
Machine Learning Demo:
Medical Imaging Project
Meetup News
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Conference Highlights
Presenters

New Technologies for Canadian Observatories

12.15.2017 AGM

LimbicConsulting

New Technologies for
Canadian Observatories

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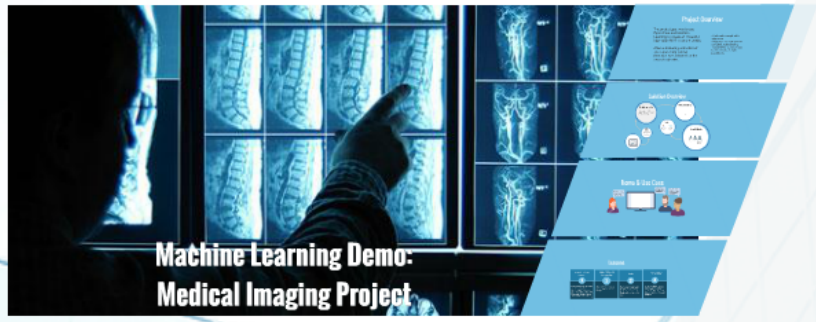


Project Overview
Solution Overview
Demo & Use Case
Lessons
Machine Learning Demo:
Medical Imaging Project

Project Overview

The project goal was to use Open Data and Machine Learning to create an impactful, high value MVP in only 6 weeks.

After considering a shortlist of use cases, lung cancer detection was selected as the project objective.

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Medical Imaging Data

Low-dose computed tomography (CT) scan advantages:

- Low dose CT scans use less radiation
- Low dose CT scans require no injections or dyes
- Scans take less than a minute
- CT scanners are relatively cheap

Neural Networks

Results

Human (trained professional)

- Non-Cancerous Cases: 66%
- Cancerous Cases: 89%

Convolutional Neural Network

- ✓ Non-Cancerous Cases: 69%
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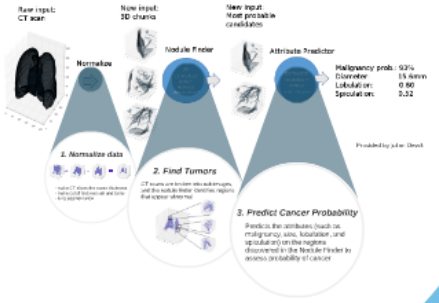
How it Works



Project Approach

1. Understand the methods and reproduce results from Julian and Daniel's model
2. Develop a simple interface to create a diagnostic tool for doctors and radiologists

kaggle

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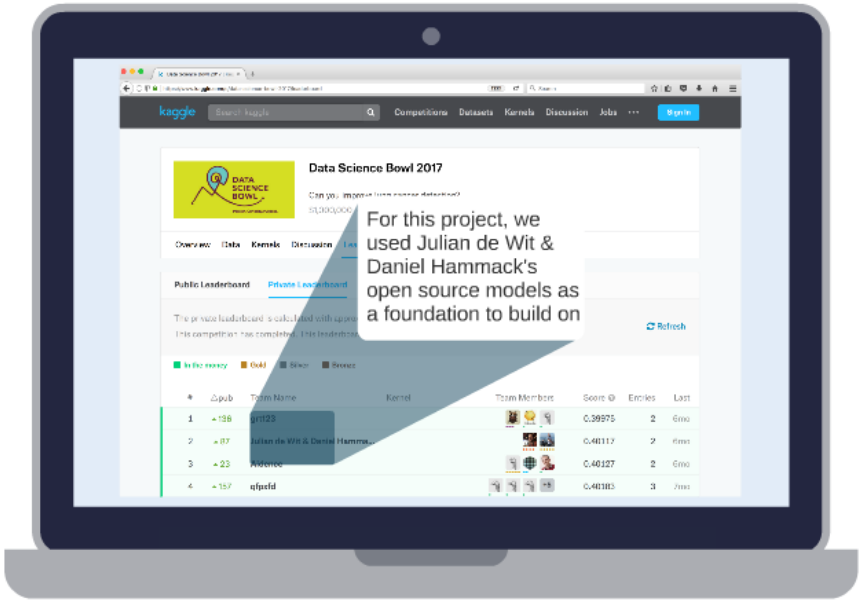

