

MGH & BWH CENTER FOR  
**CLINICAL DATA SCIENCE**

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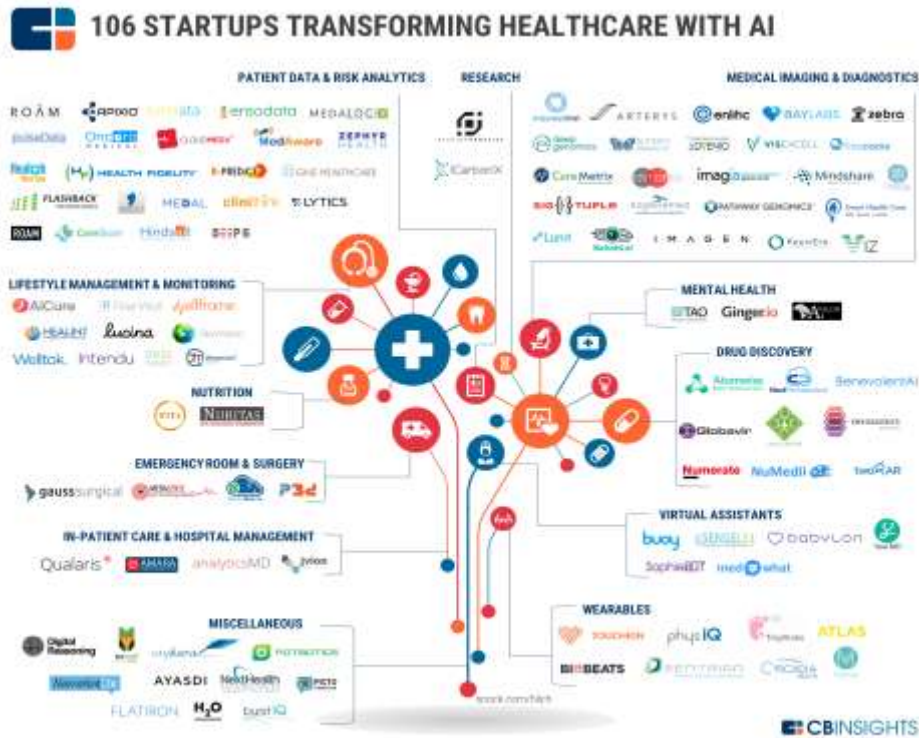
**AI in radiology: more standardization is key!**

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**Machine Learning Scientist**

**AIMed conference - June 18, 2019**



# AI in radiology, why is it taking so long?



- We have the data!
- We have the experts!
- We have algorithms!

# Developing and deploying are challenging!

## Development challenges

- Access to data
- Performance evaluation
- Building trust to the end-user
- Maintenance

