Melanoma Lesion Classifier

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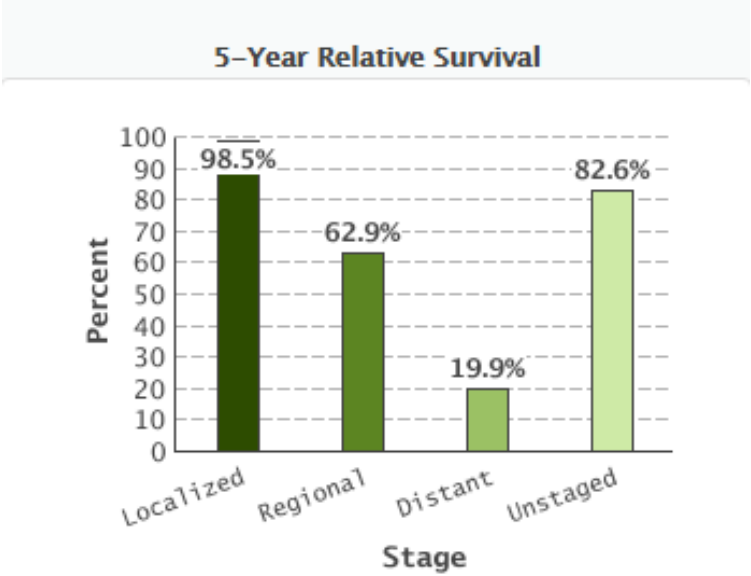
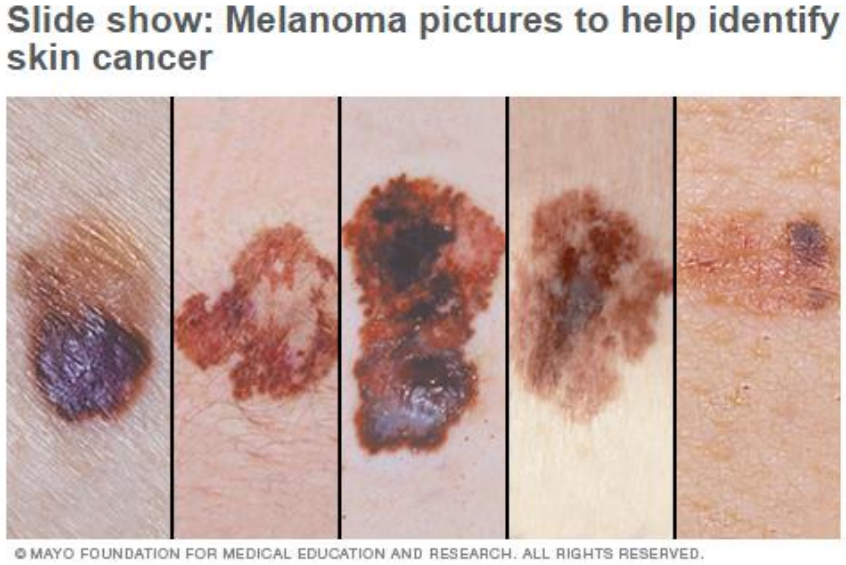
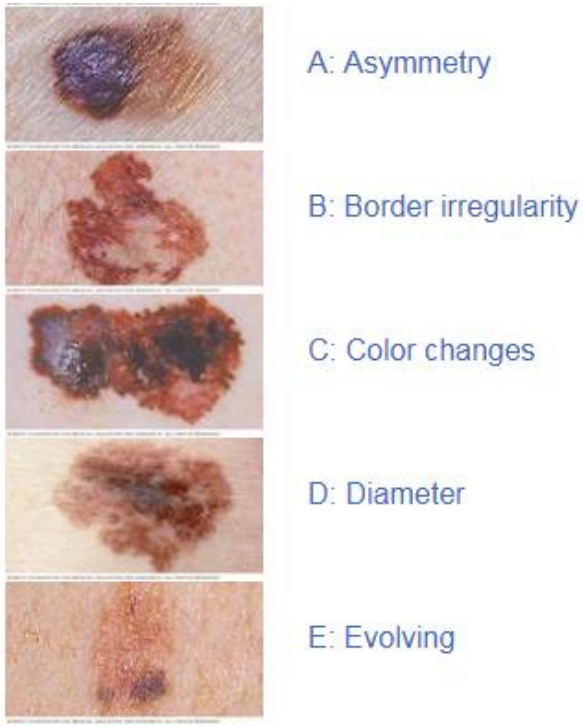
Introduction to Data Science