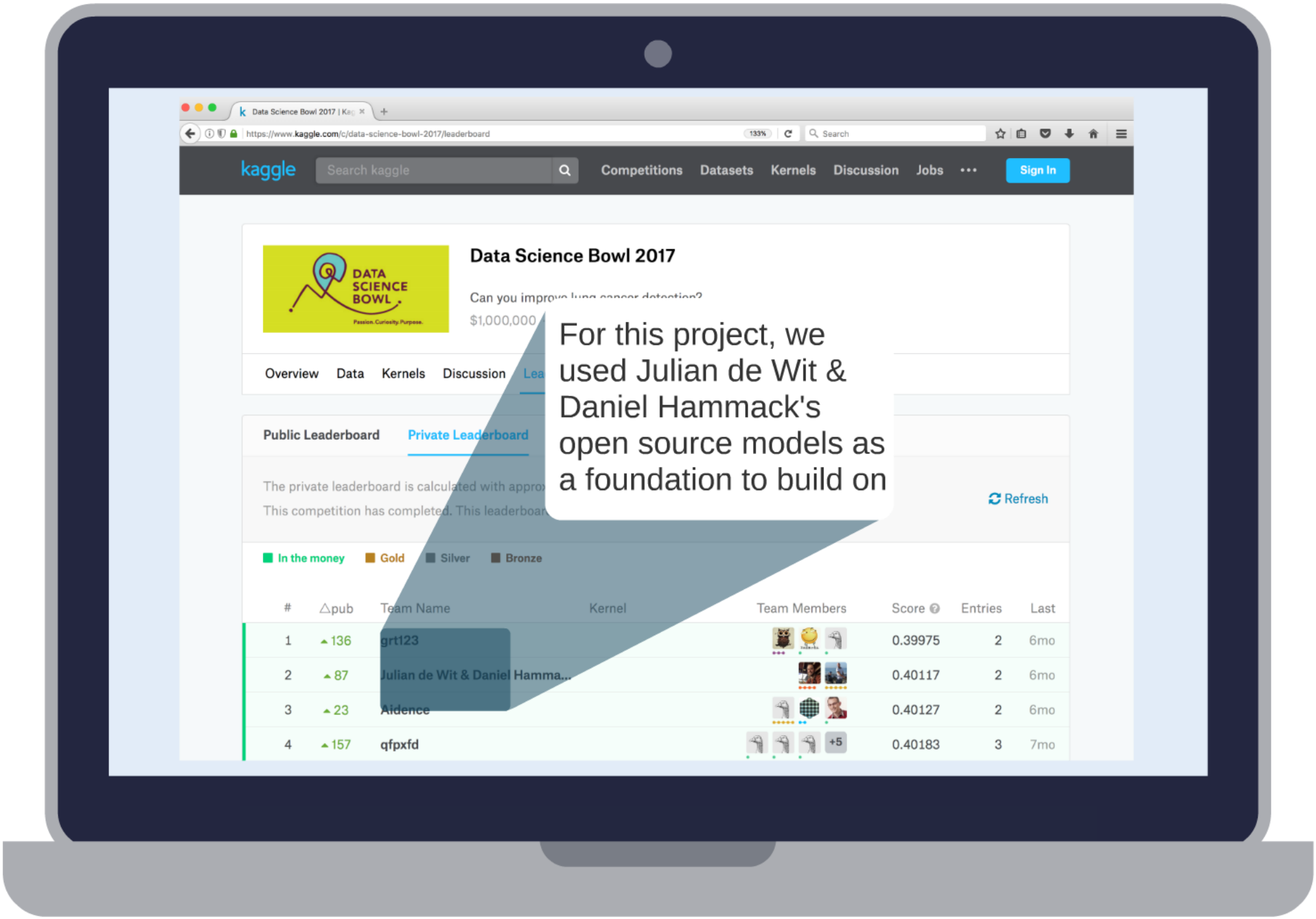
Data Science Bowl 2017 | Kaggle
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Data Science Bowl 2017
Can you improve lung cancer detection?
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Overview
Data
Kernels
Discussion
Public Leaderboard
Private Leaderboard
The private leaderboard is calculated with approx
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Refresh
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Gold
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1 ▲136 grt123 0.39975 2 6mo
2 ▲87 Julian de Wit & Daniel Hamma... 0.40117 2 6mo
3 ▲23 Aidence 0.40127 2 6mo
4 ▲157 qfpxfd +5 0.40183 3 7mo
For this project, we used Julian de Wit & Daniel Hammack's open source models as a foundation to build on

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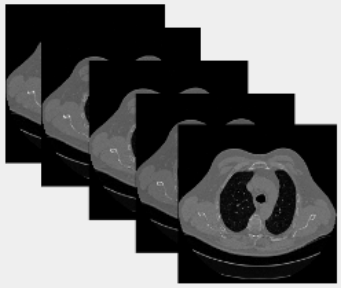
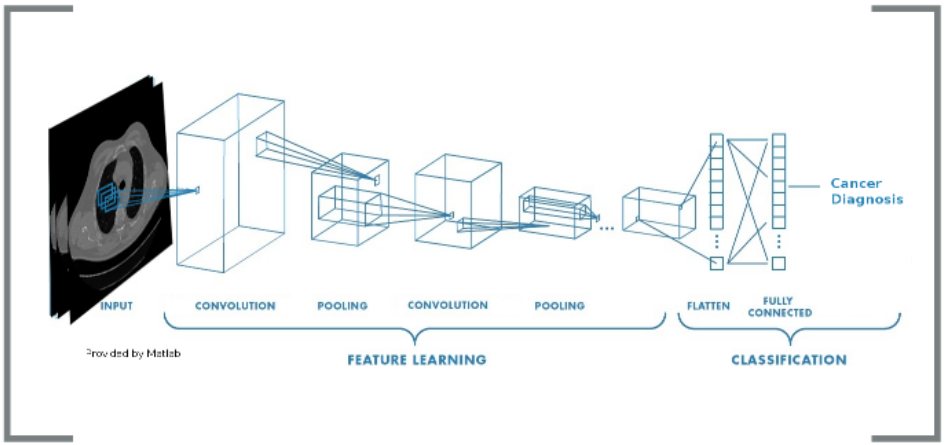
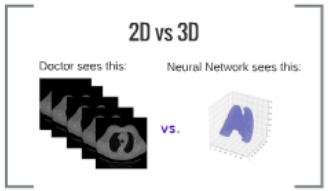
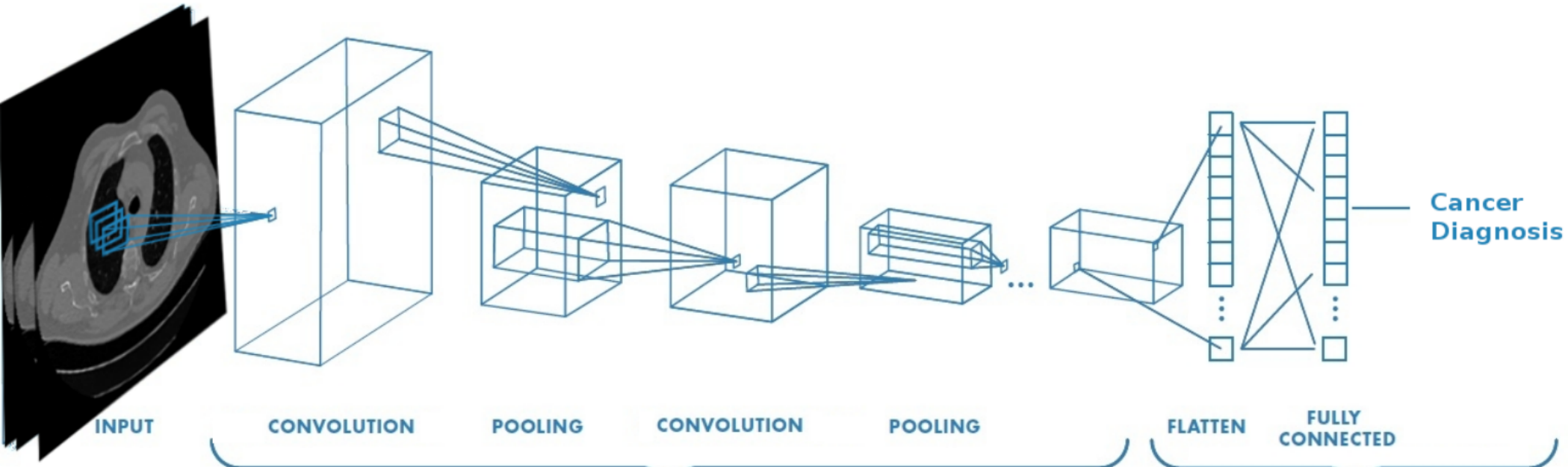


