

# **Skin Lesion Image Analysis For Melanoma Detection**

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# Melanoma

- Over 160,000 newly diagnosed cases in the United States this year
- One person dies of melanoma every hour
- About \$3.3 billion dollars spent annually to treat melanoma

- source: <http://www.skincancer.org/skin-cancer-information/skin-cancer-facts>

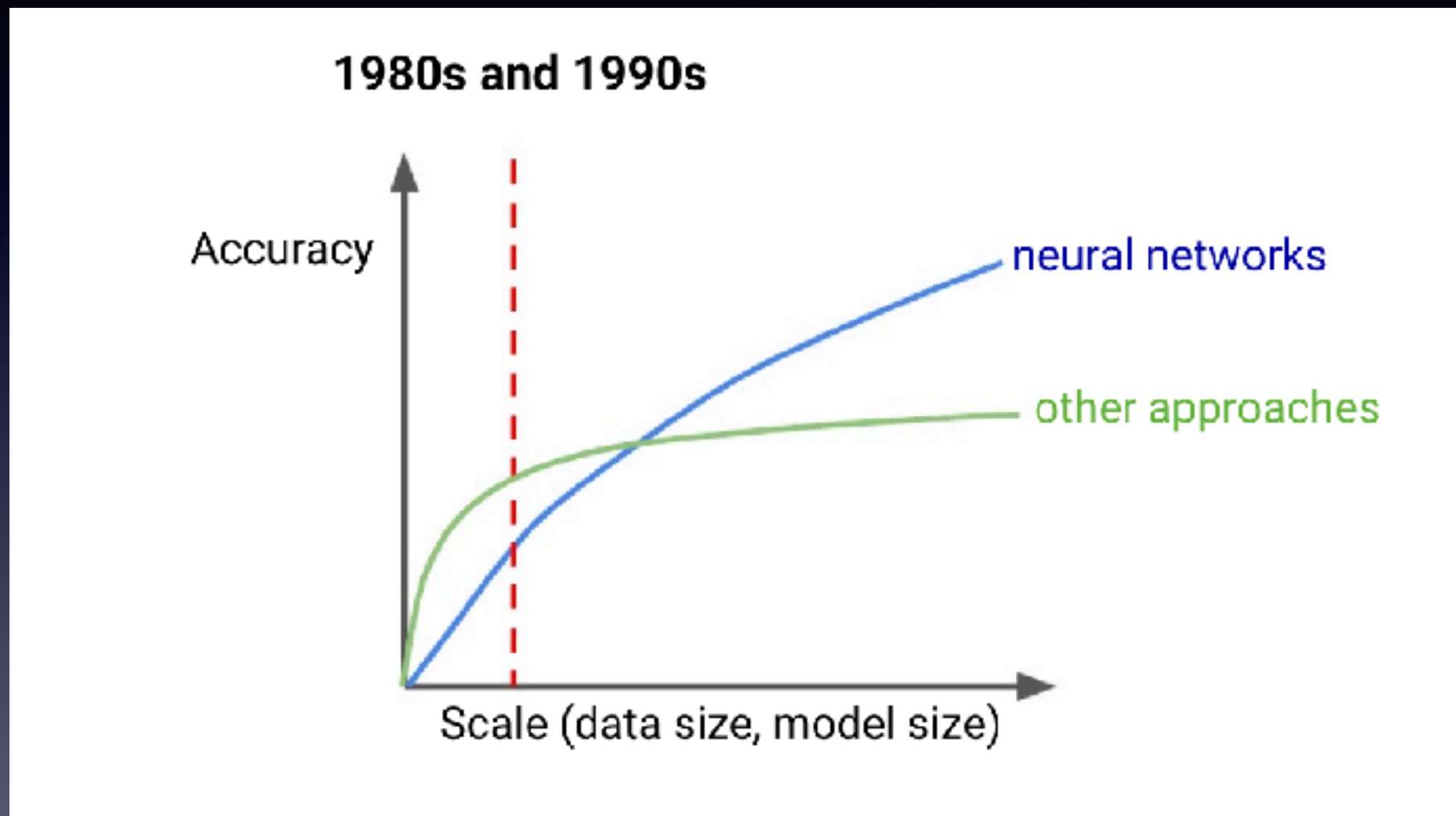
# Melanoma

- 5-year survival is over 98% if detected early
- Can be detected by expert visual inspection
- It can also be detected with automated image analysis

- source : [www.cancer.net/cancer-types/melanoma/statistics](http://www.cancer.net/cancer-types/melanoma/statistics)

