The new era of smart AI based diagnostics – an example of endoscopic decision support system

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Dr. Dror Zur, Magentiq Eye LTD, August 2018

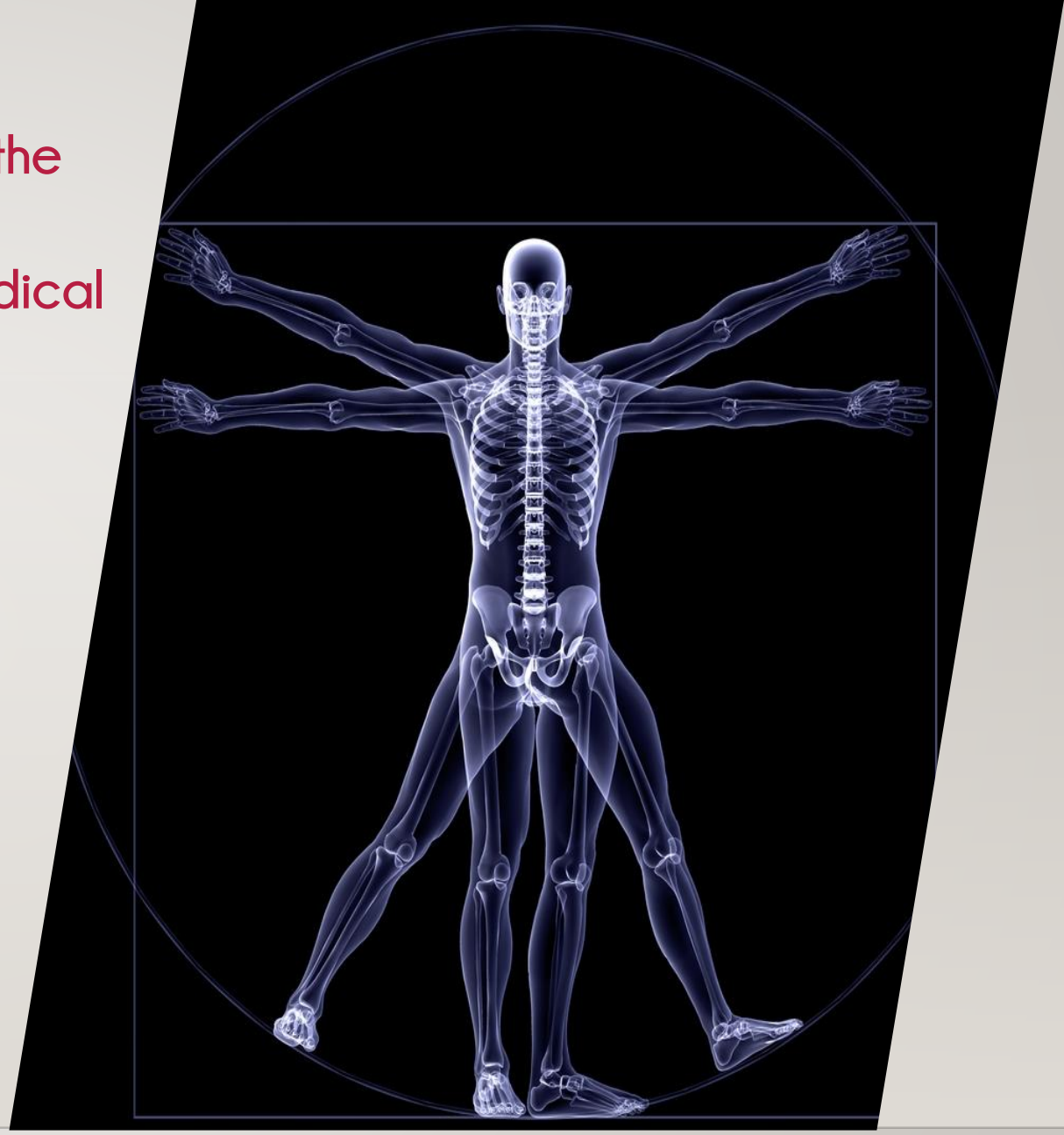
www.magentiq.com

Diagnostics

- Generally: the process of determining which disease or condition explains a person's symptoms and signs
- More specifically: an attempt at classification of an individual's condition into separate and distinct categories that allow medical decisions about treatment and prognosis to be made