Neural Networks







Provided by Matlab

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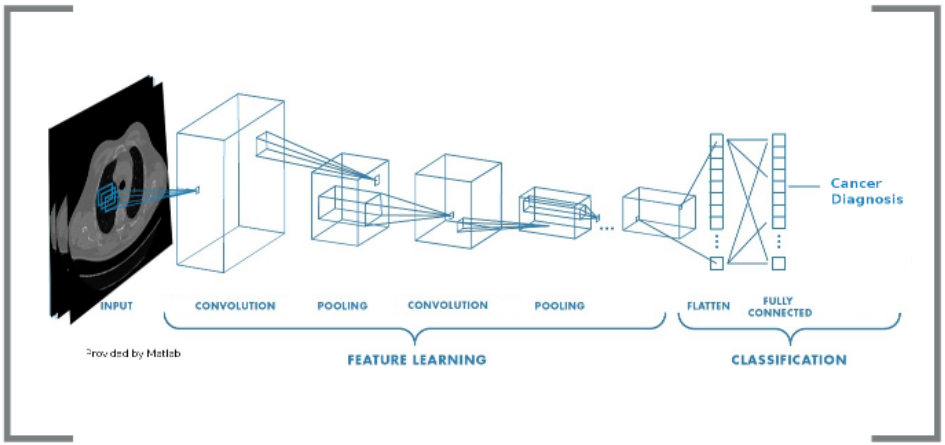
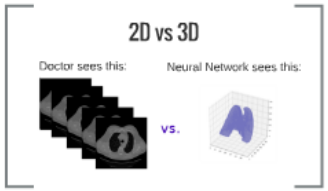
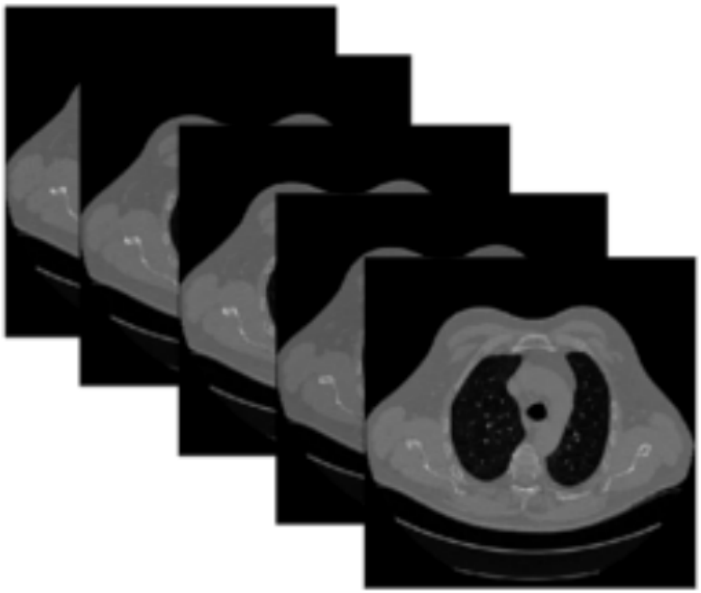




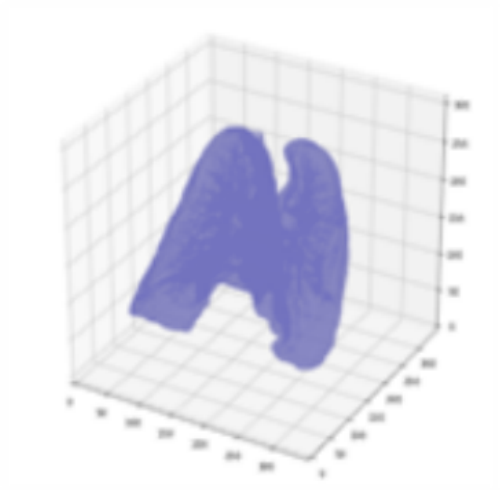
2D vs 3D

Doctor sees this:



vs.

Neural Network sees this:



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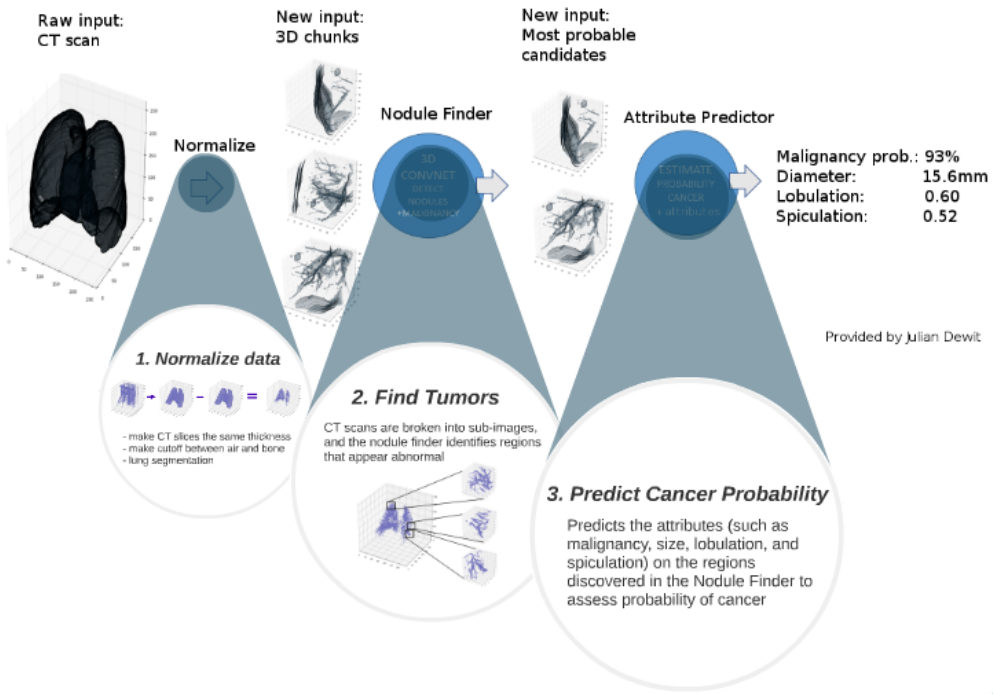
Raw input:
CT scan
Normalize
New input:
3D chunks
Nodule Finder
3D CONVNET
DETECT NODULES +MALIGNANCY
New input:
Most probable candidates
Attribute Predictor
ESTIMATE PROBABILITY CANCER +attributes
Malignancy prob.: 93%
Diameter: 15.6mm
Lobulation: 0.60
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Provided by Julian Dewit
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- make cutoff between air and bone
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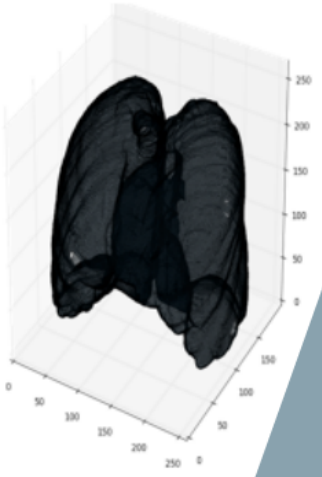

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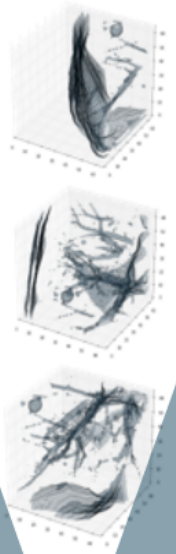

Nodule Finder

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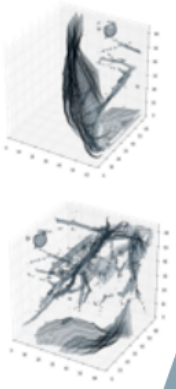

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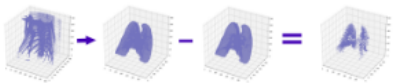

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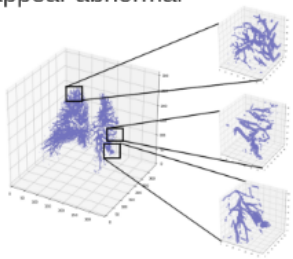

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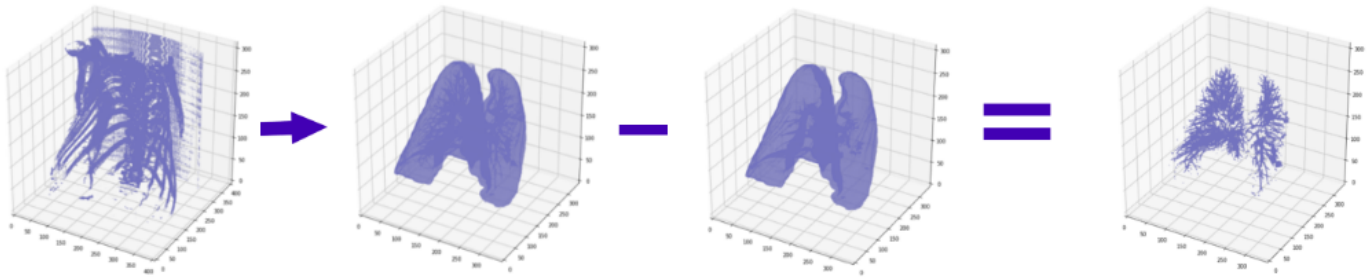

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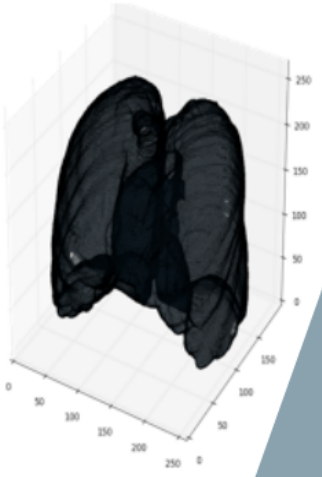

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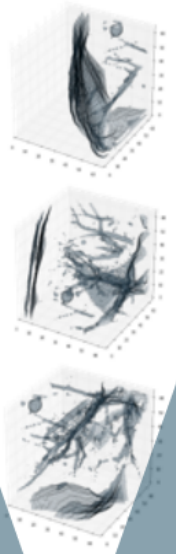

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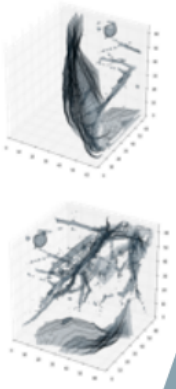

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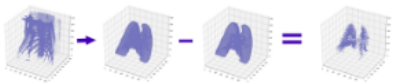

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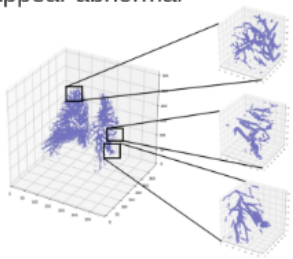

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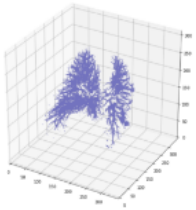