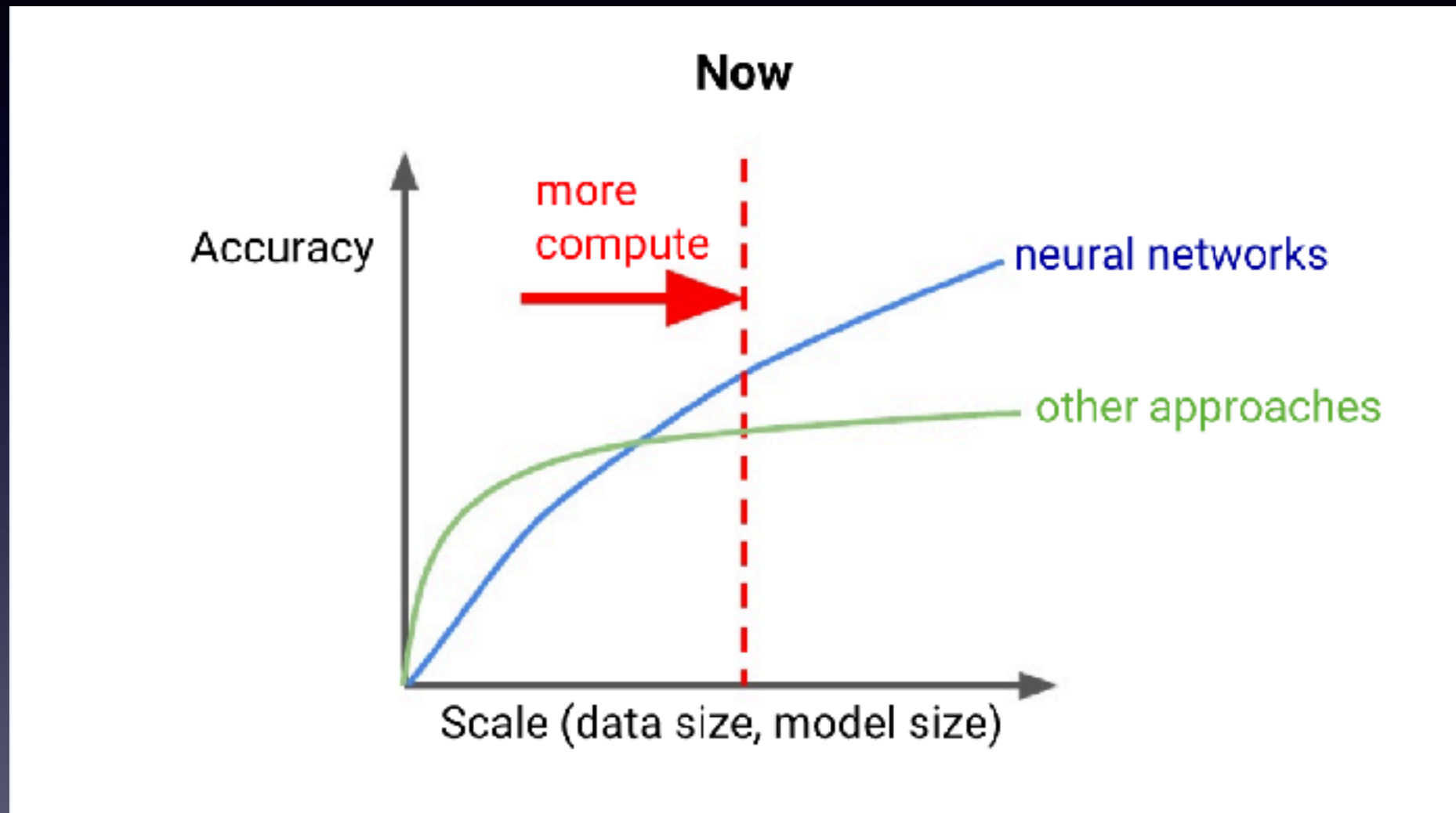


# Why Deep Learning?



- source: <http://blog.ycombinator.com/jeff-deans-lecture-for-yc-ai/>

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