# Melanoma Detection

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Melanoma Overview

- What is melanoma?

  - The most serious type of skin cancer

  - Appears suddenly on the skin or develops from an existing mole

  - Early detection is essential as advanced melanoma can spread to other parts of the body and lead to death

  - In 2016 it is estimated that there will be 76K new cases and 10K deaths in the US

Detection

- Skin biopsy: only way to 100% confirm melanoma

- How does one know they need a skin biopsy?

- Today, we have teledermatology:
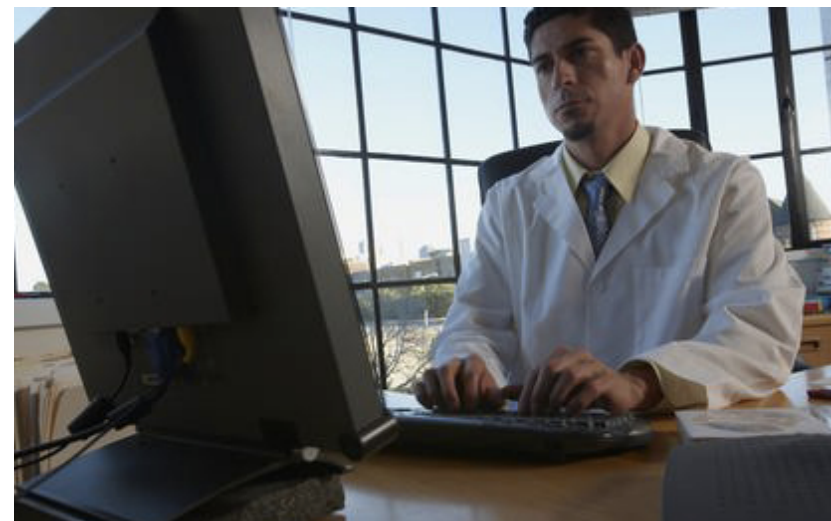
ABCDE Rule: Signs of Melanoma

- **A**symmetry

- **B**order irregularity

- **C**olor variations

- **D**iameter greater than 1/4 inch

- **E**volving

Data & Model

- The data: International Skin Imaging Collaboration Archive*

  - 771 melanoma images/771 benign images of moles
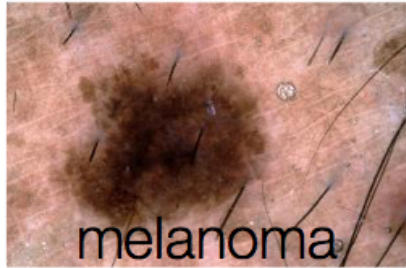

melanoma

benign

- My model: convolution neural network (CNN) with 3 convolutional layers, 2 dense layers

* International Skin Imaging Collaboration Archive: (https://isic-archive.com)

Measuring Model Success

Actual

 melanoma

 melanoma

 melanoma

 benign

 benign

Prediction

"suspect melanoma"

"suspect melanoma"

"benign"

"suspect melanoma"

"suspect melanoma"

Measuring Model Success

Actual	melanoma	melanoma	melanoma	benign	benign
Prediction	"suspect melanoma"	"suspect melanoma"	"benign"	"suspect melanoma"	"suspect melanoma"
Recall	proportion of melanoma images predicted to be melanoma				

Measuring Model Success

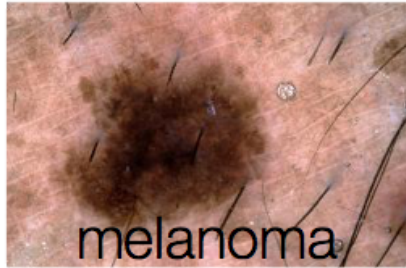|					
Actual	melanoma	melanoma	melanoma	benign	benign
Prediction	"suspect melanoma"	"suspect melanoma"	"benign"	"suspect melanoma"	"suspect melanoma"
Recall	proportion of melanoma images predicted to be melanoma				67%

Measuring Model Success

Actual	melanoma	melanoma	melanoma	benign	benign
Prediction	"suspect melanoma"	"suspect melanoma"	"benign"	"suspect melanoma"	"suspect melanoma"