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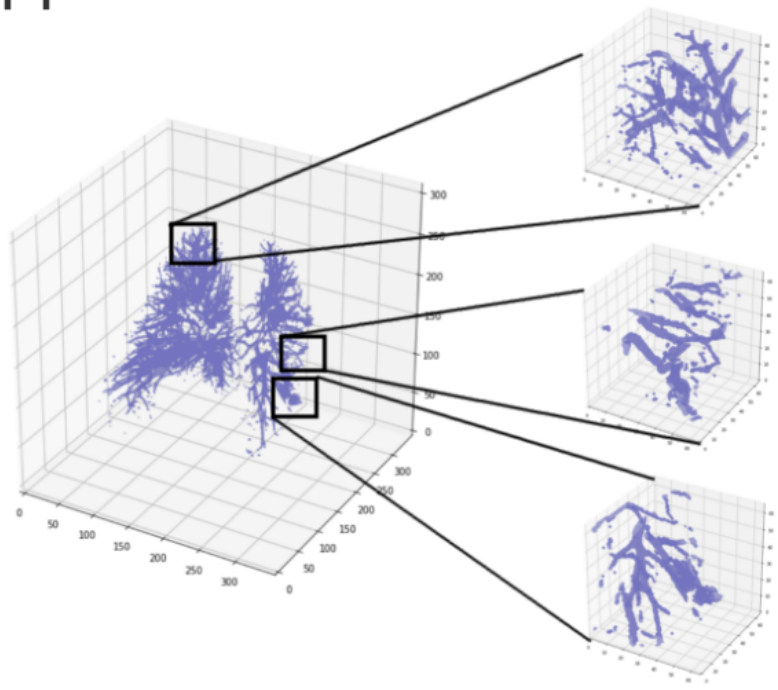

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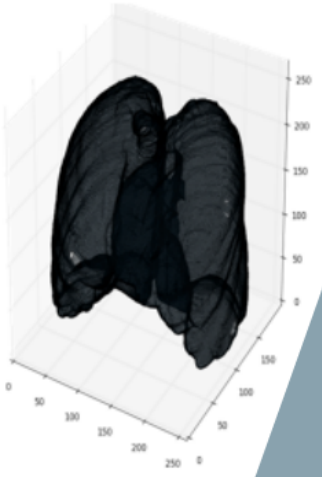

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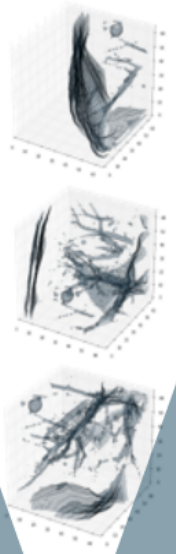

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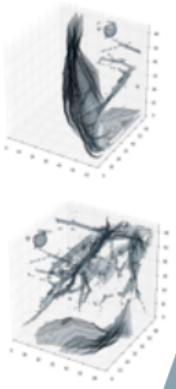

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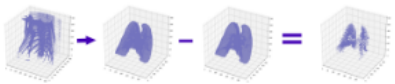

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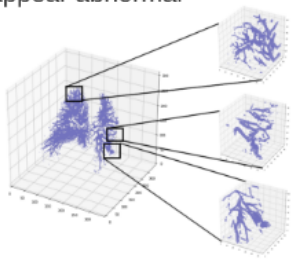

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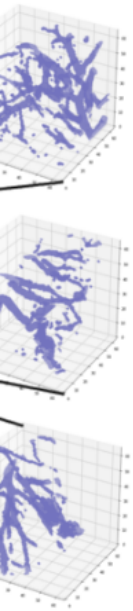

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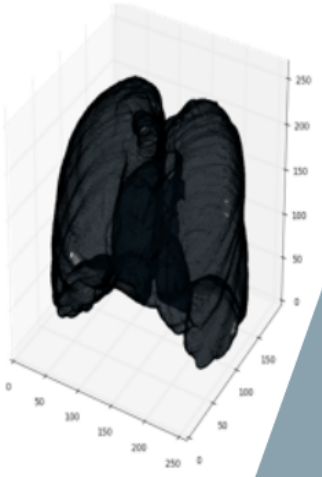

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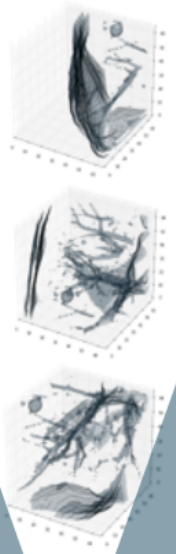

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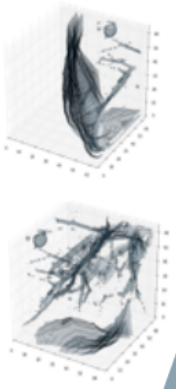

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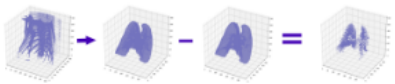

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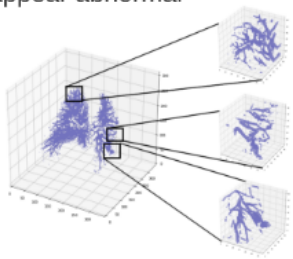

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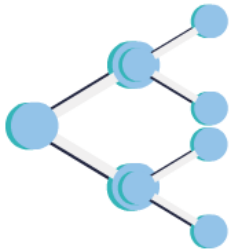

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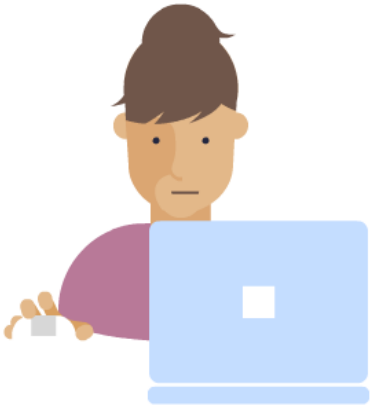

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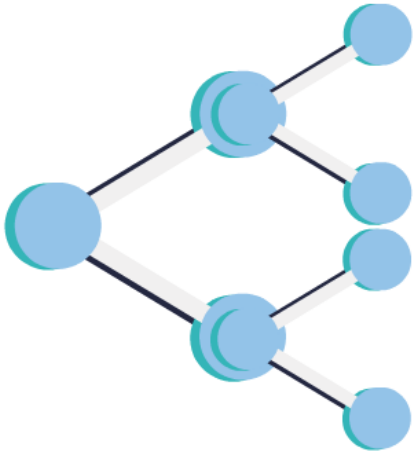