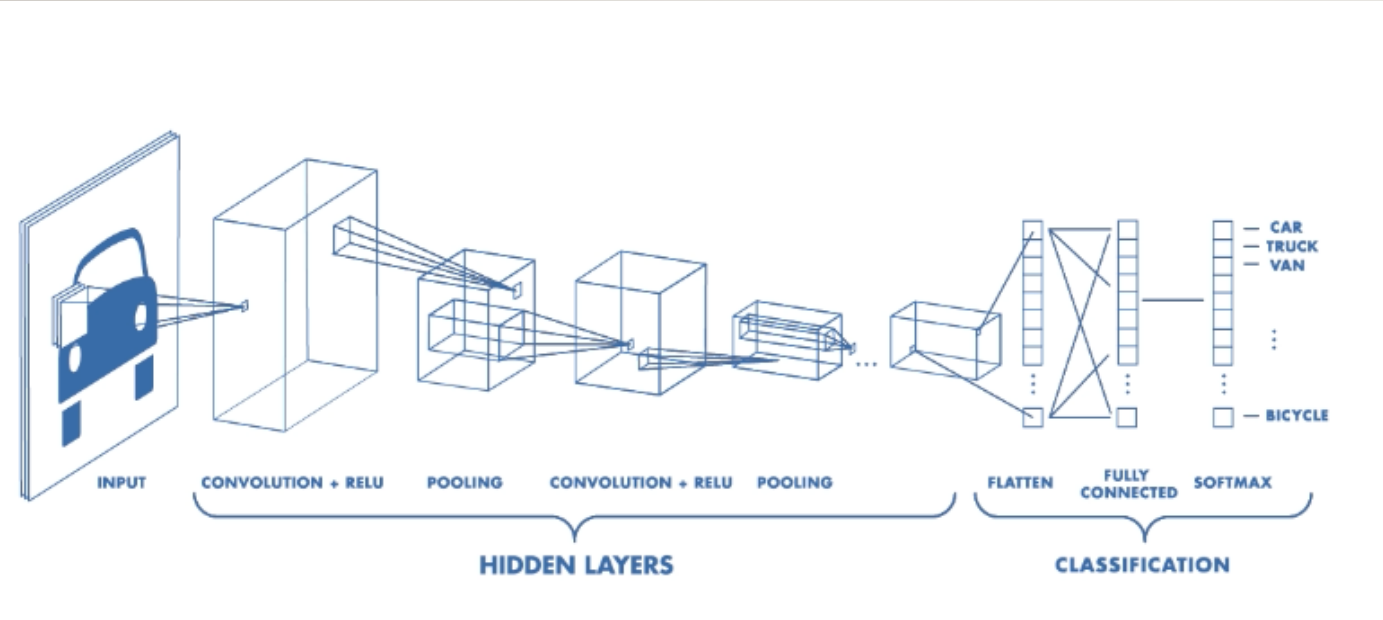
Medical (Diagnostic) Imaging

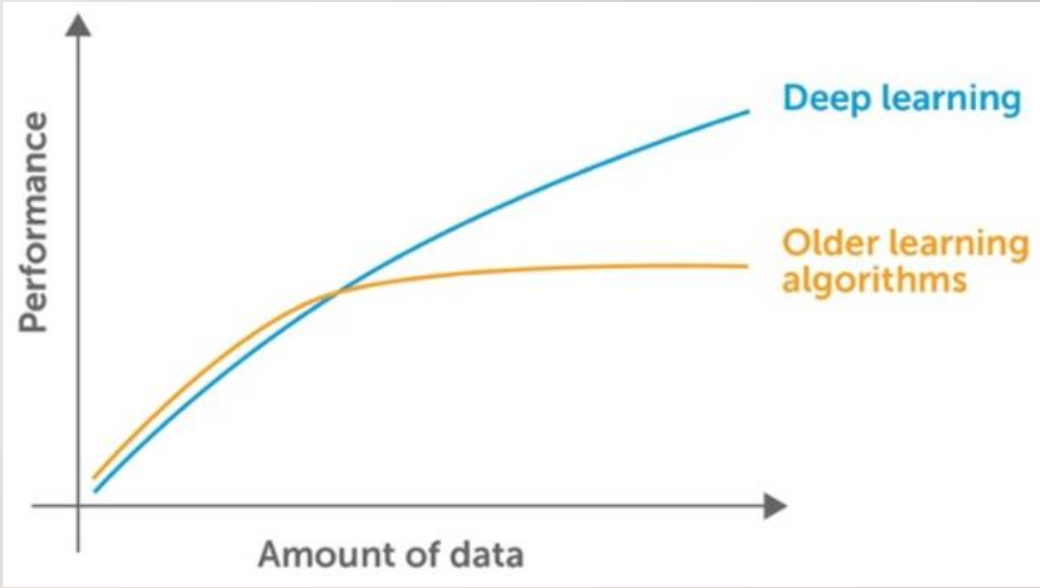
- process of creating visual representations of the interior of a body for clinical analysis and medical intervention
- Examples:
  - X-Ray
  - CT
  - MRI
  - Ultrasound
  - Endoscopy



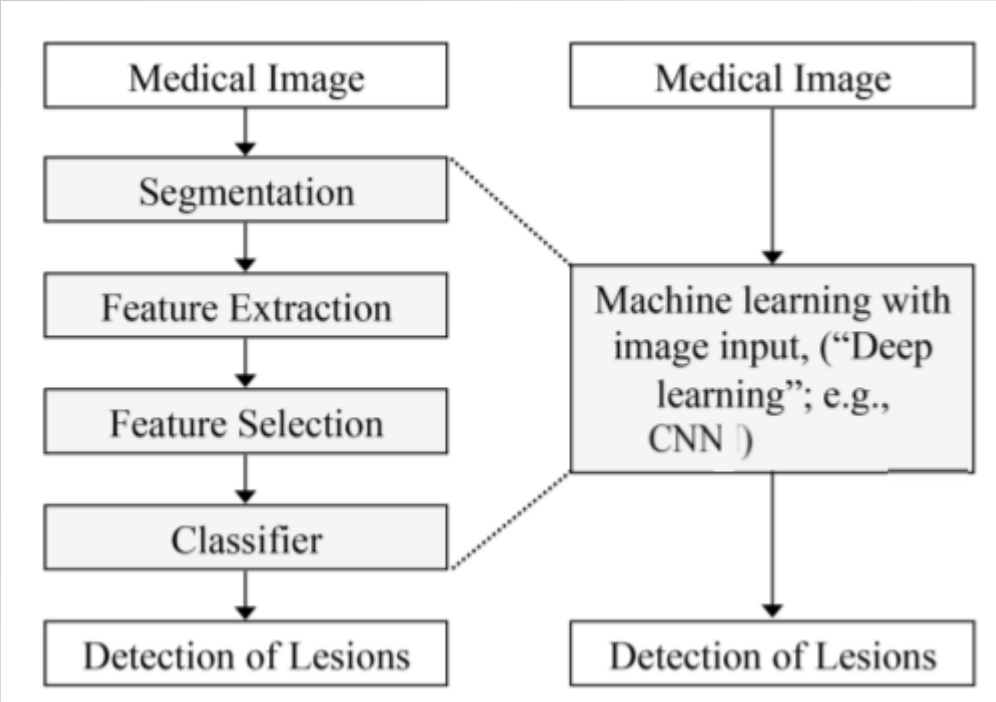
Artificial Intelligence (AI), Deep Learning, and Neural Networks