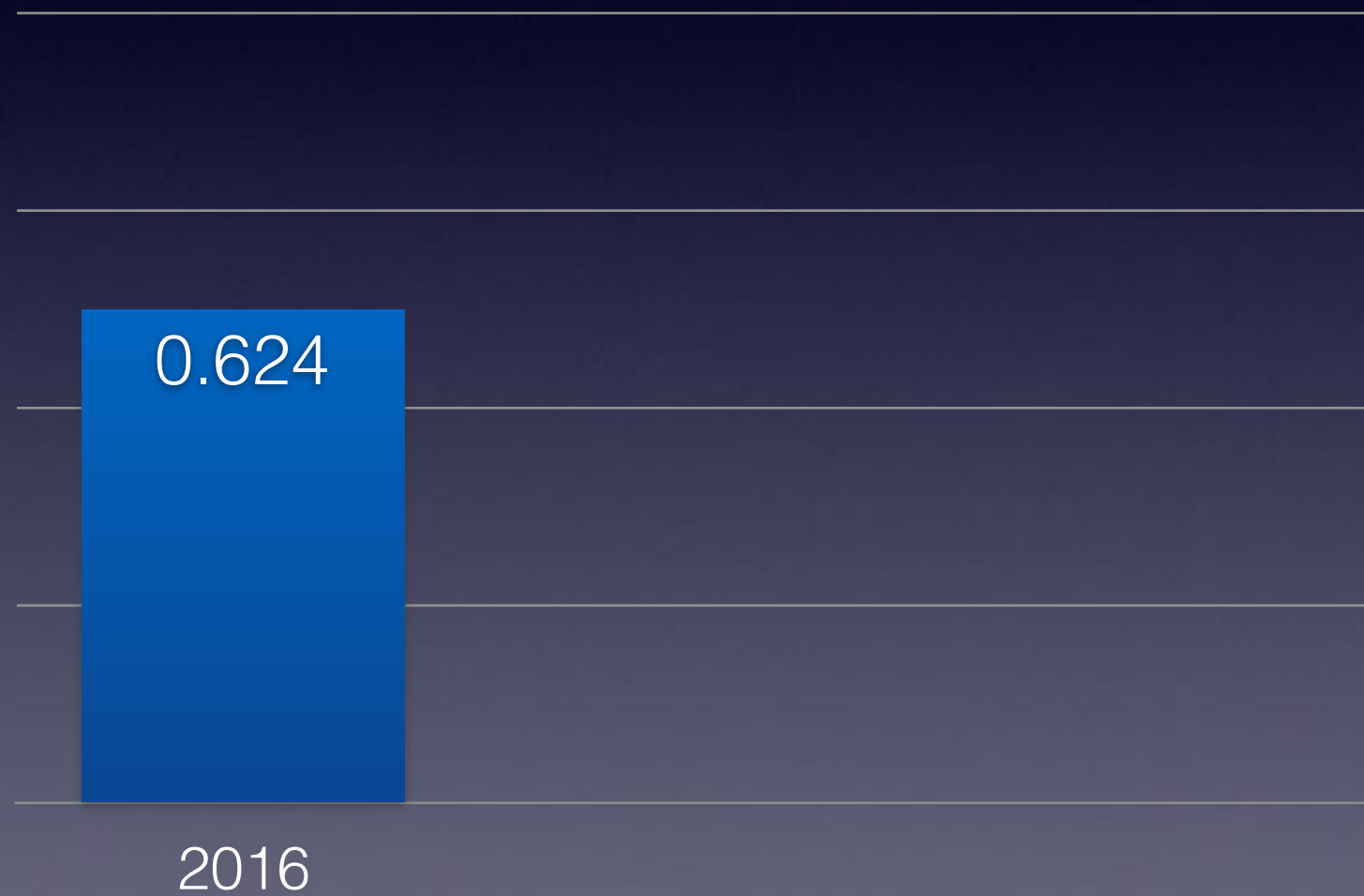
# Melanoma Dataset

- ISIC Archive: International Skin Imaging Collaboration
- Over 3600 images for training set and 600 for test set