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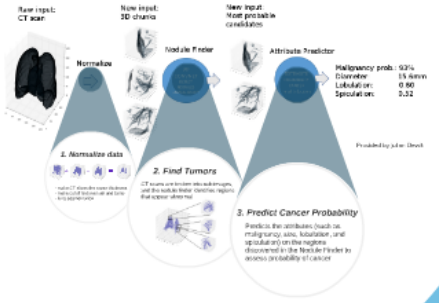

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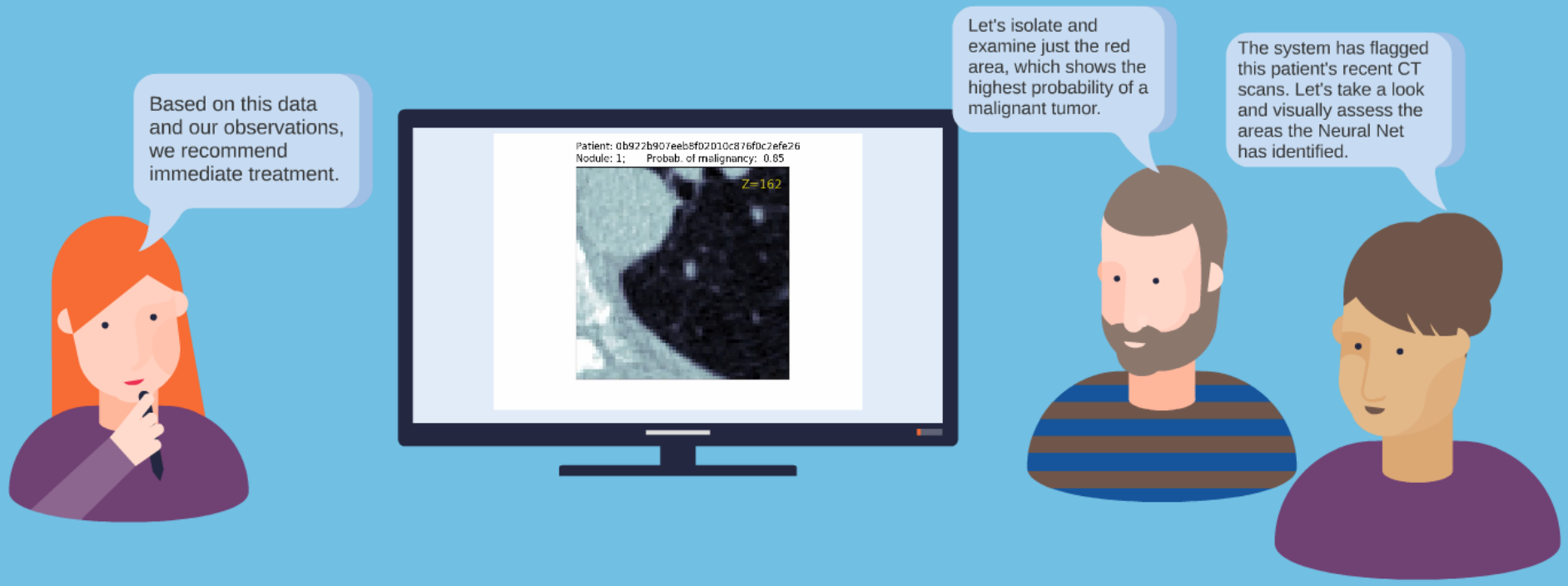
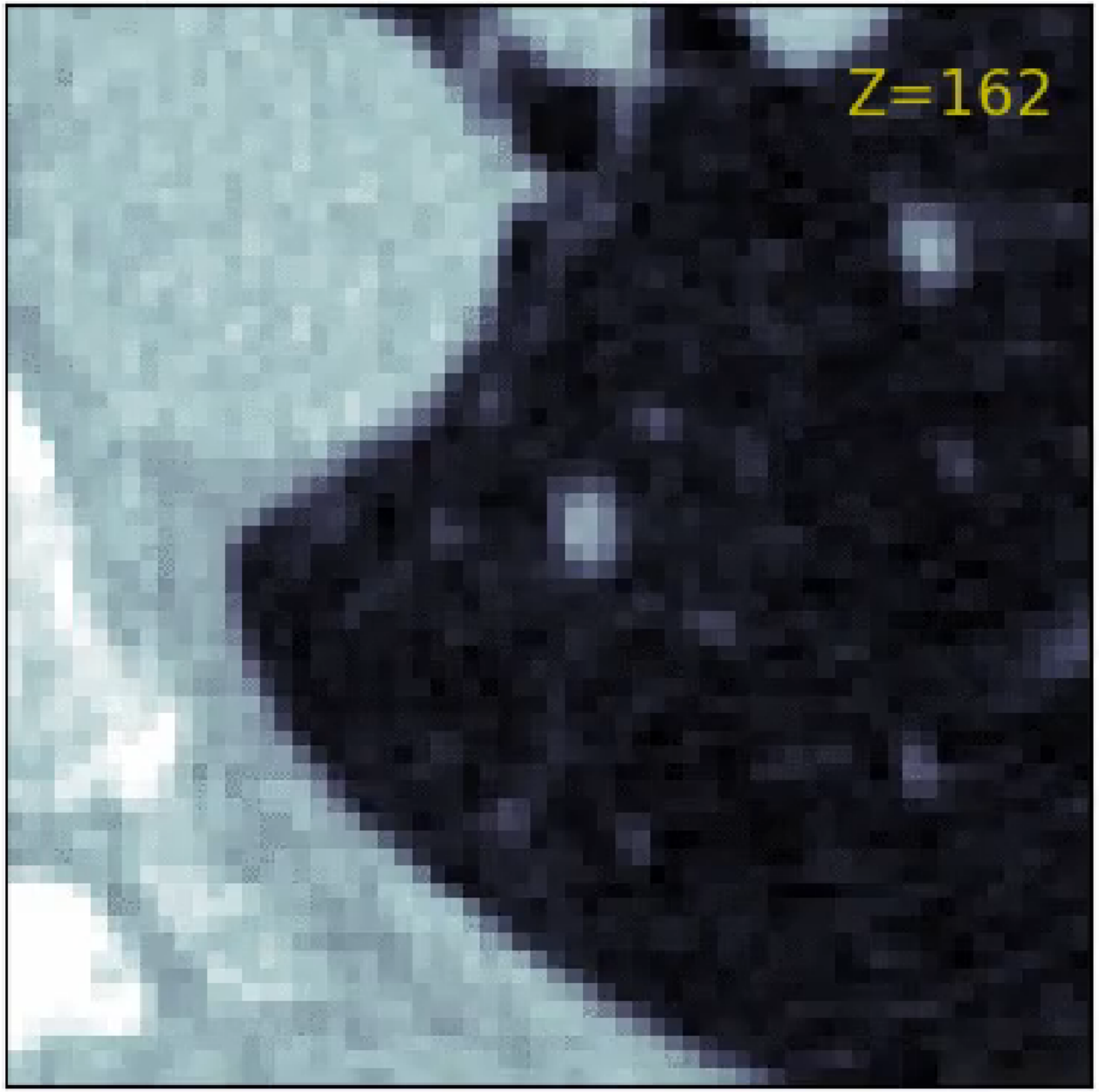
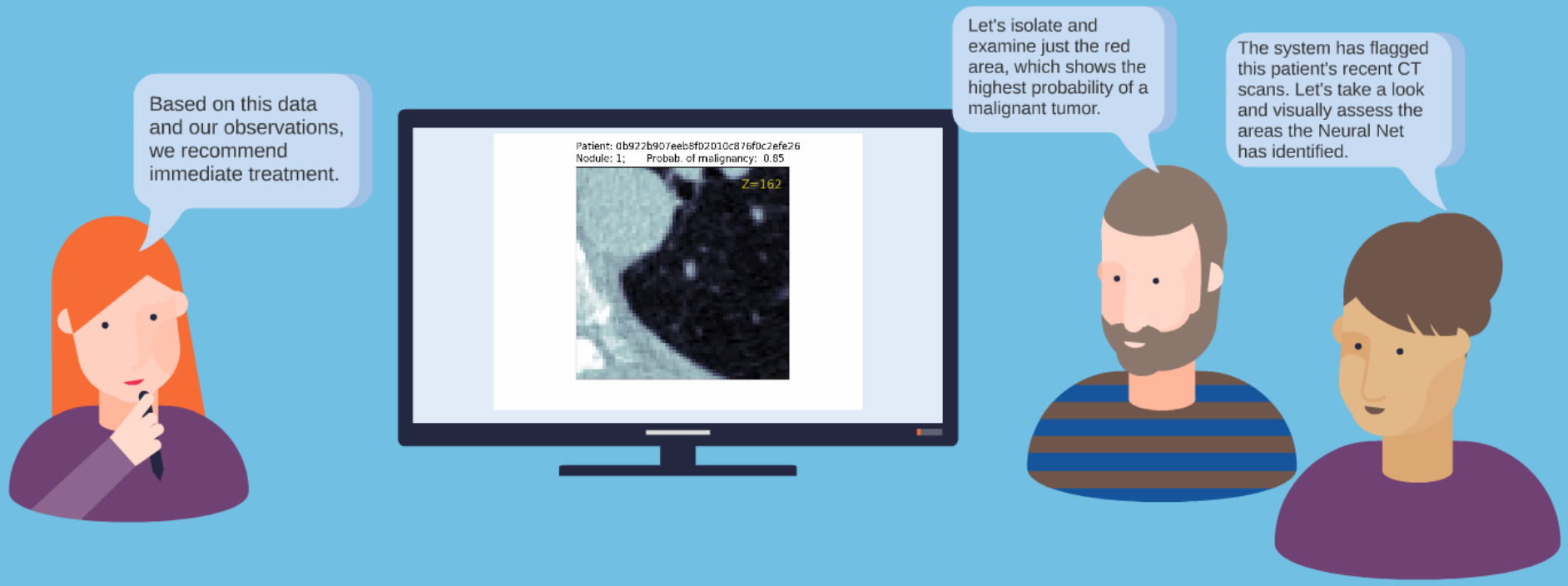