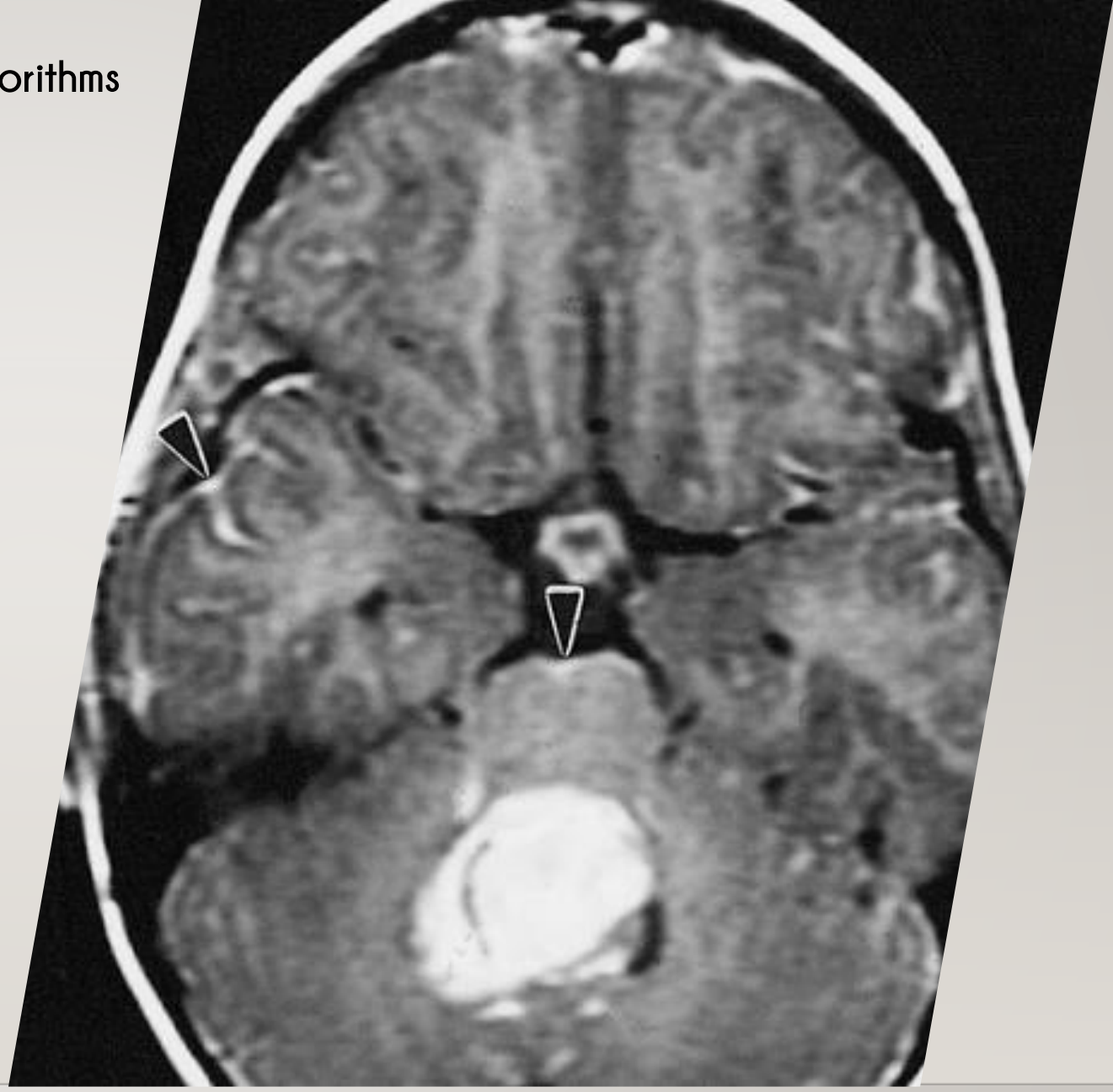
- Incredibly exciting and powerful machine learning-based techniques used to solve many real-world problem by using Big amount of Data





Deep Learning vs. other Learning or Classification Algorithms
Lesion Detection Example



