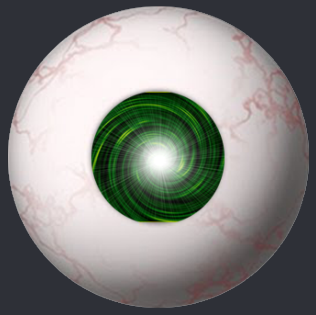
2017 YALE HEALTHCARE HACKATHON



# DeepEye

*A biomimetic approach to computer-aided diagnosis of lung cancer*

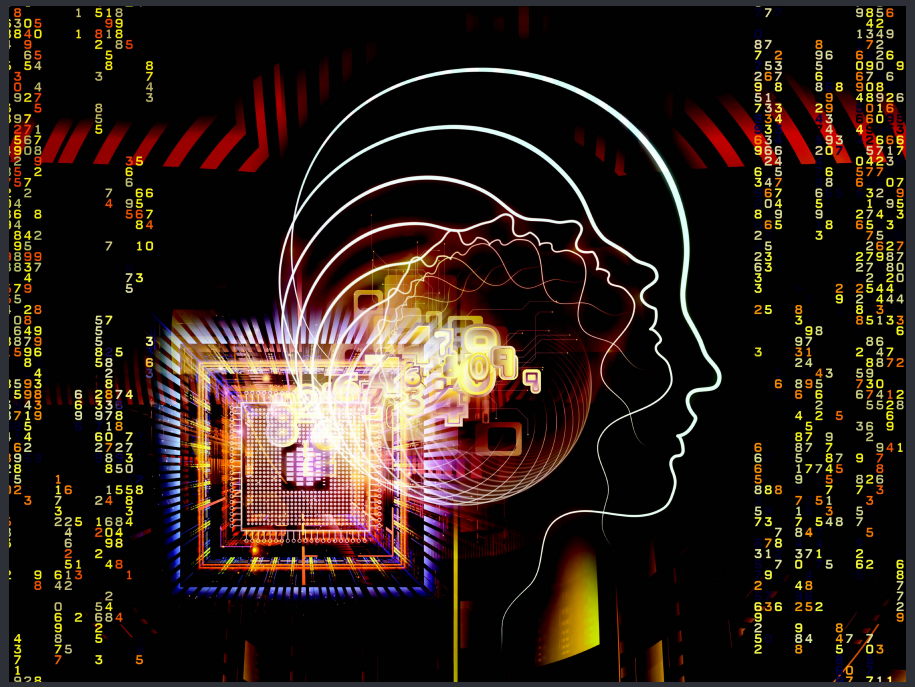
*The DeepEye Team (Yale+MIT)*

# The Challenge Facing Healthcare

- Lung cancer is the **#1** cause of cancer-related death in the US
- Every day, up to 150 cases of lung cancer are missed by radiologists
- Due to varying skill of the radiologist, fatigue and time pressure

# Computer-Aided Diagnosis (CADx)

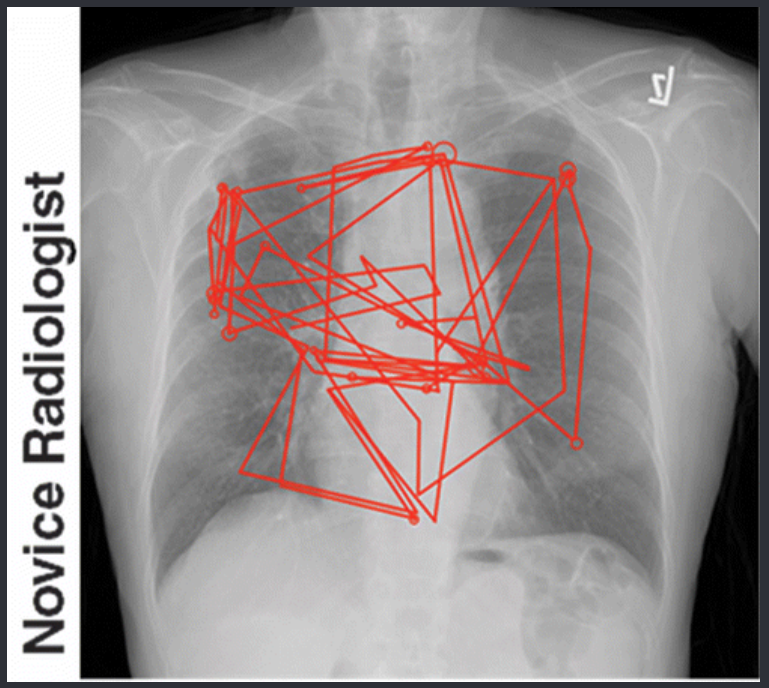
- Machine learning and deep learning are poised to revolutionize medicine
- But still cannot replace an experienced radiologist