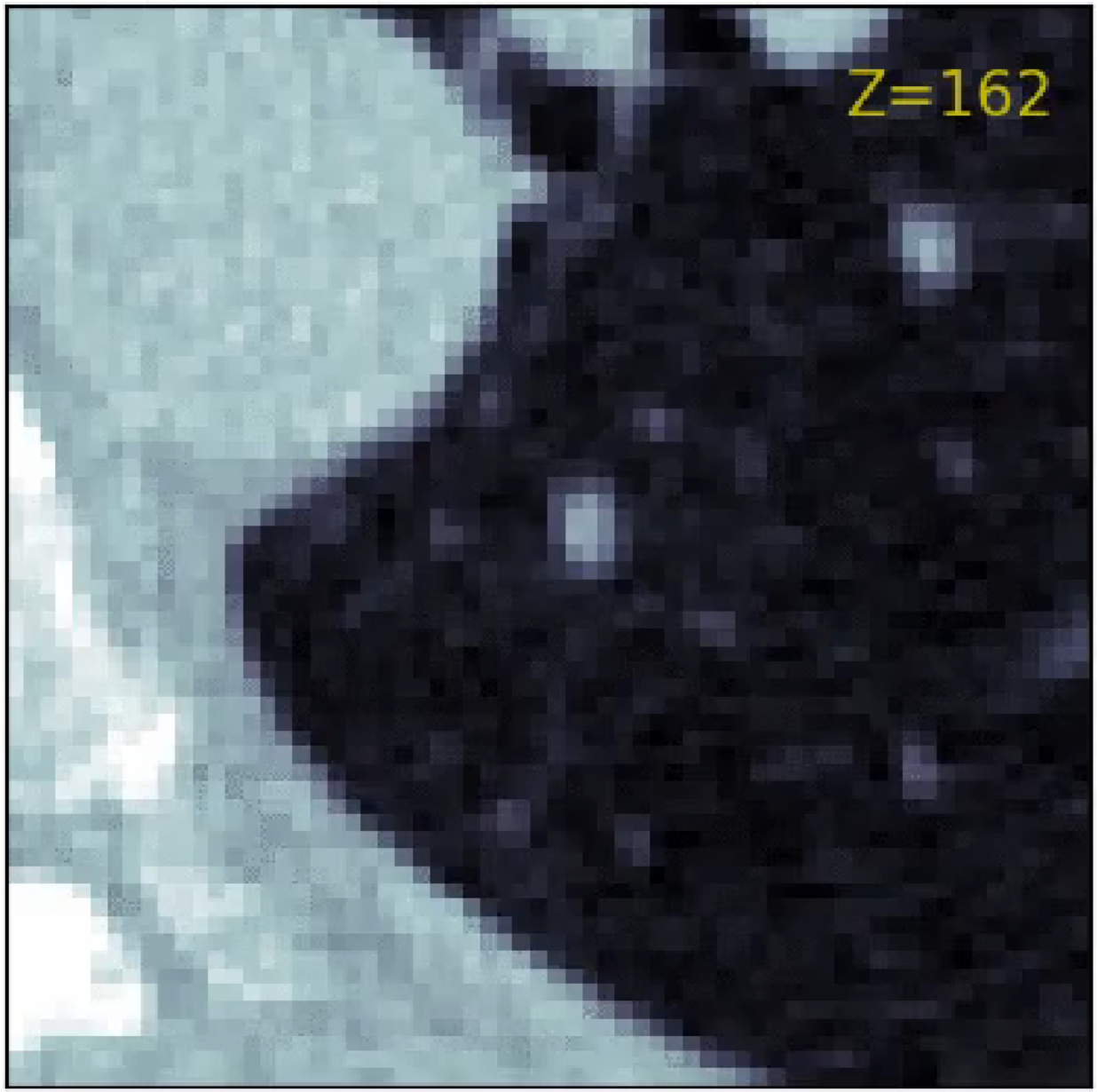
Patient: 0b922b907eeb8f02010c876f0c2efe26
Nodule: 1; Probab. of malignancy: 0.85