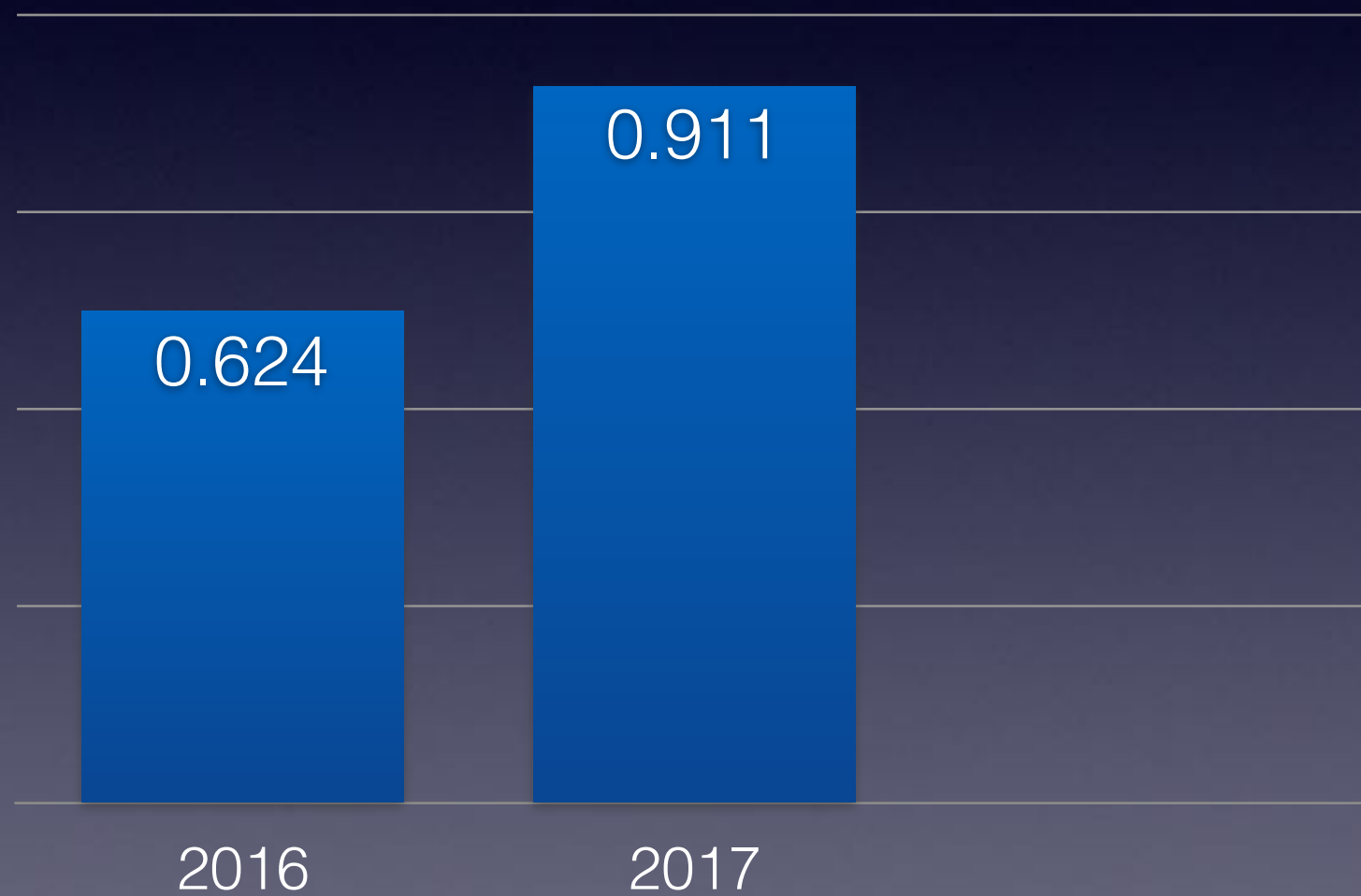
# ISIC Competition Results

Leaderboard Score (AUC)



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Leaderboard Score (AUC)



