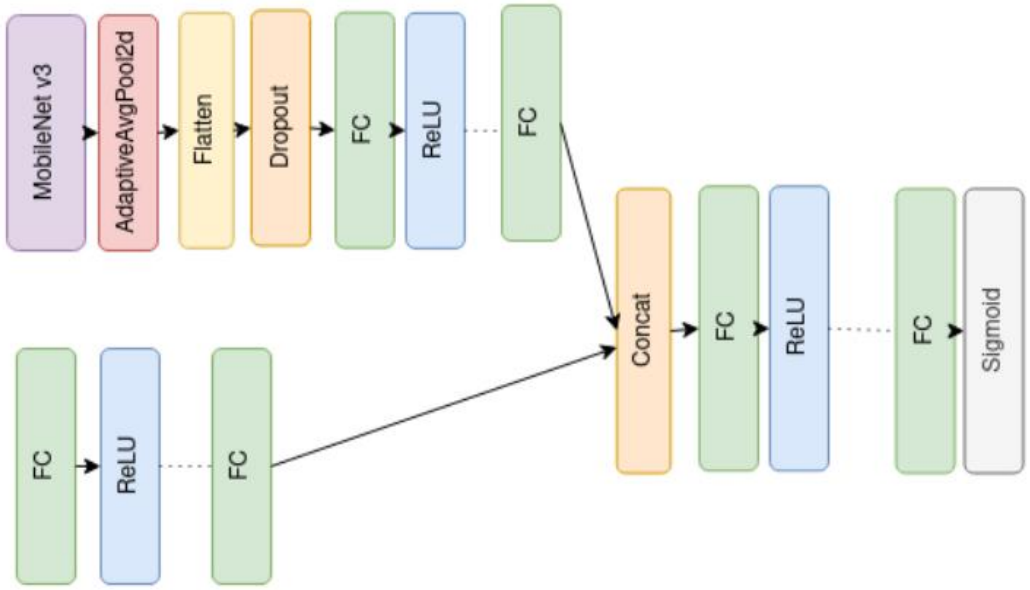


AlexNet-based

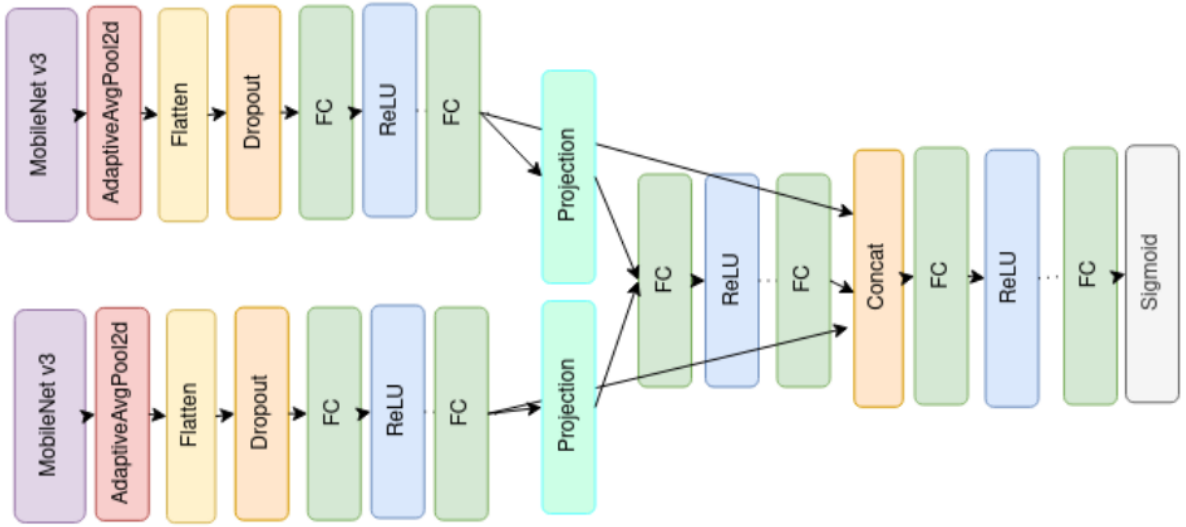


model for images and tabular data

Architecture III.