Melanoma detection: benign or malignant?





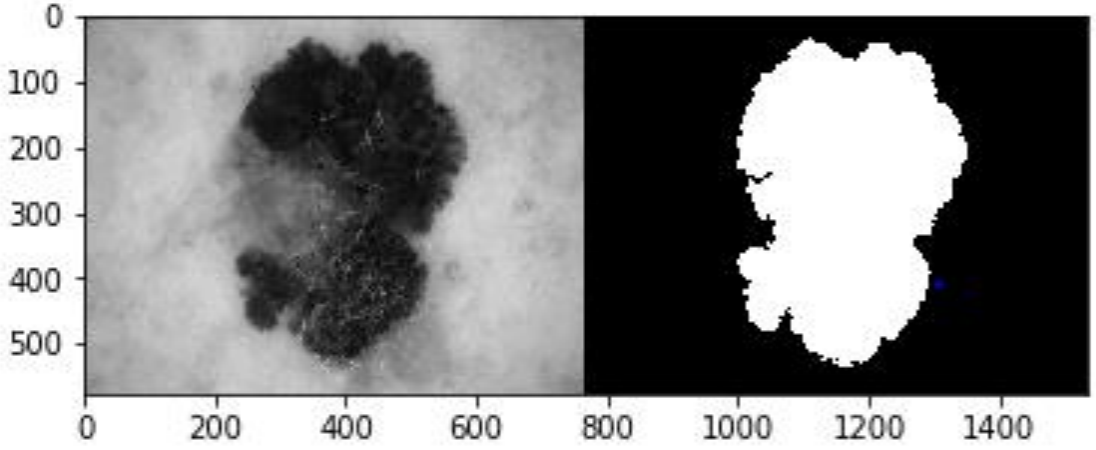


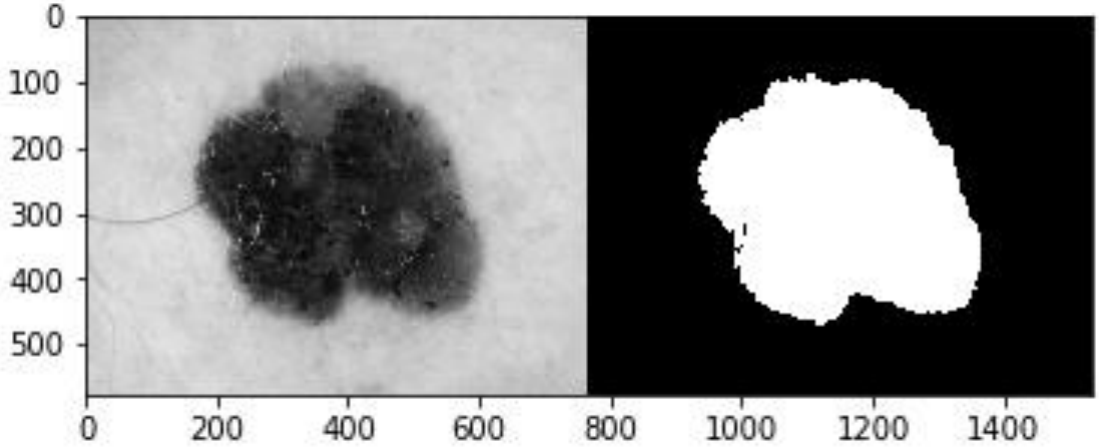
If undetected:

→ Late stage Melanoma can spread to organs

→ Poor prognosis (95% → 19% survival)

Image segmentation and Feature Extraction





Classifiers

	Classification Tree	Logistic Regression	K-Nearest Neighbor	Support Vector Machine	Random Forest	Adaboosting Classification Tree
Optimized Parameter	Tree Depth	L2 Regularization	None (Should be K)	Type of Kernel-rbf& Penalty Parameter	# of tree and # of features	# of trees &tree depths
Avg AUC 10 Fold Cross Validation	0.667	0.70	0.747	0.805	0.78	0.806

Top 3 important features of Logistic Regression:

- area,
- 2nd eigen value of inertia tension of the mole
- perimeter

Random Forest:

- Min intensity in the mole,
- Variance in the mole
- STD of whole image

Combination of weak classifiers

6 weak classifers

- Split data in to testing and training
- Training 6 classifers

Test all data

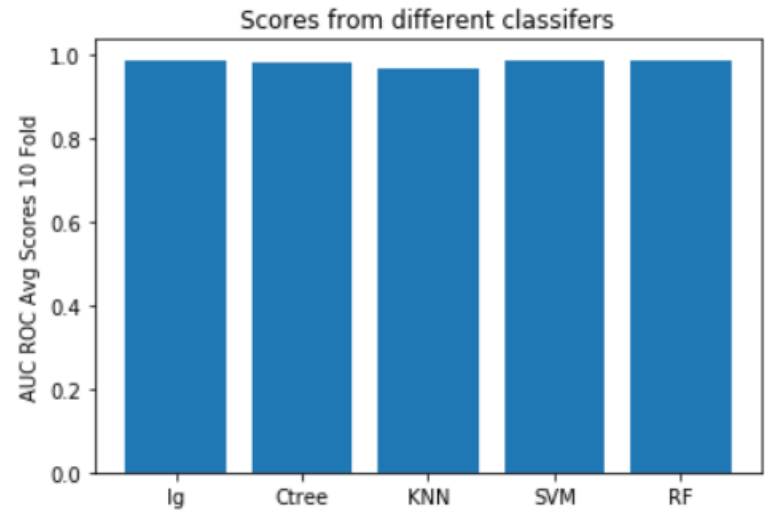
- Test the whole dataset with 6 weak classifiers
- Output the possibility of being maglignant from 6 calssifers

6 Strong Classifiers

- Use the possiblity from 6 classes as feature to train and test y classifers
- Tried on all 6 classifers again- All very strong classifers with AUC close to 1