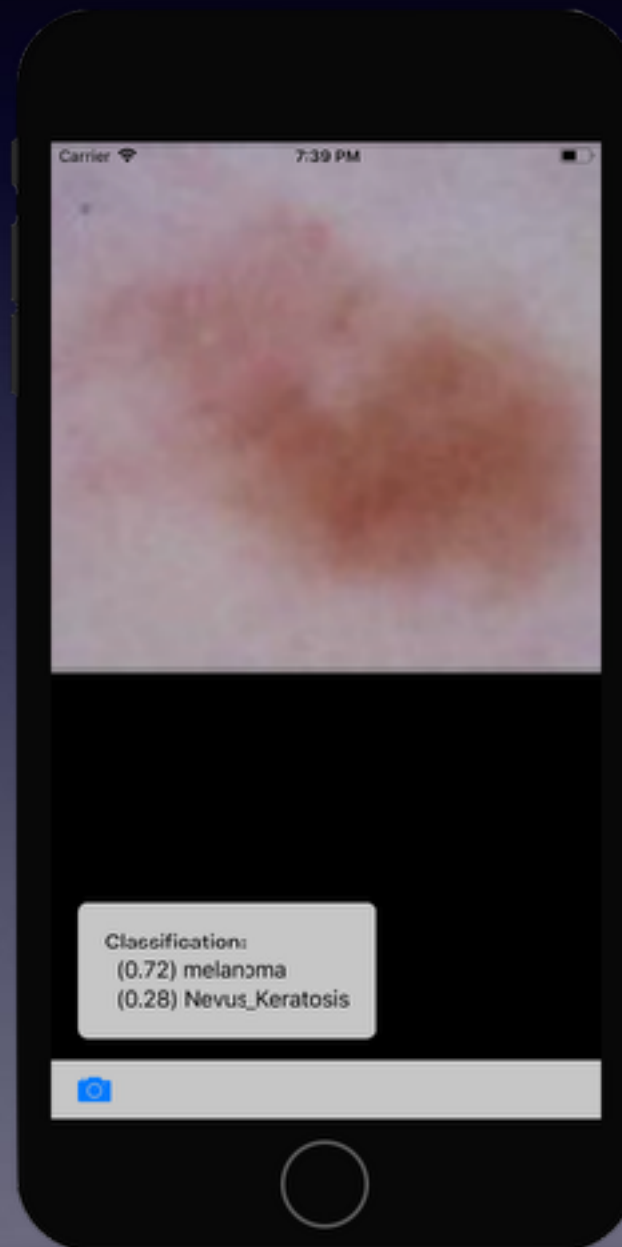


# ISIC Competition Results

Leaderboard Score (AUC)