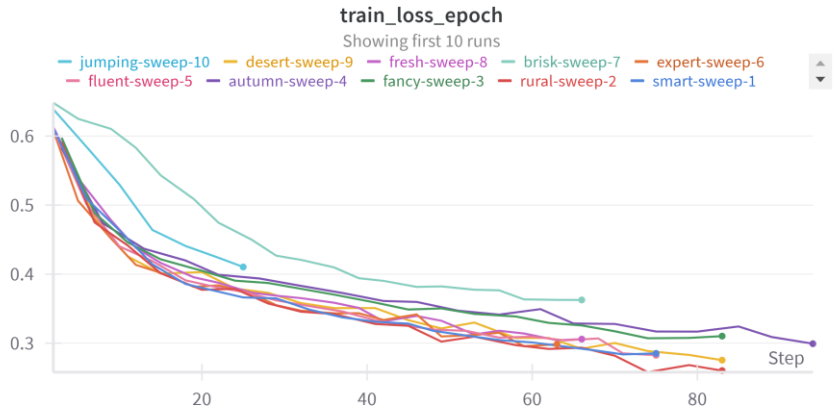
MobileNet-based complex

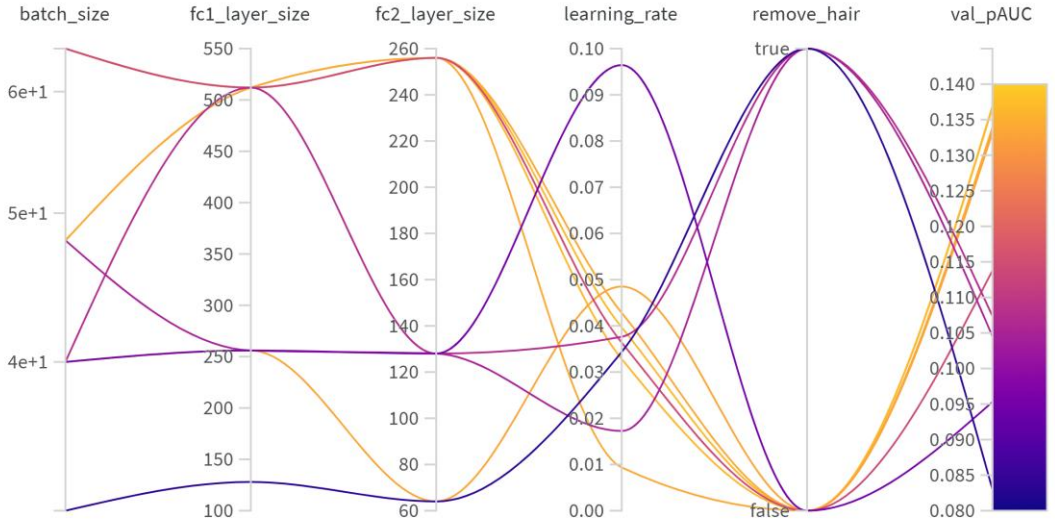


combined model with tabular data

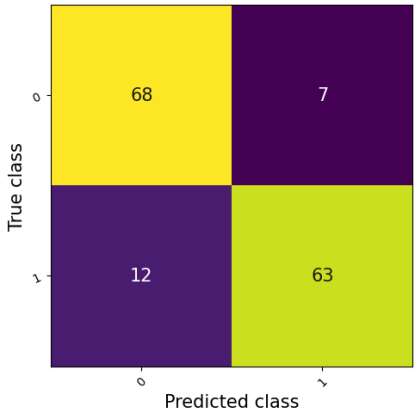
Train and hyperopt

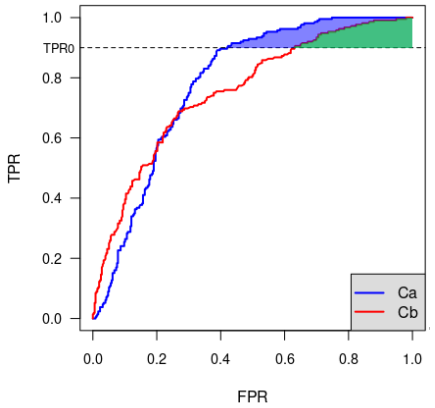
- PytorchLightning for making pipeline
- Wandb for hyperopt (Bayesian and random)
- EarlyStopping + ModelCheckpoint
- Running on Colab





Results

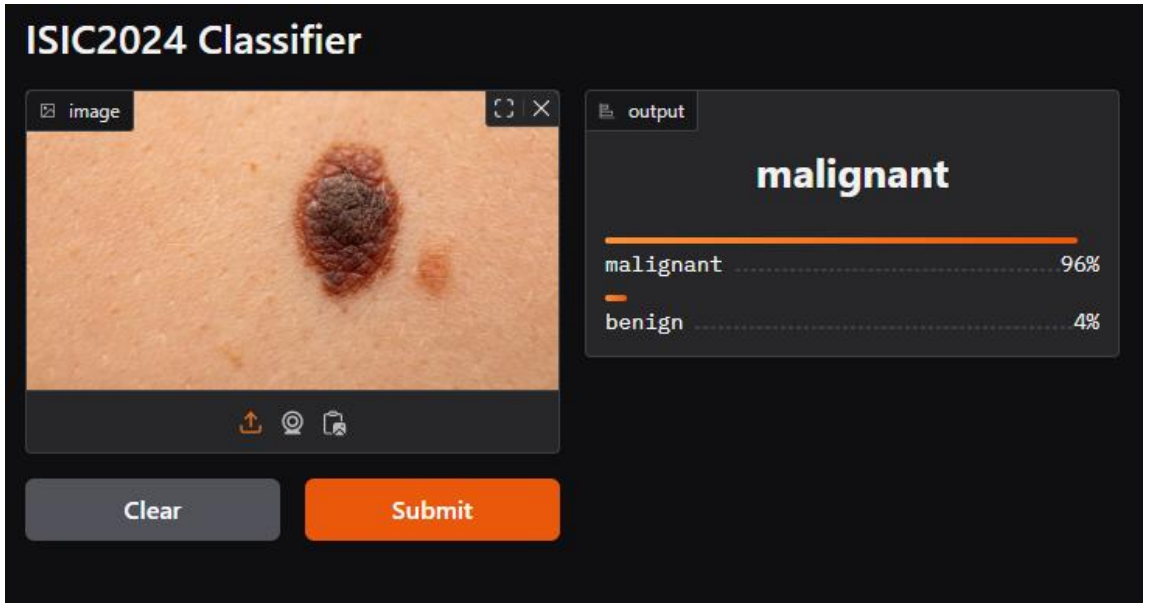




Model	pAUC	recall	precision	f1-score	loss
Baseline	*0.077*	*0.573*	*0.860*	*0.688*	*0.574*
AlexNet based	0.116	0.800	0.822	0.811	**0.434**
MobileNetv3 based	**0.159**	0.760	**0.950**	0.844	0.445
Combined (AlexNet + MobileNet v3)	0.134	**0.840**	0.900	**0.869**	0.455
Complex (images + tabular data)	0.125	**0.840**	0.851	0.846	0.446
Complex (images + tabular data MobilNetv3)	0.151	0.600	0.918	0.725	0.503
Combined + tabular data	0.086	0.773	0.734	0.753	0.537

Conclusion

- Tried several methods
- Learnt a lot about computer vision
- Got correct results (we can improve them)
- Made a working AI service (with Gradio)



AI service on [Huggingface]