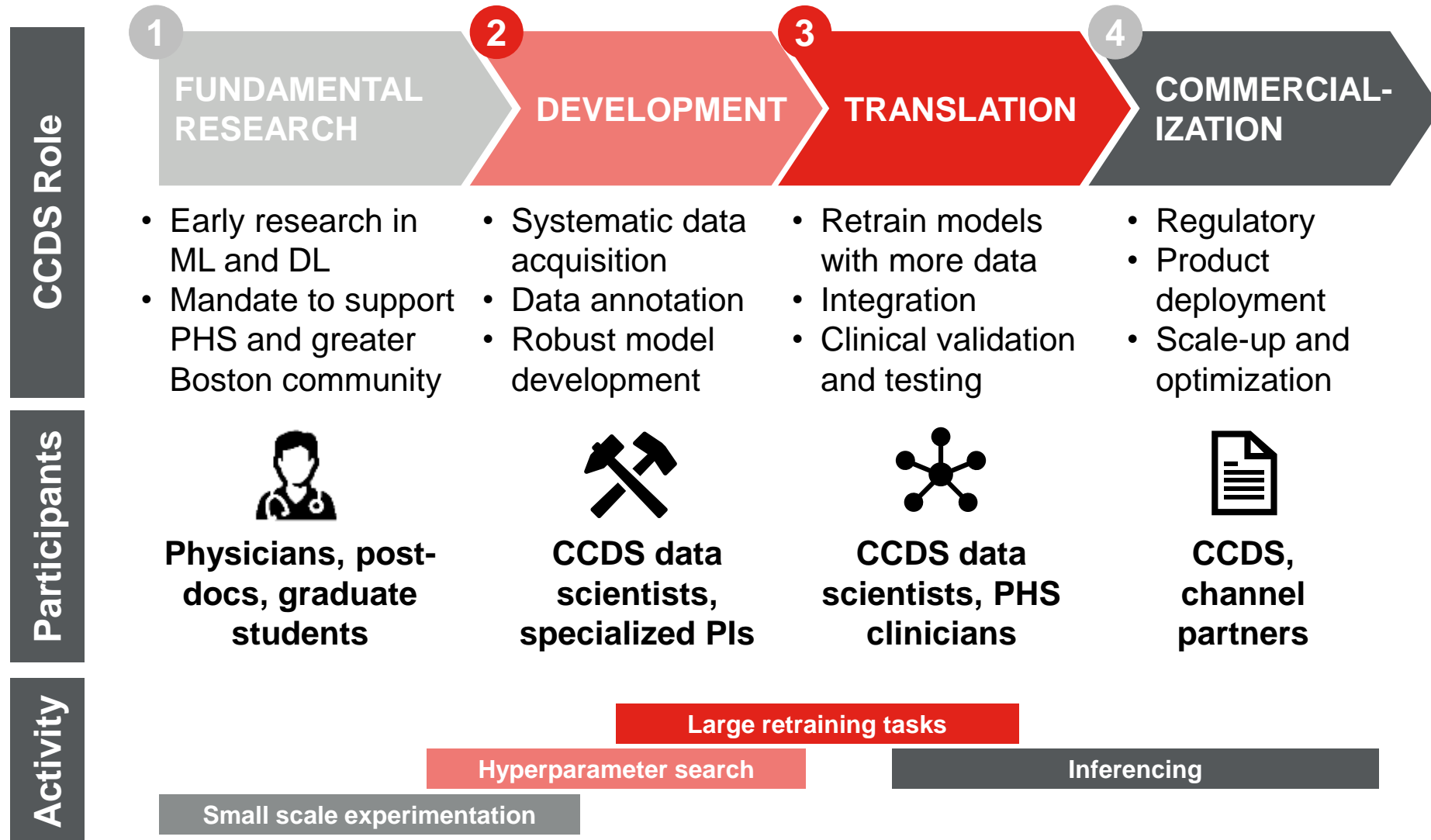
## Deployment challenges

- Healthcare IT is not designed for AI
- Significant inertia of the hospital IT systems

<b>Type of exam:</b>	MR-Lumbar spine w/o contrast.
<b>Date of birth:</b>	DELETED FOR ANONYMITY.
<b>History:</b>	Backpain.
<b>Findings:</b>	<p>At the L5-S1 level, there is a 6mm right paracentral disc herniation indenting the anterior aspect of the thecal sac and impinging on the right S1 nerve root in the recess. The neural foramina are patent.</p> <p>The L4-5, L3-4, L2-3, L1-2, and T12-L1 levels show no evidence of disc herniation or spinal stenosis. The neural foramina are patent.</p> <p>The conus and cauda equina are normal.</p> <p>The paravertebral soft tissues are normal.</p> <p>No fracture or dislocation is identified.</p>

Medical reports are rarely standardized and key information may be difficult to extract

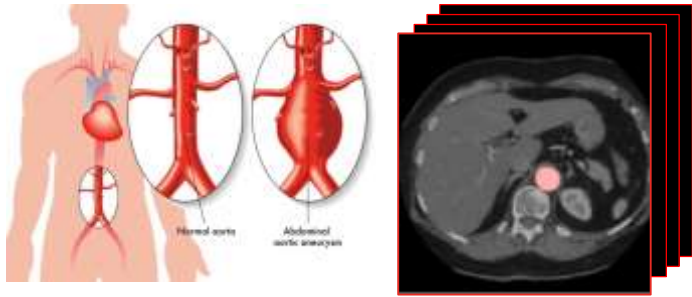
# CCDS is making AI a reality for the clinicians