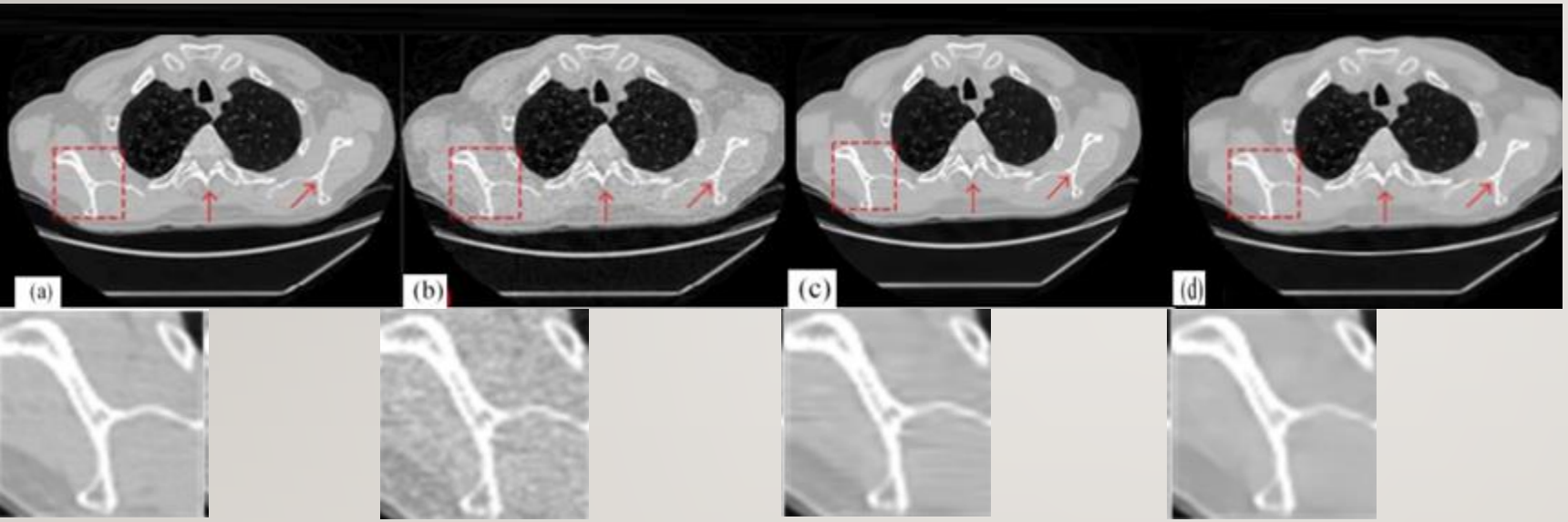


The Use of Deep Learning in Diagnostics

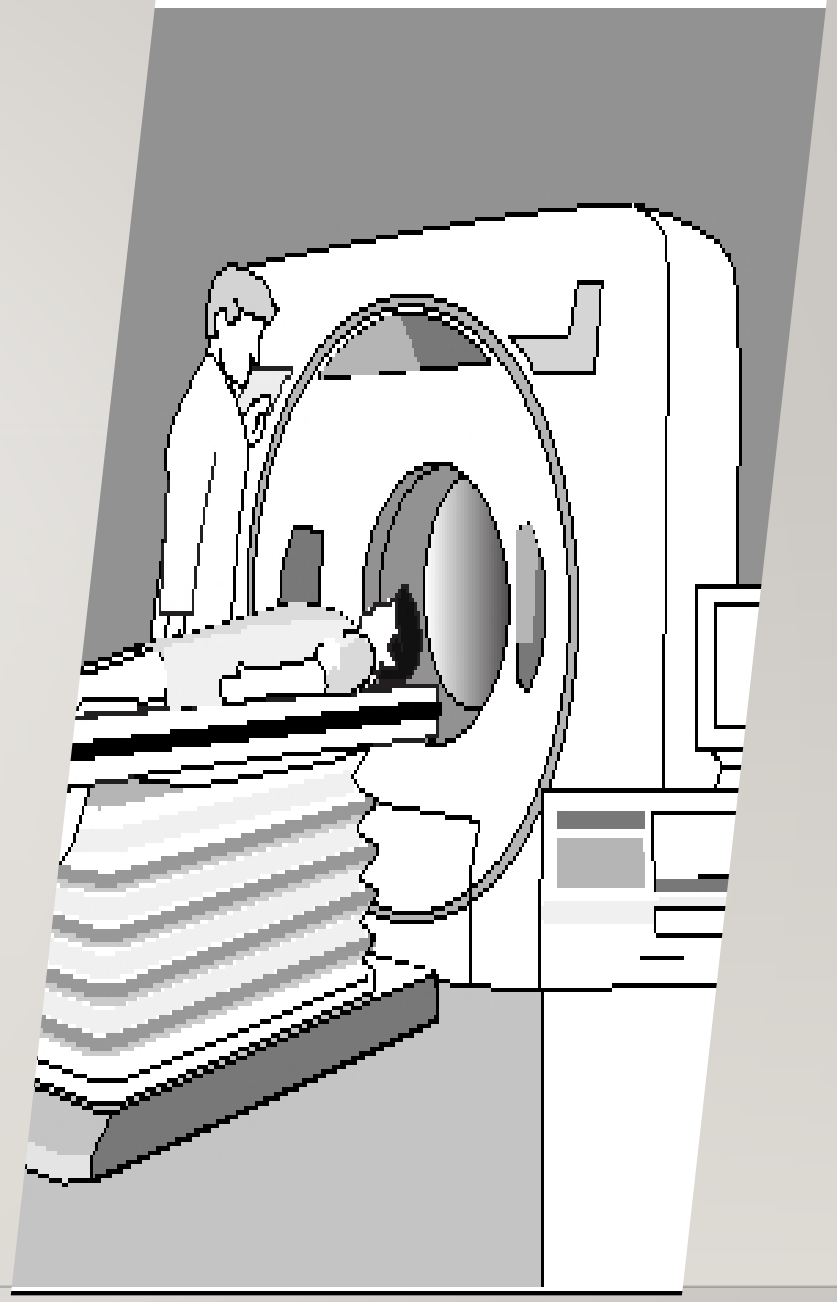
- Deep learning algorithms get better at diagnosing the same way physicians do: with practice (learning on big data),
- With nowadays available computational power their capabilities are getting more and more unlimited

Deep Learning in Medical Imaging

- CT Example: Low dose CT Processing

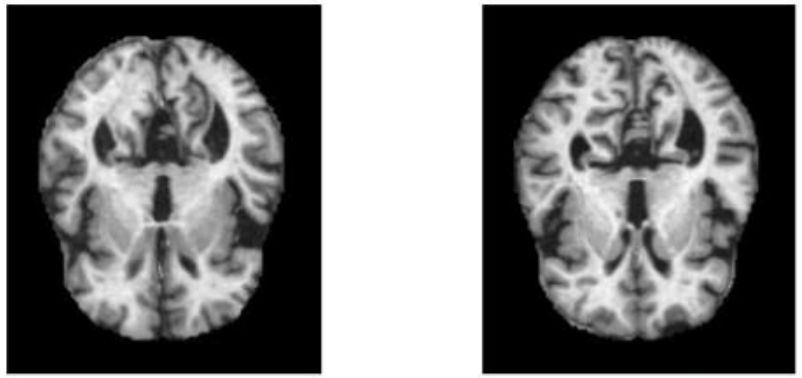


Low-Dose CT via Deep Neural Network Hu Chen,Yi Zhang, Weihua Zhang , Peixi Liao , Ke Li, Jiliu Zhou, Ge Wang



Deep Learning in Medical Imaging

- MRI - Early Alzheimer Detection



(a) (b)

Fig. 1. Images from the OASIS dataset (a) AD. (b) HC.