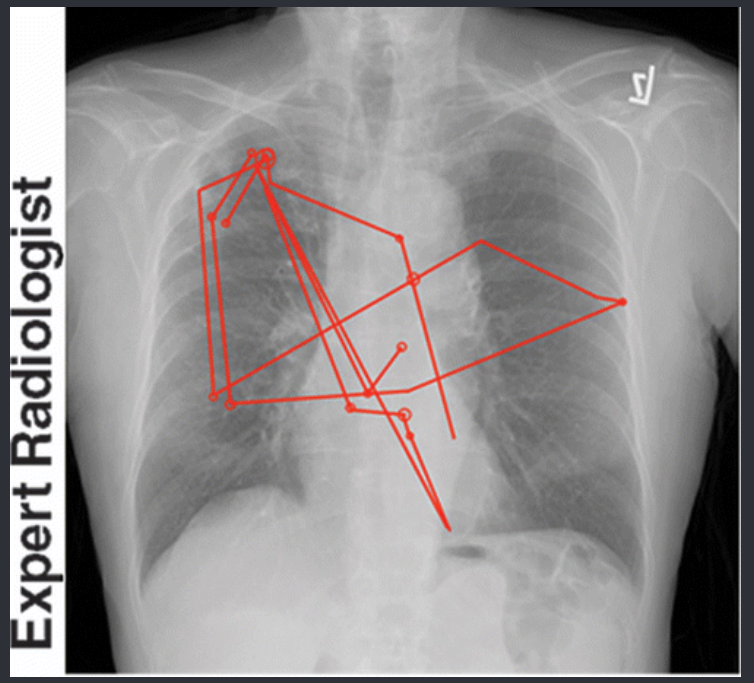


# What is missing?

The Human Touch

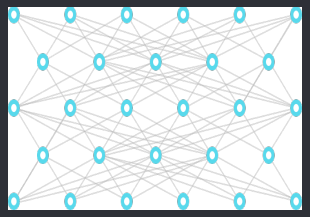
# Novice vs. Expert Radiologist



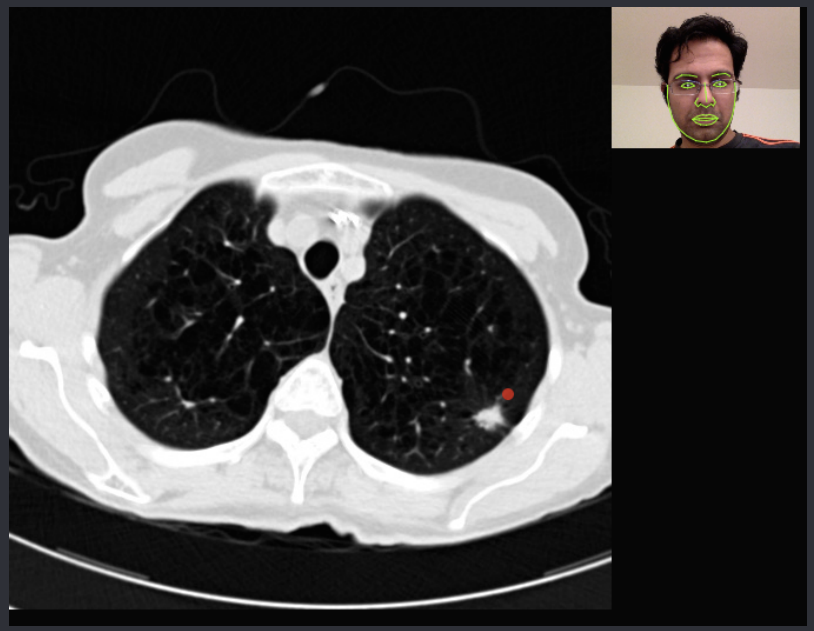




Radiographics. 2013; 33:263-274

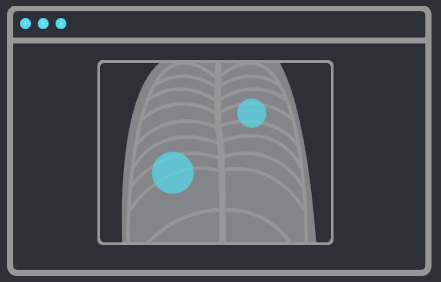
# DeepEye



Open Source
Deep Learning
Algorithm
**Baseline**
**Accuracy: 77%**

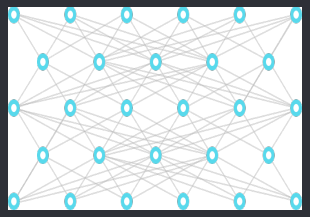


Eye-tracking data from
3 radiologists with
combined experience
of 49 years



**DeepEye**
**Accuracy: 80%**

# DeepEye



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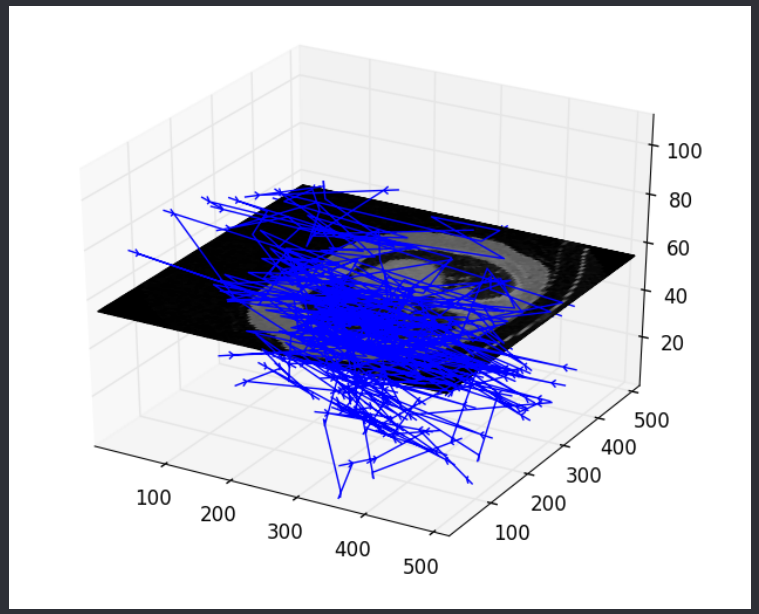


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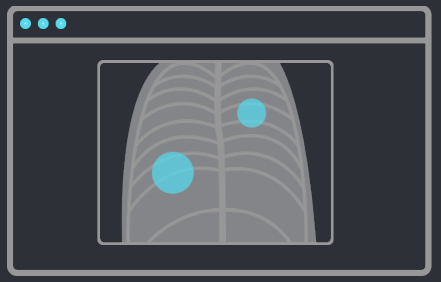

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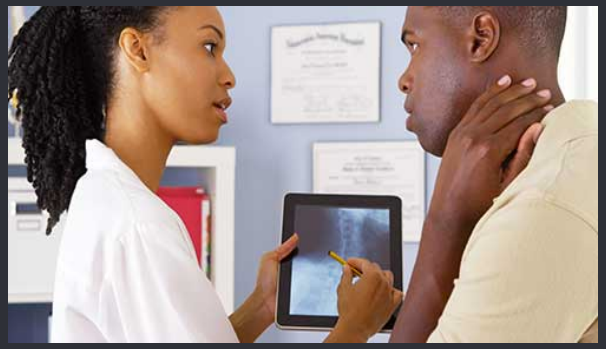
# Symbiotic Business Model



## Patient Care

- License to software companies