Recall — proportion of melanoma images predicted to be melanoma — 67%

Precision — proportion of predicted melanoma where actual melanoma exists

Measuring Model Success

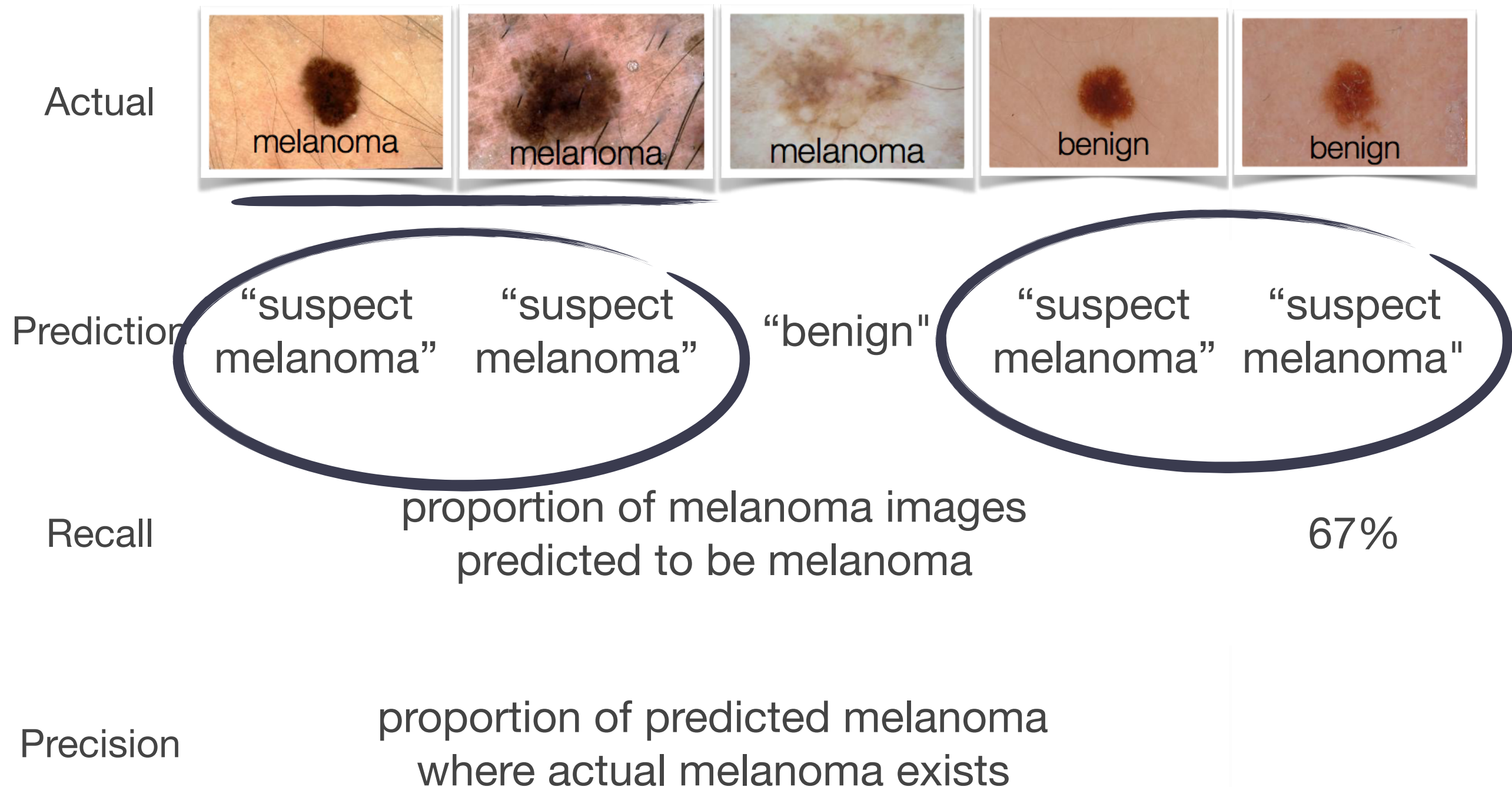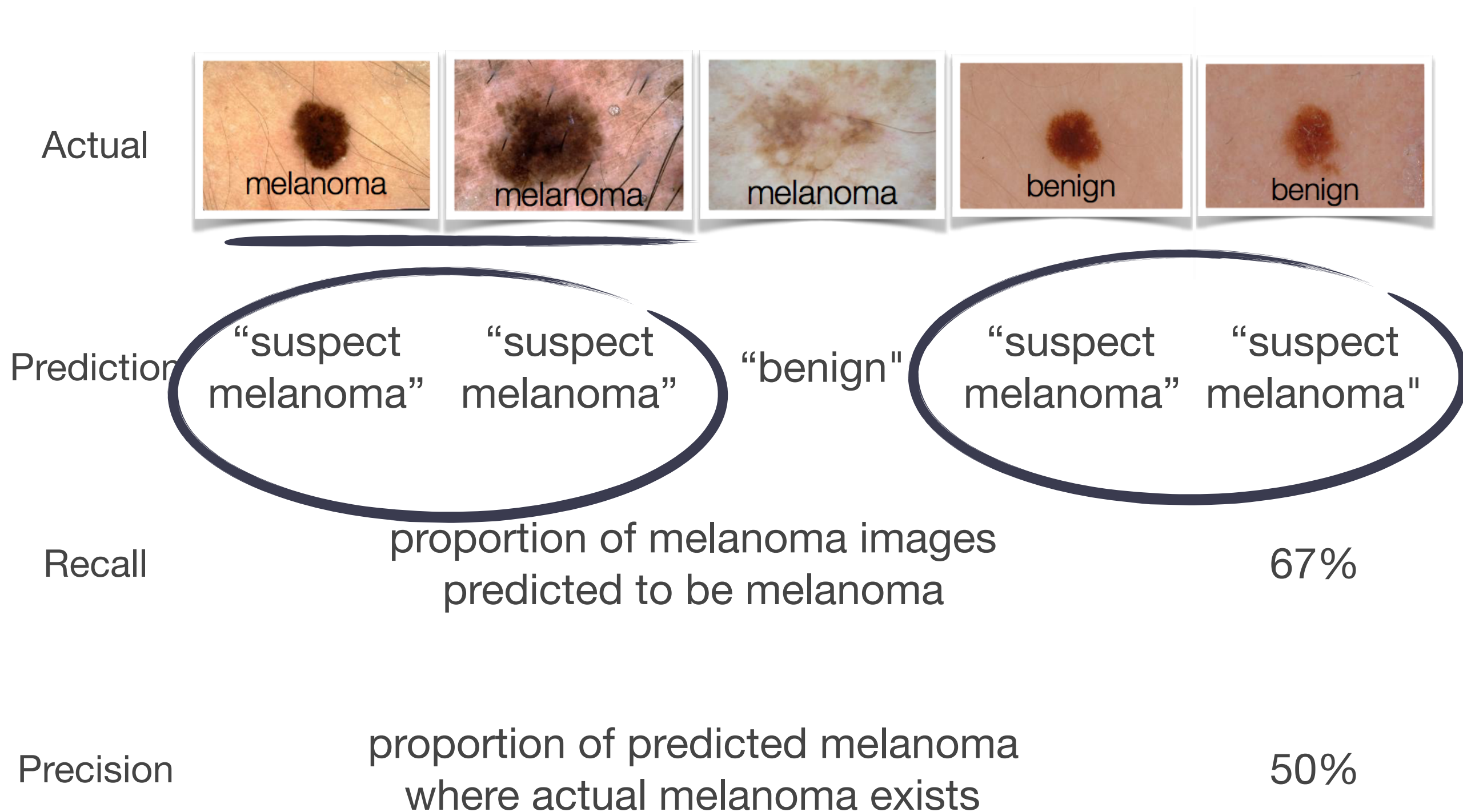|					
Actual	melanoma	melanoma	melanoma	benign	benign
Prediction	"suspect melanoma"	"suspect melanoma"	"benign"	"suspect melanoma"	"suspect melanoma"
Recall	proportion of melanoma images predicted to be melanoma				67%
Precision	proportion of predicted melanoma where actual melanoma exists				50%