TABLE I

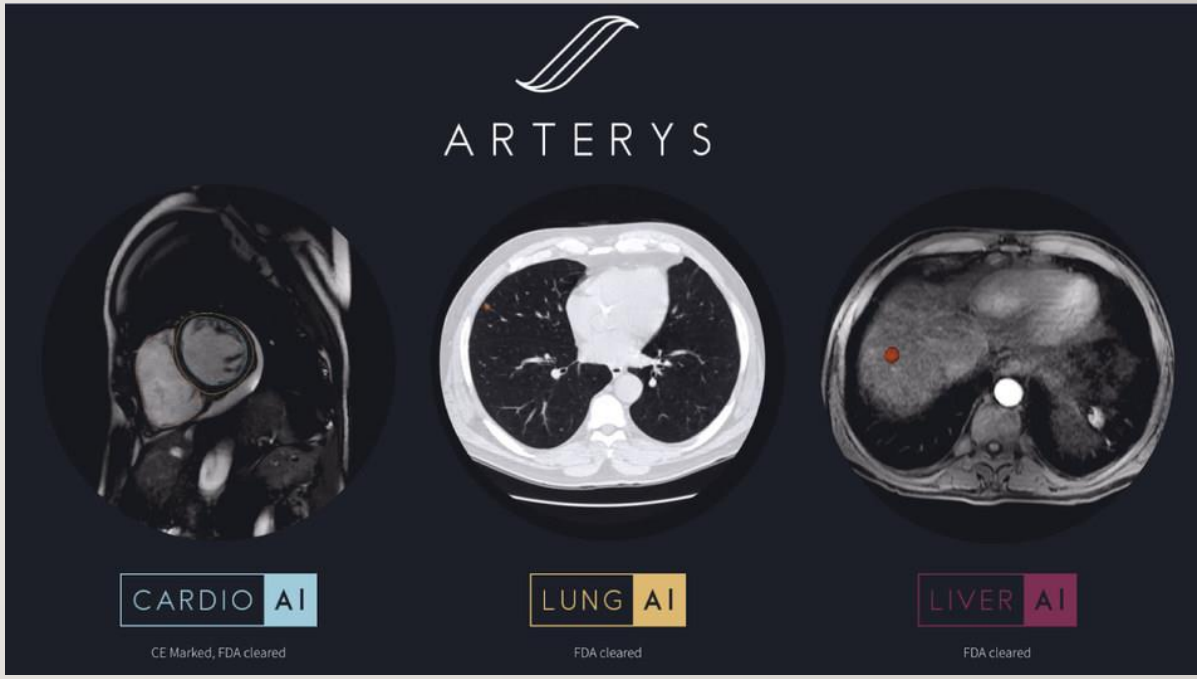
TESTED MODELS AND CORRESPONDING AVERAGE ACCURACY FROM 5-FOLD CROSS-VALIDATION. STANDARD DEVIATION OVER THE 5 FOLDS IN BRACKETS.

Model	Avg. Acc. (st. dev.) (%)
VGG16 (from scratch)	74.12 (1.55)
VGG16 (transfer learning)	92.3 (2.42)
Inception V4 (transfer learning)	96.25 (1.2)

Towards Alzheimer's Disease Classification through Transfer Learning
Hon M., Khan N.M.

Deep Learning in Medical Imaging - Regulatory Approved

- Example (2/18) : Arterys Receives First FDA Clearance for Broad Oncology Imaging Suite with Deep Learning - FDA clearance covers all solid tumors. Initial launch will include Liver AI and Lung AI oncology software to empower clinicians to quickly measure and track lesions and nodules in MRI and CT scans



Deep Learning in Medical Imaging

- Ultrasound
  - Less data available
  - The modality is highly noisy
  - Less work is done
- Endoscopy
  - Much less data is available
  - Much less work is done

Deep Learning in Medical Imaging

- Endoscopy
  - Much less data is available
  - Much less work is done
  - The need exists

Magentiq Eye - The Vision

To be a major player in the efforts of cancer prevention and patients' life saving by improving the diagnostics in endoscopic procedures using machine deep learning and computer vision technologies

- Colorectal cancer is the third most common cancer
- About 30% of the polyps are missed
- Half of these misses appear in the video screen
- Every missed polyp can cause Interval Colon Cancer