## Resident Training

- Trainee feedback and skill guidance development

| | Baseline | With DeepEye |
|---|---|---|
| Current salary of radiologists ($/hr) | **200** | **200** |
| Time to interpret CT studies (min) | **15** | **6** |
| Radiologists productivity | **$800** | **$2,000** |
| Improvement in productivity | **150%** | |

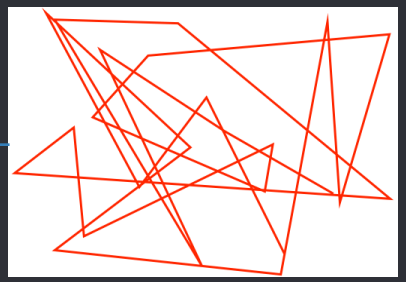
# Future Steps

- Incorporate additional data to enhance algorithm
- Expand to other organ systems and disease processes
- Utilize dedicated eye-tracking hardware

# Thank you for your attention!

- Omair Khan, Yale College ’19
- Muhammad Khan, PhD Candidate
- Nripesh Parajuli, PhD Candidate
- Issa Ali, MPH Candidate
- Karthik Murugadoss, MS Candidate
- Mansur Ghani, MD Candidate
- Gowthaman Gunabushanam, MD

# Deep Neural Network Architecture



Convolutional Layer

Convolutional Layer

Max Pooling

Drop Out

Fully Connected

Drop Out

Softmax Classifier