# A few projects at CCDS

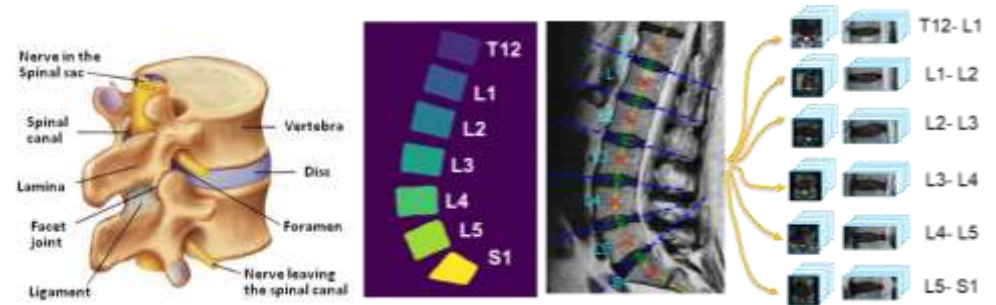
## AAA incidental finding

- Aortic aneurysm detection in CT w and w/o contrast



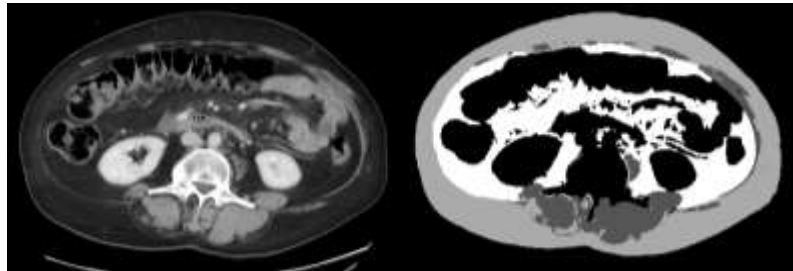
## DeepSpine

- Automated stenosis grading



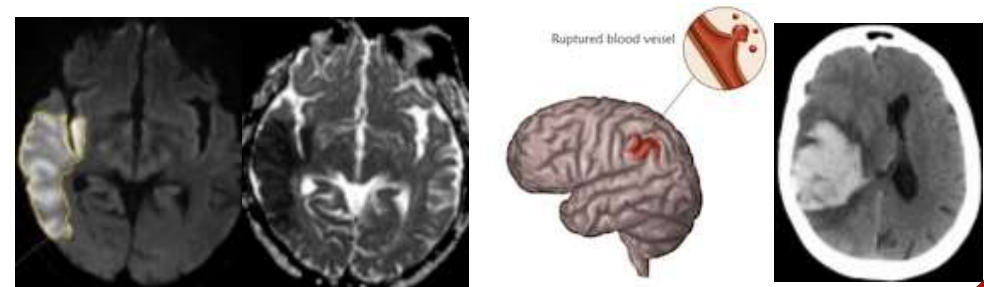
## Body composition

- Fat and muscles segmentation in CT

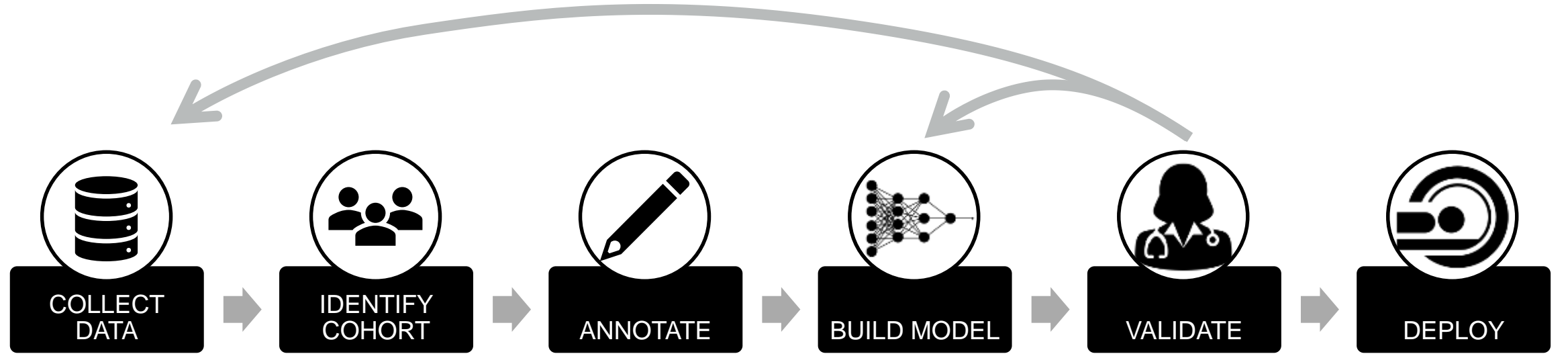