The Problem: Colon Polyp Detection Miss Rate

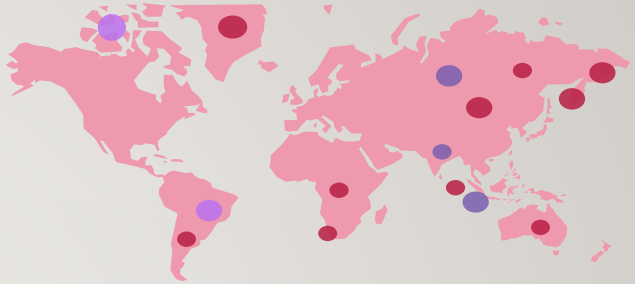
The Market

20M tests per year

USA

10M tests per year

Europe

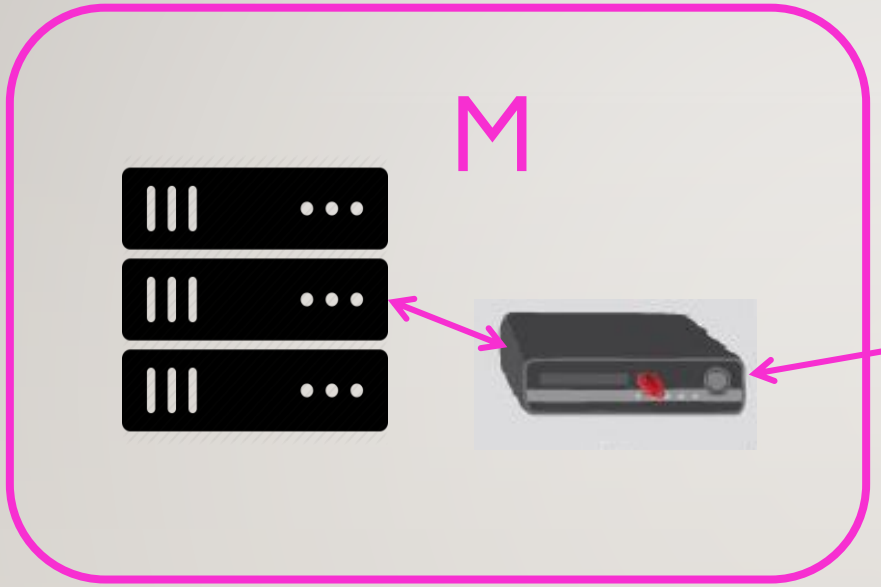


10M tests per year

Rest of the Word

- The Global GI Endoscopic Market Rolled $4.9B in 2016 (source: iData Research)
- 40M colonoscopy test per year
- Rapidly Growing Market:
  - Population over 50 increases
  - Awareness getting higher
  - # of tests increased by 33% since 2012

The Solution: the Automatic Polyp Detection system (APDS)