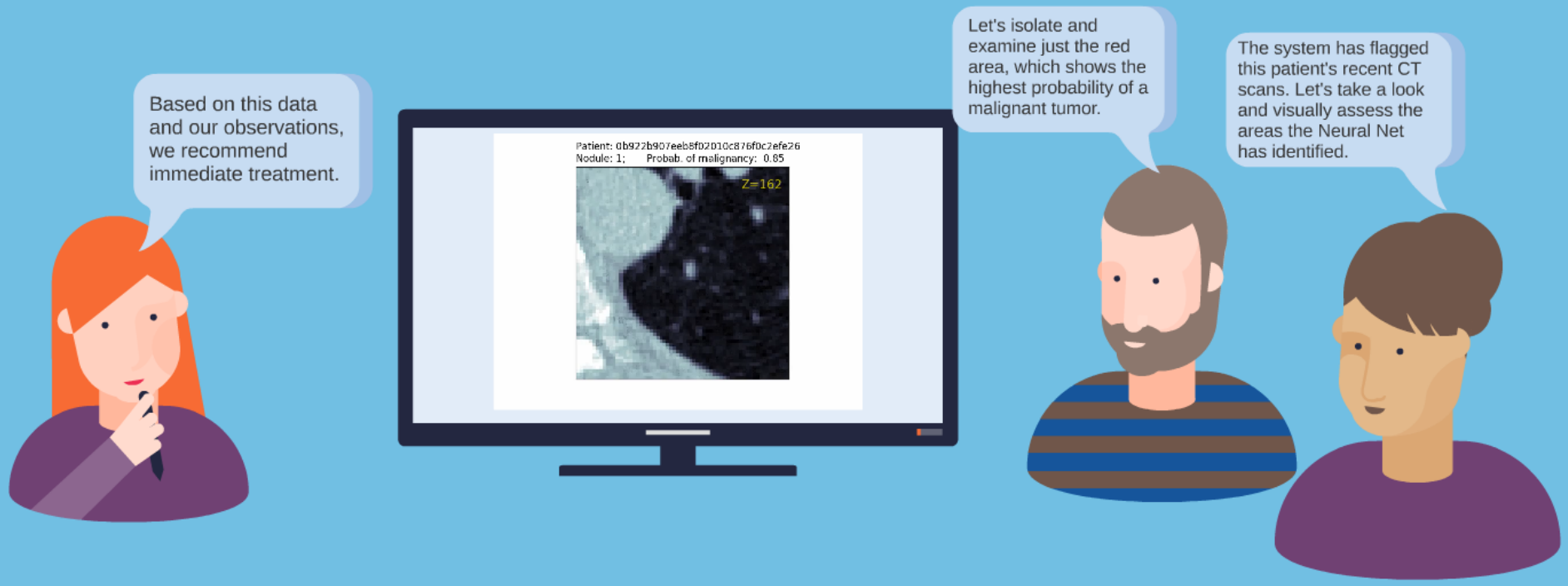
Demo & Use Case



Patient: 0b922b907eeb8f02010c876f0c2efe26
Nodule: 1; Probab. of malignancy: 0.85



Demo & Use Case



Lessons

Impactful Use cases

1

Not all potential use cases are relevant; select important problems and provide actionable insights that would be hard to get without Machine Learning

DEEP Neural Networks

2

State of the art models are getting deeper and deeper.

Data

3

The research and rapid implementation of this project was enabled by large, well-curated data sets.

Flexibility

4

Agility, flexibility, and an R&D mindset enable sucessful outcomes for data-driven, AI-powered projects.


Project Overview
Solution Overview
Demo & Use Case
Lessons
Machine Learning Demo:
Medical Imaging Project

New Technologies for
Canadian Observatories

12.15.2017 AGM

LimbicConsulting