## Stroke Suite

- 5-model suite of models for stroke diagnosis



# AI is so much more than training models!



- Radiology exam data
- Radiology report and meta-data
- EHR
- RPDR
- Biobank
- ..others

- Cohort manager
- Report labelling
- Series selection

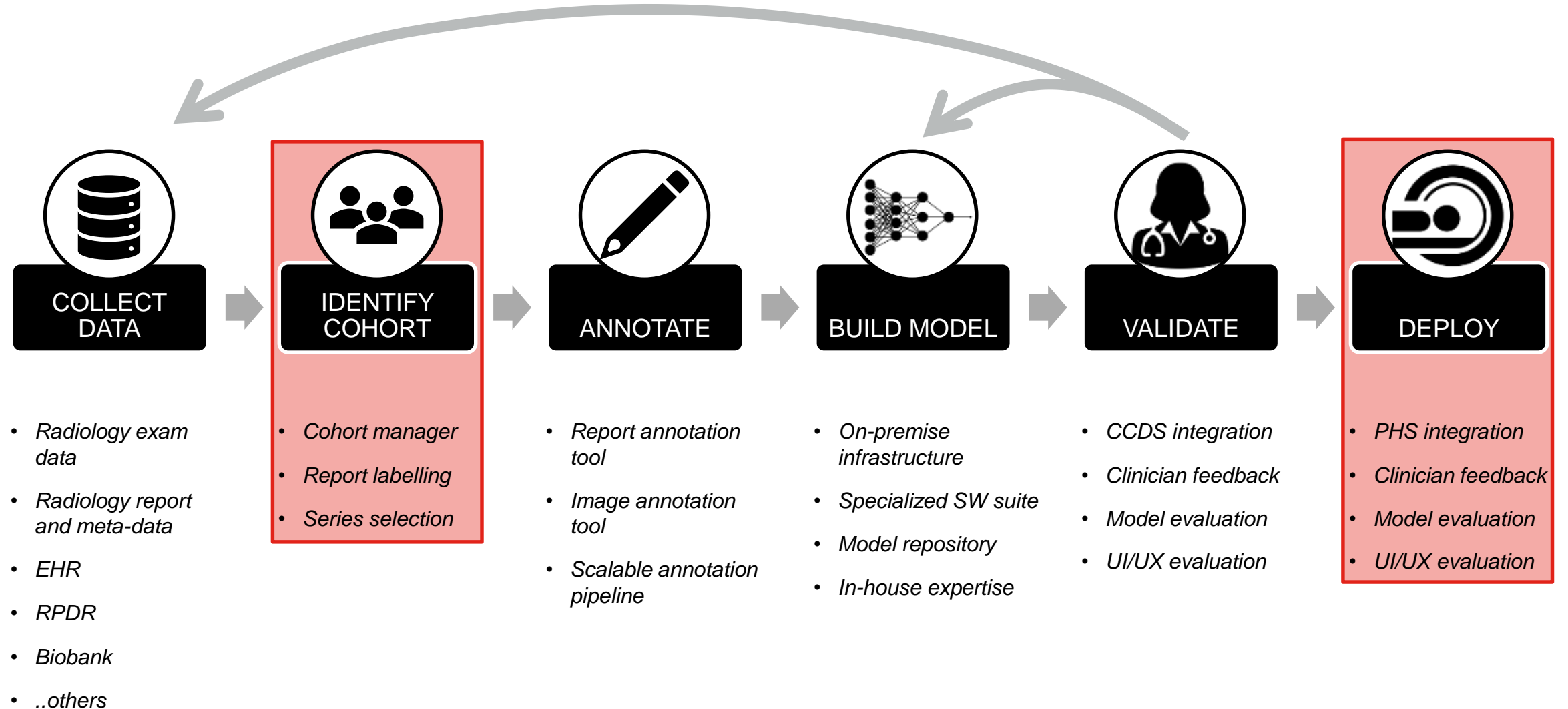
- Report annotation tool
- Image annotation tool
- Scalable annotation pipeline