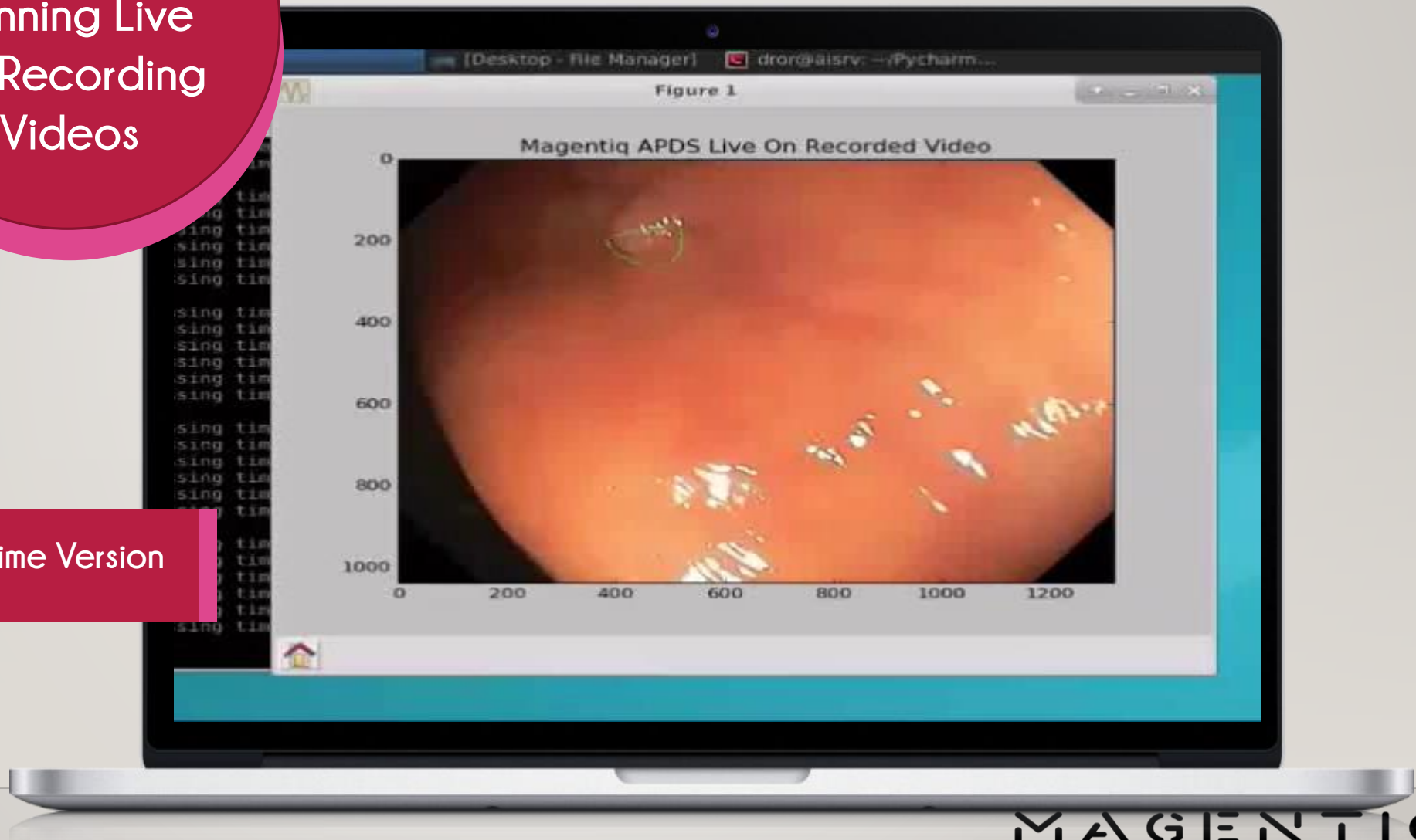


The Common Setup

Deep Learning & Computer Vision & Realtime Analysis

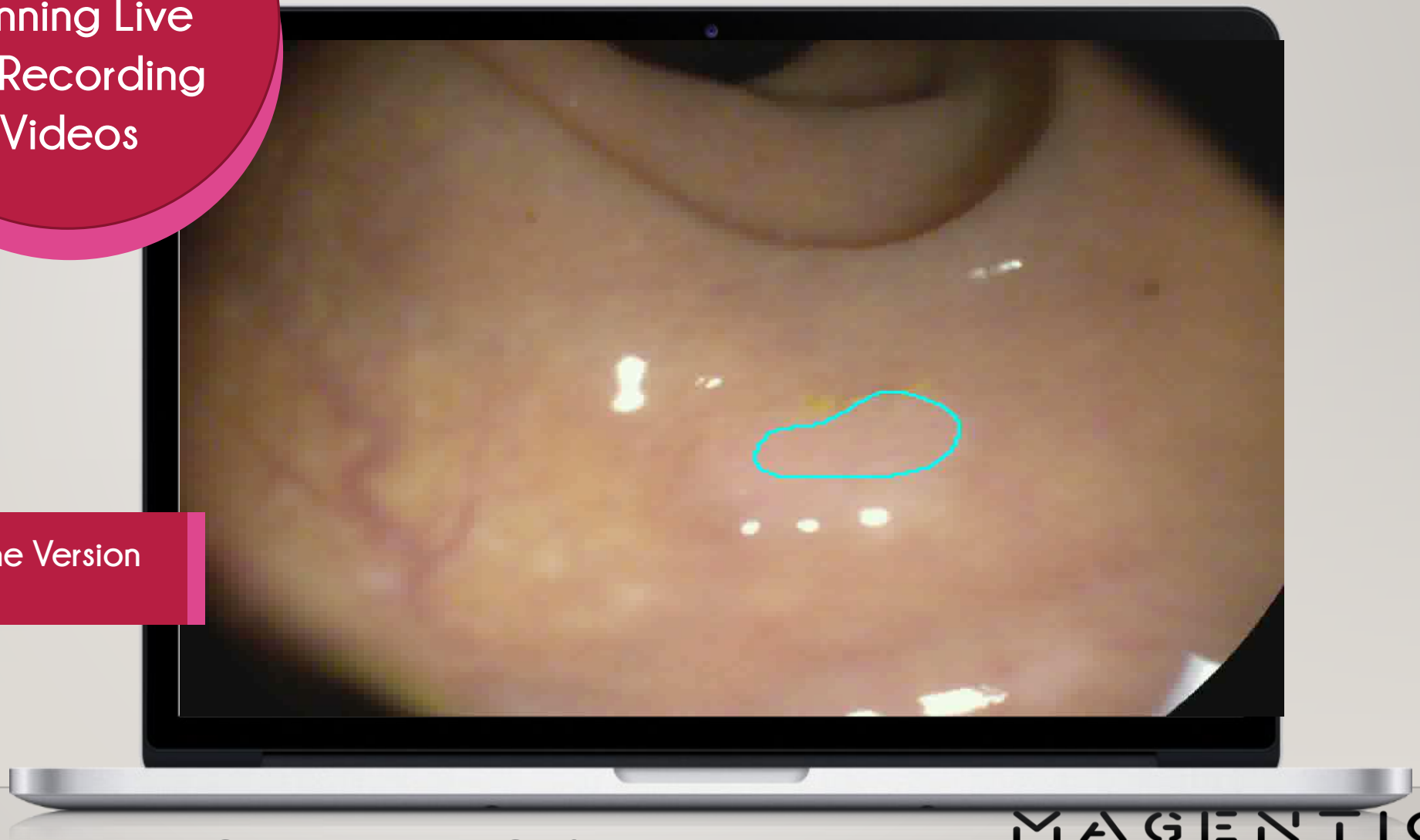
Grabbing (video frame) ->Analysing -> Detecting ->Highlighting (Polyp)