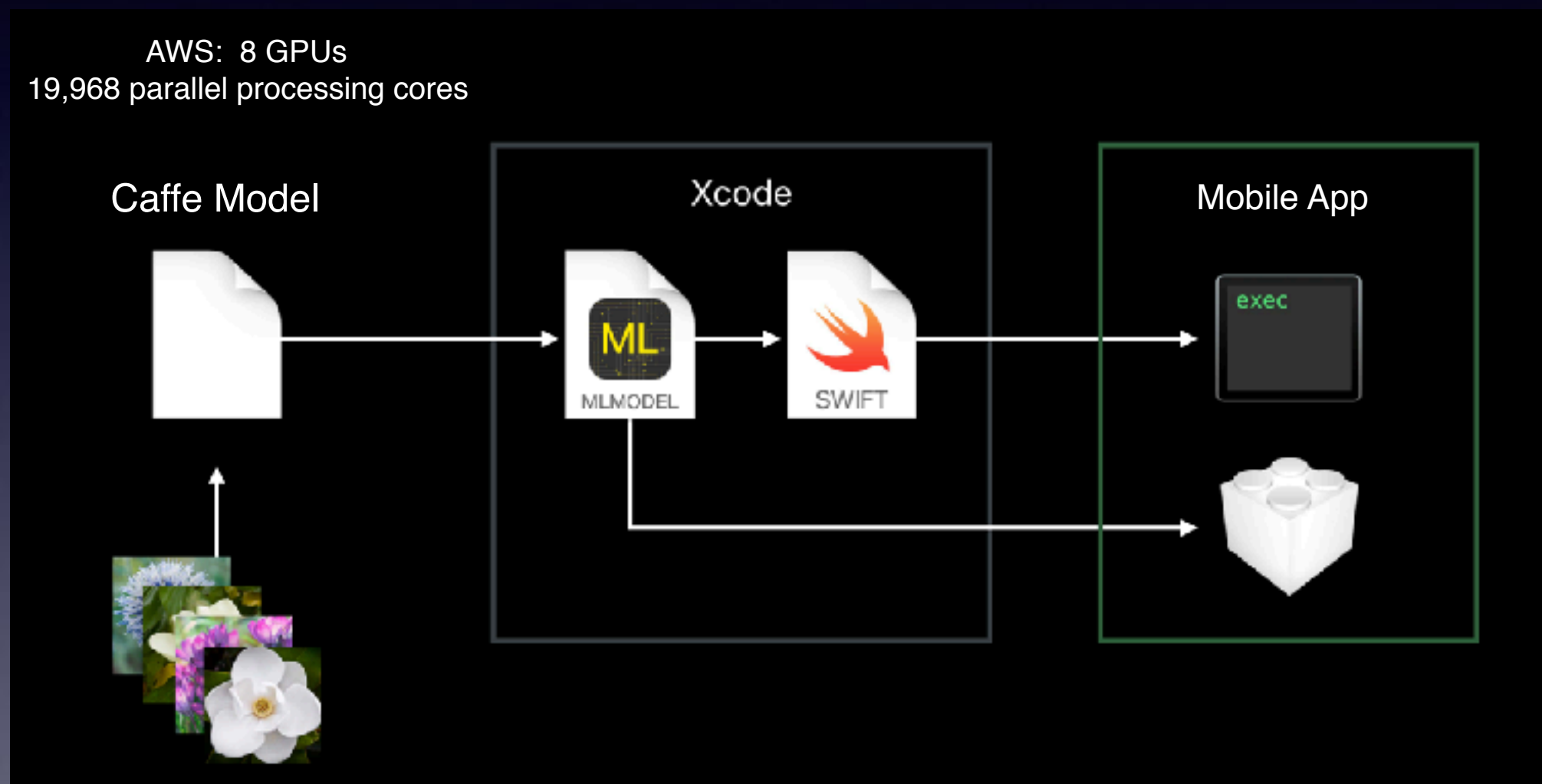


# iOS App



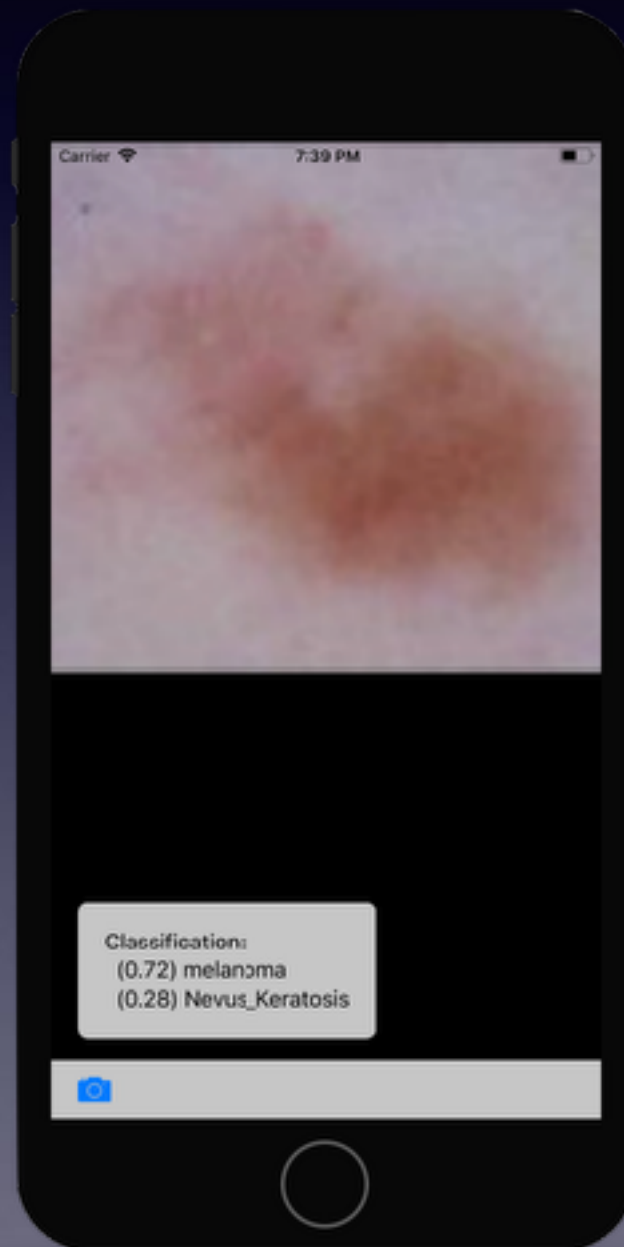
# Mobile App

## Apple's CoreML, iOS11



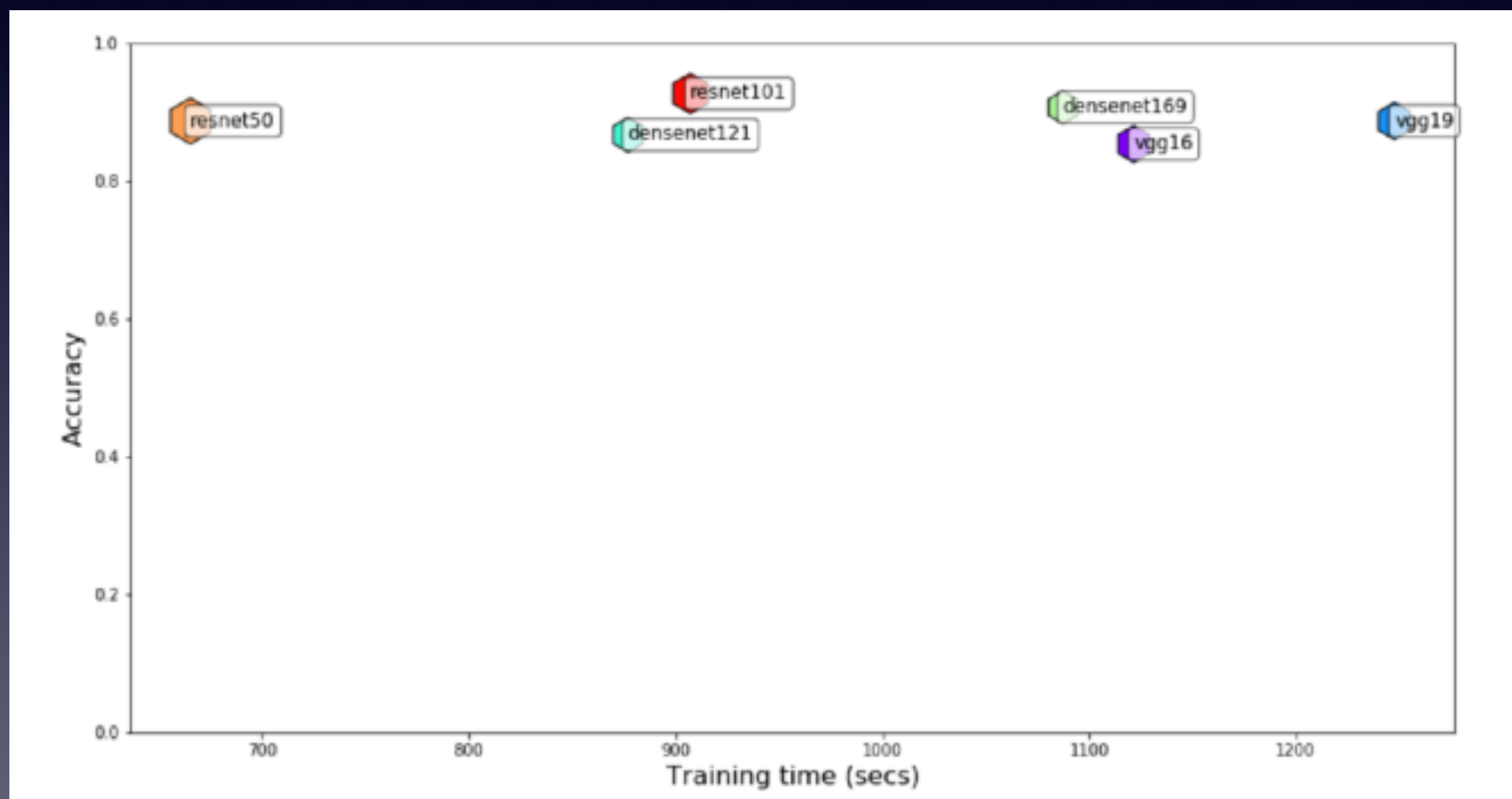
- source: WWDC 2017, Core ML in depth

# Demo



- Additional Slides

# Model Exploration



# Deployment-Caffe, Nvidia DIGITS

**Disk Size**  
10.8 GB

**Network (train/val)**  
[train\\_val.prototxt](#)

**Network (deploy)**  
[deploy.prototxt](#)

**Solver**  
[solver.prototxt](#)

**Raw caffe output**  
[caffe\\_output.log](#)

**Pretrained Model**  
[/home/ubuntu/models/ovlc\\_alexnet.caffemodel](#)

## Dataset

[melanoma](#)