- On-premise infrastructure
- Specialized SW suite
- Model repository
- In-house expertise

- CCDS integration
- Clinician feedback
- Model evaluation
- UI/UX evaluation

- PHS integration
- Clinician feedback
- Model evaluation
- UI/UX evaluation

# AI is so much more than training models!

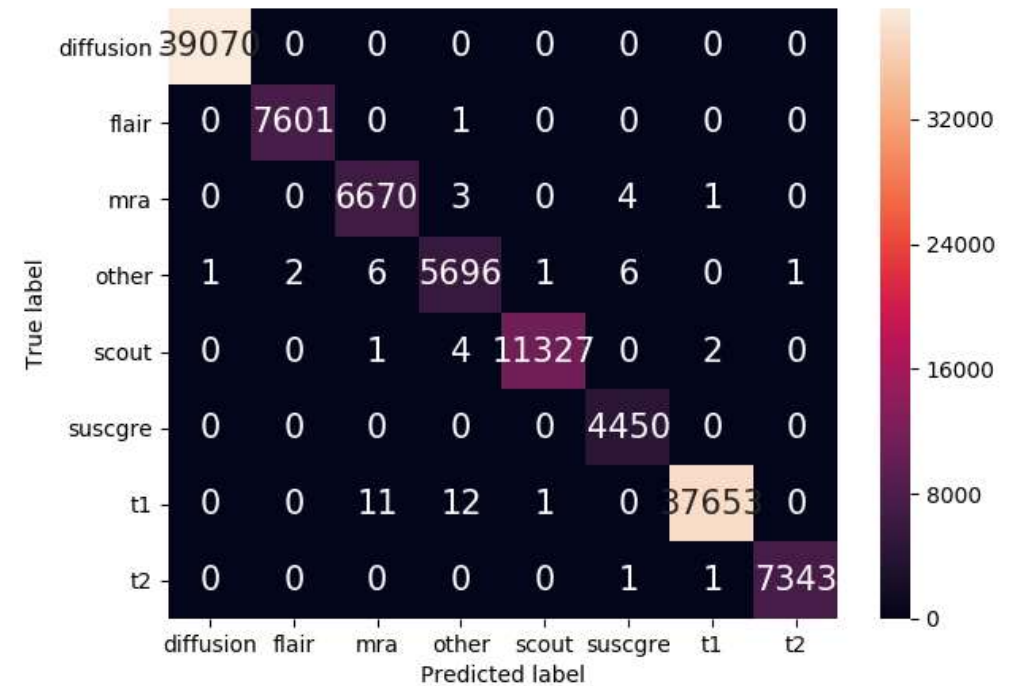






# Series naming categorization can be automated

- Solution: learn a Random Forest classifier based on image acquisition parameters
- Very high performance (>99.9% accuracy on 120k series)
- Generalizes reasonably well (up to 97.4% accuracy on a large dataset from another institution)



Confusion matrix of results on test set

Want to know more?

Come to my presentation at **SIIM conference on Friday 28<sup>th</sup>, in Denver, CO**

# Thank you!



We are hiring!  
(ML scientists, softw engineers, clinical innovation fellows...)

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