The APDS Prototype Running Live on Recording Videos



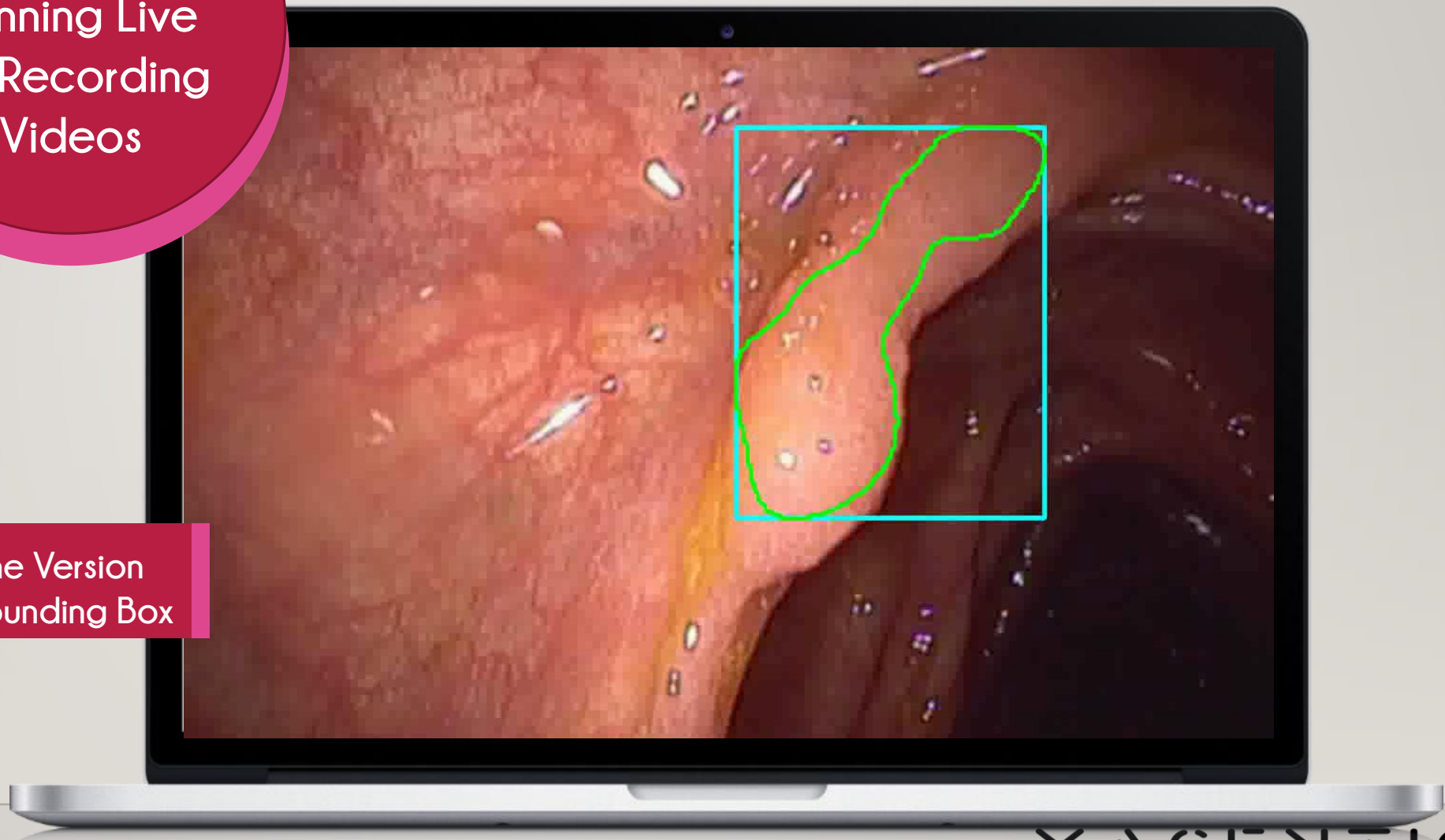
Real-time Version

The APDS Prototype Running Live on Recording Videos

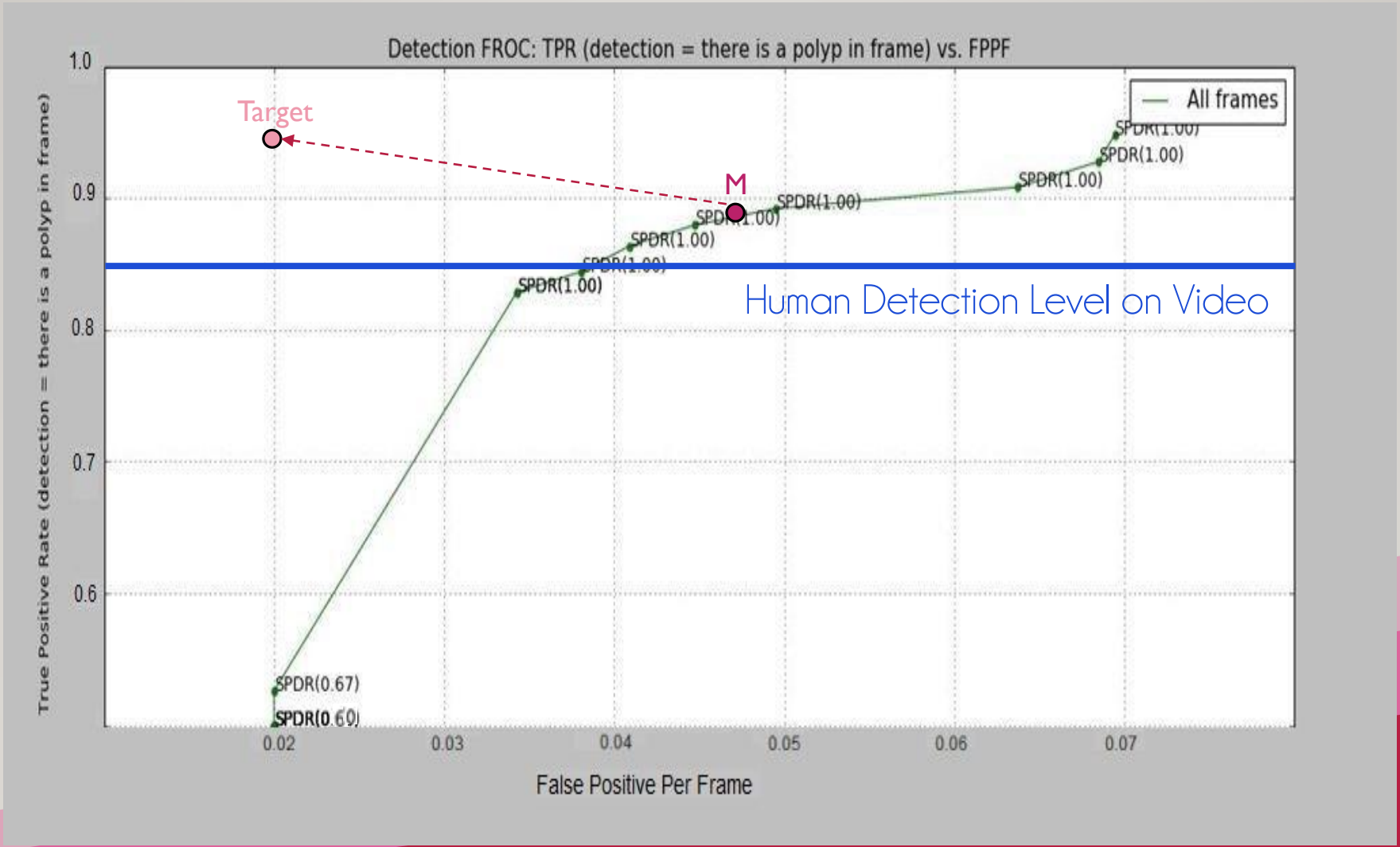


Offline Version

The APDS Prototype Running Live on Recording Videos



Offline Version with Bounding Box



- Magentiq: 88% sensitivity with 95% specificity on current data
- Target: 95% sensitivity with 98% specificity on full data

NVIDIA
INCEPTION PROGRAM

IBM PartnerWorld

intel
The Intel for Startup Program

Microsoft BizSpark
NETWORK PARTNER

MAGENTIQ
SEE BEYOND THE VISIBLE