Done Thu Sep 28, 07:43:57 PM

**Image Size**

256x256

**Image Type**

COLOR

**DB backend**

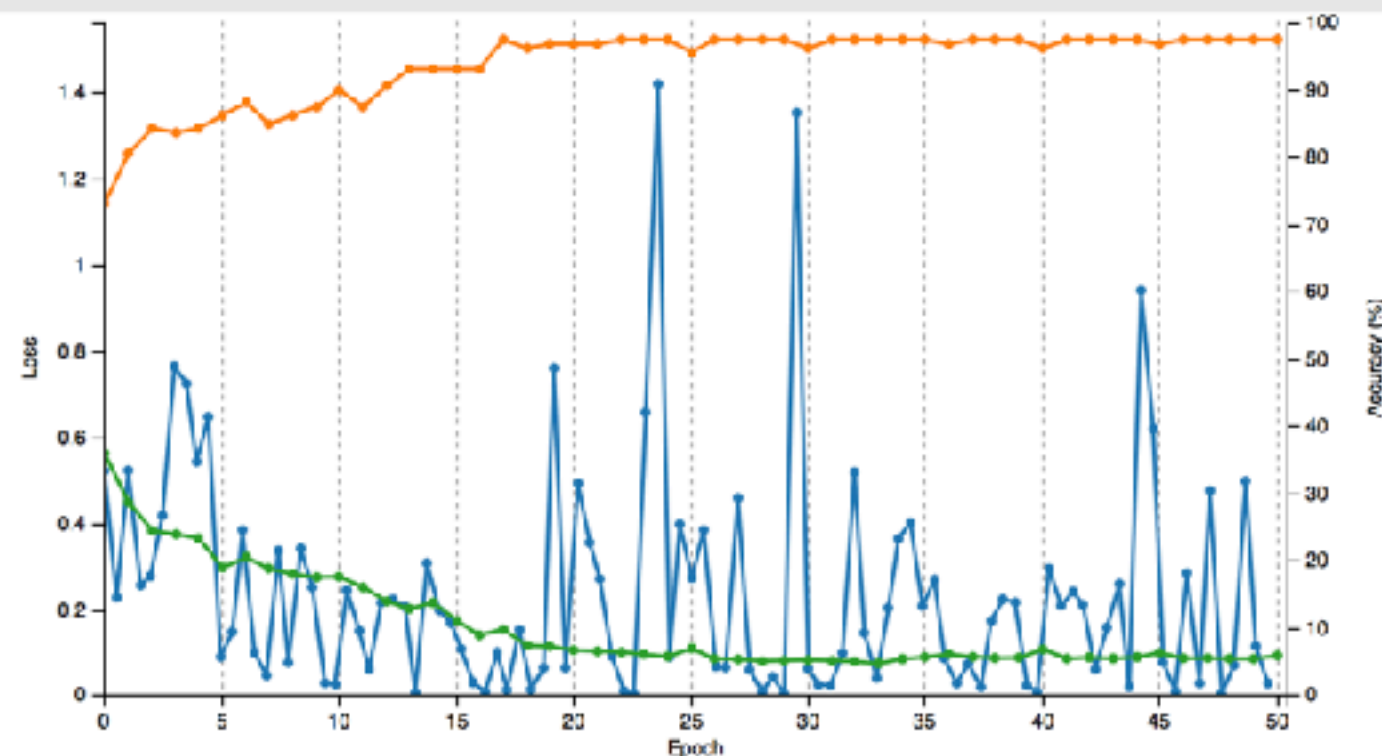
lmdb

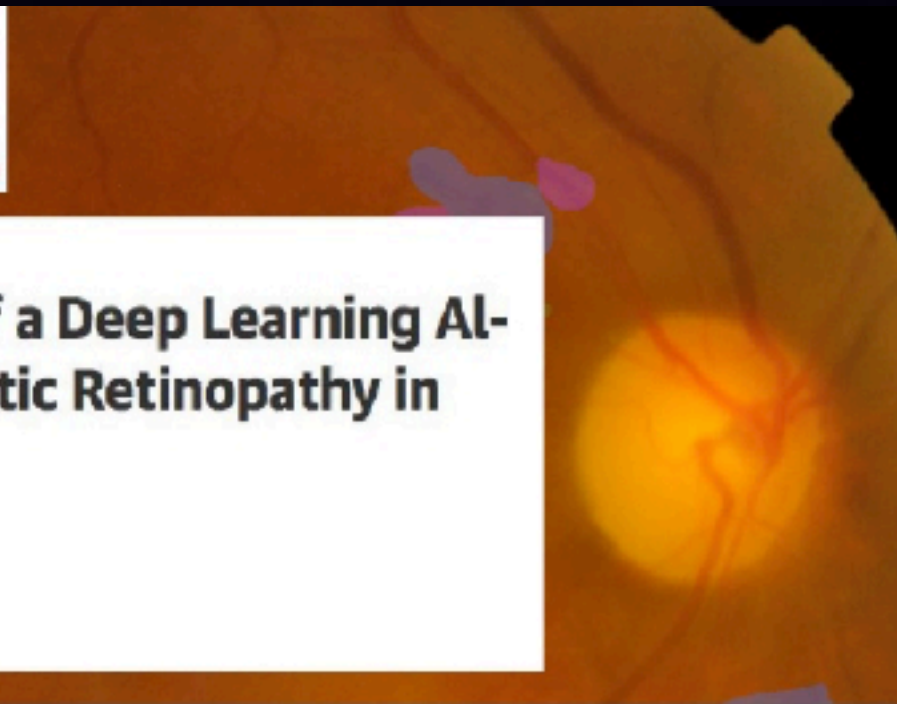
**Create DB (train)**

3631 images

**Create DB (val)**

150 images





**JAMA** The Journal of the American Medical Association

December 13, 2016

## Development and Validation of a Deep Learning Algorithm for Detection of Diabetic Retinopathy in Retinal Fundus Photographs

Varun Gulshan, PhD<sup>1</sup>; Lily Peng, MD, PhD<sup>1</sup>; Marc Coram, PhD<sup>1</sup>; et al

[➤ Author Affiliations](#)

JAMA. 2016;316(22):2402-2410. doi:10.1001/jama.2016.17216

Performance **on par or slightly better** than the median of 8 U.S. board-certified ophthalmologists (F-score of 0.95 vs. 0.91).  
<http://research.googleblog.com/2016/11/deep-learning-for-detection-of-diabetic.html>

- source: <http://blog.ycombinator.com/jeff-deans-lecture-for-yc-ai/>