Teledermatologist Vs. Computer

	Teledermatologist Results
Recall	71%*
Precision	58%*

* http://jamanetwork.com/journals/jamadermatology/fullarticle/419641

Teledermatologist Vs. Computer

	Teledermatologist Results	Full Color Images Test Set
Recall	71%*	79%
Precision	58%*	98%

* http://jamanetwork.com/journals/jamadermatology/fullarticle/419641

Teledermatologist Vs. Computer

	Teledermatologist Results	**Full Color Images Test Set**	**Blue Channel Only Images Test Set**
Recall	71%*	79%	**96%**
Precision	58%*	98%	66%

* http://jamanetwork.com/journals/jamadermatology/fullarticle/419641

Next Steps

- Capture more melanoma images

- More complex model could improve results

- Remove artifacts in the pictures:

vignettes | rulers | air bubbles | hair
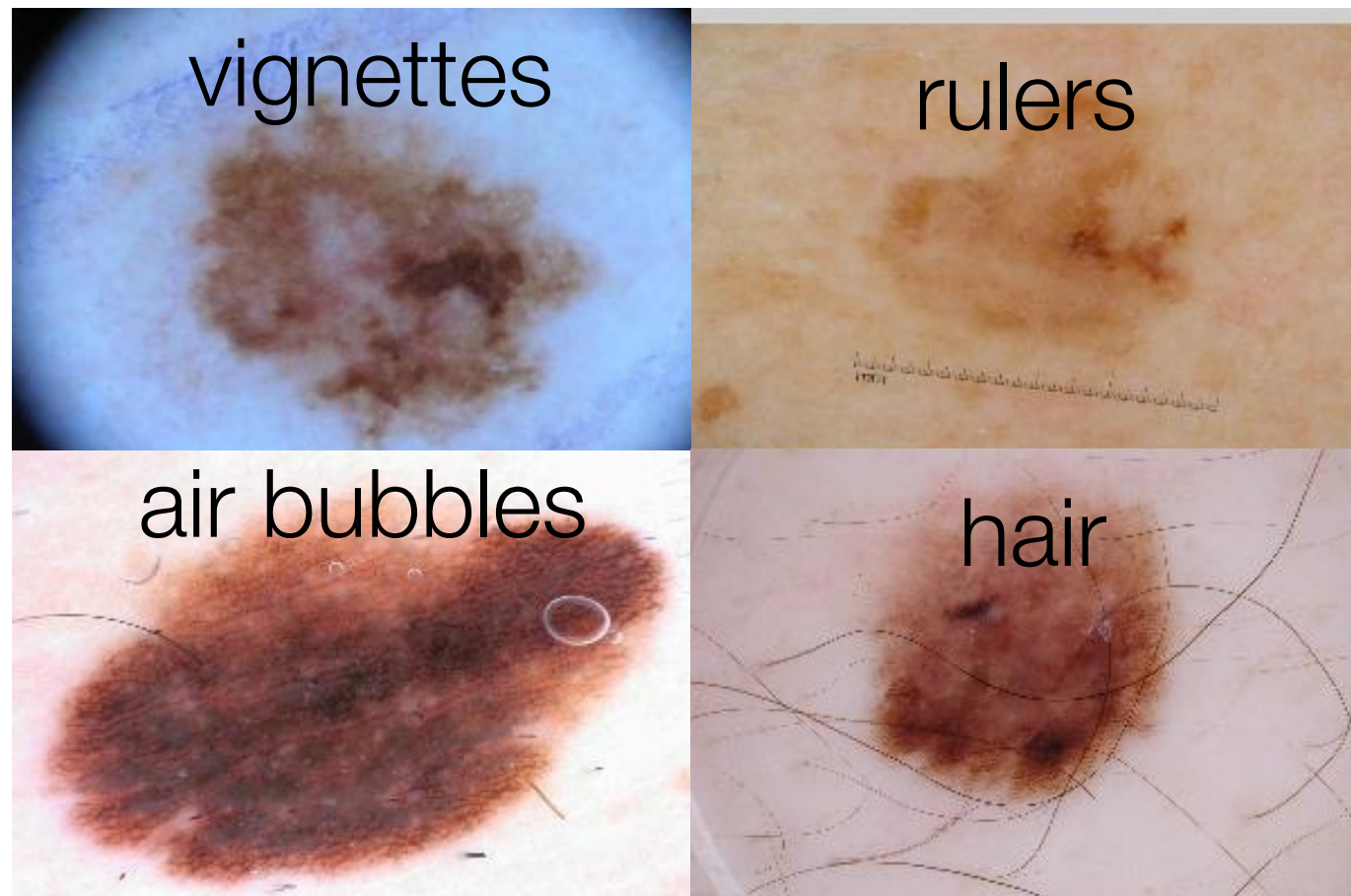
Thank You!

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