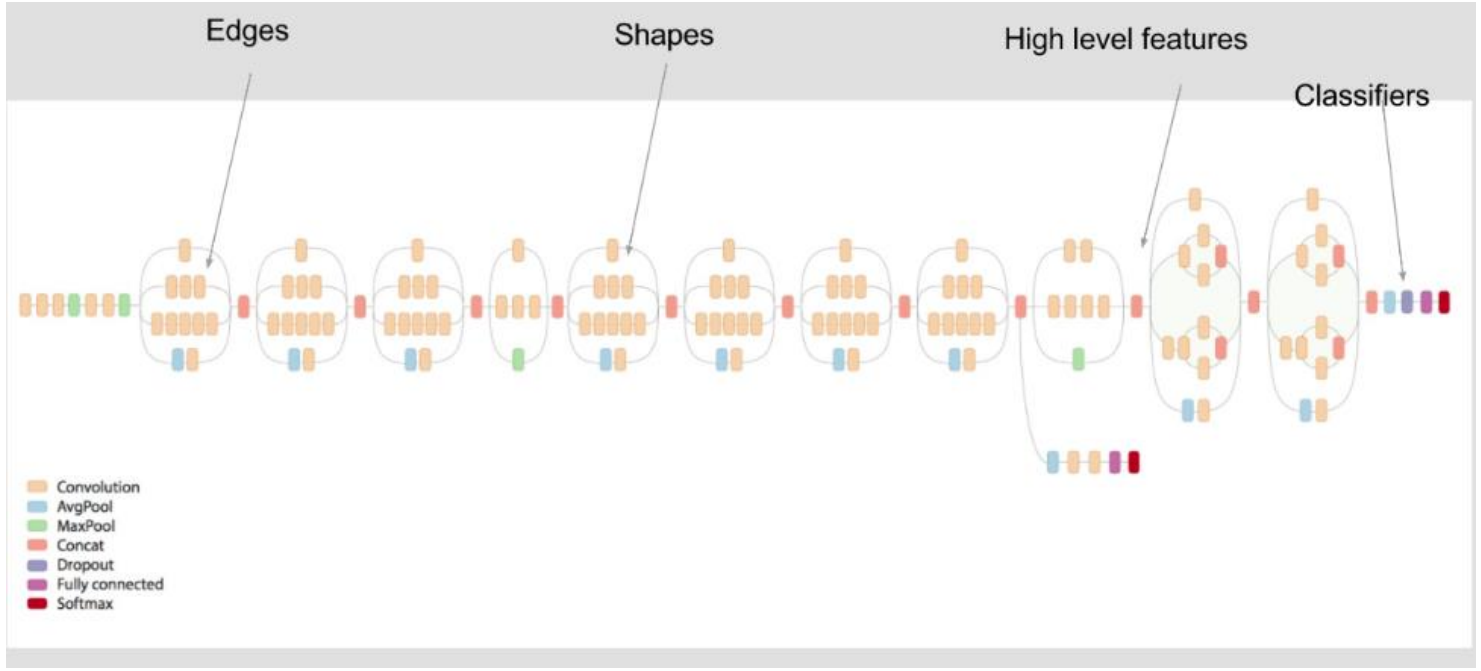
Prediction

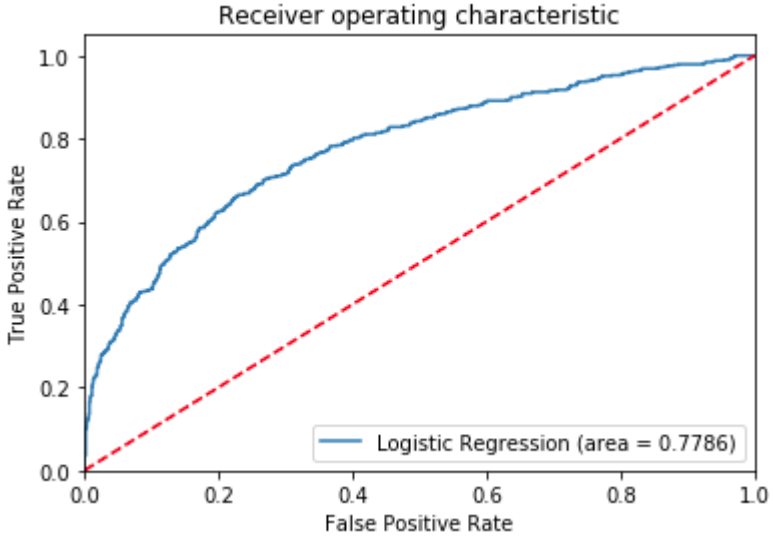
- Run all feautues through 6 week classifers for possibity output
- Predict with possibility on strong classifers



Transfer learning with InceptionV3

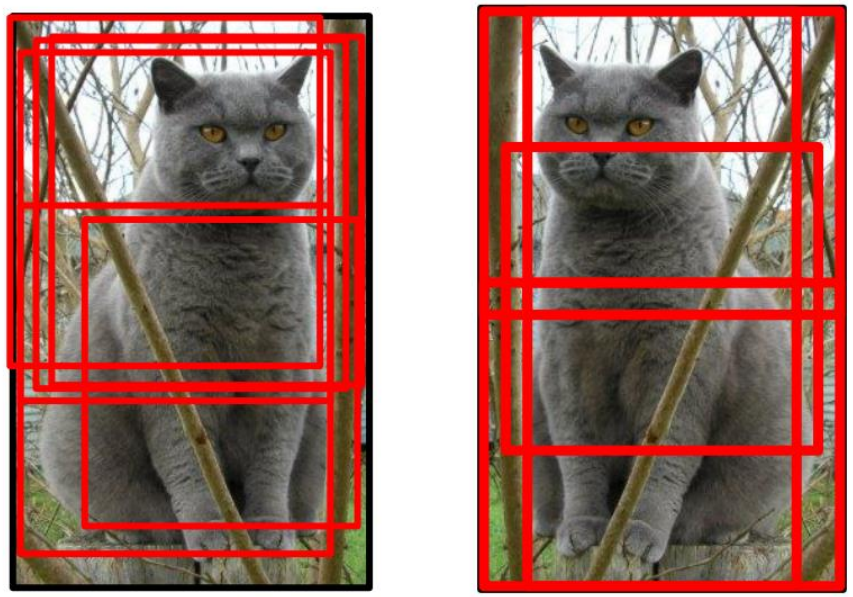
- Trained on ImageNet
  - (1.2 million images/1000 classes/weeks on multiple GPUs)
- Feature extractor + initialization weights

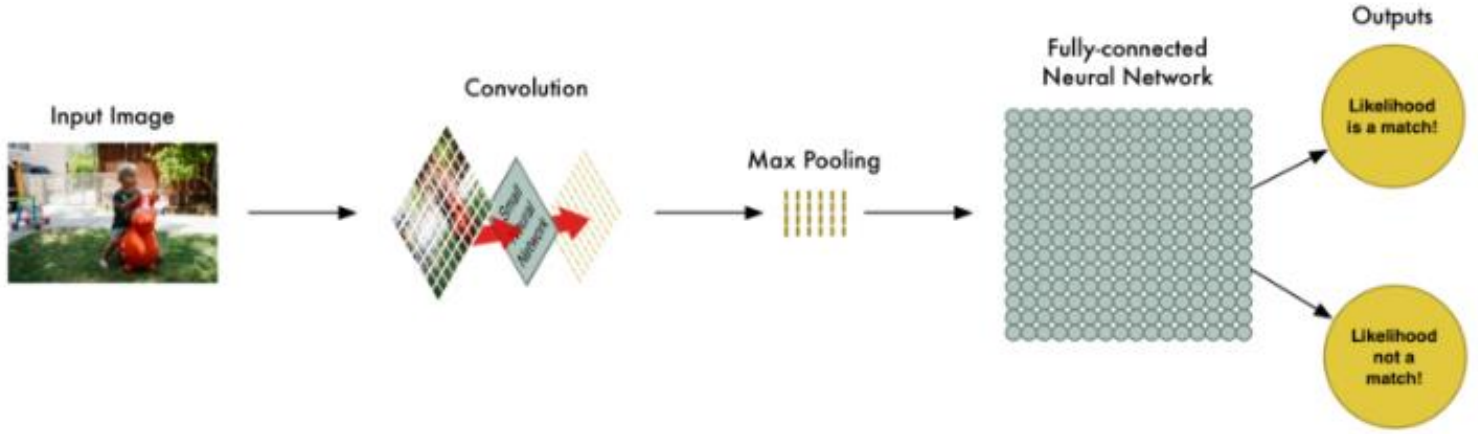




Transfer learning: Image augmentation

- Unbalanced dataset
  - 15 thousand images
  - 80/20
- Increase
  - Dataset size
  - Generalizability
- Example transformations: Pixel color jitter, rotation, shearing, random cropping, horizontal flipping, stretching, lens correction.





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Notebooks

Future Works

Pros and Cons