

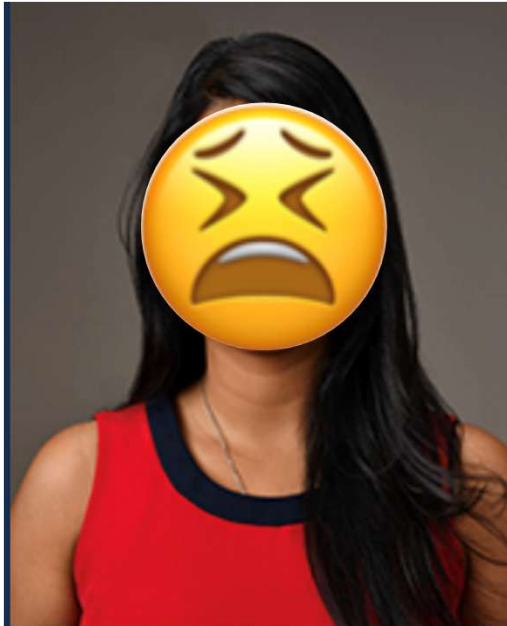
Is Machine Learning the Next Frontier in Aortic Surgery or Just Another Surgeon's Folly?

Sophia Khan, MD

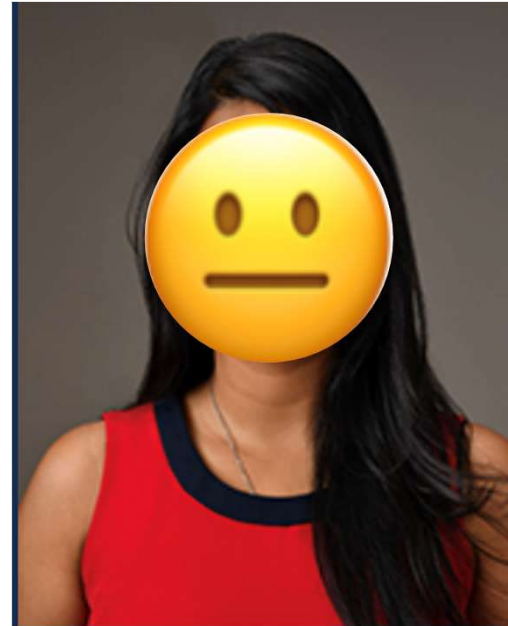
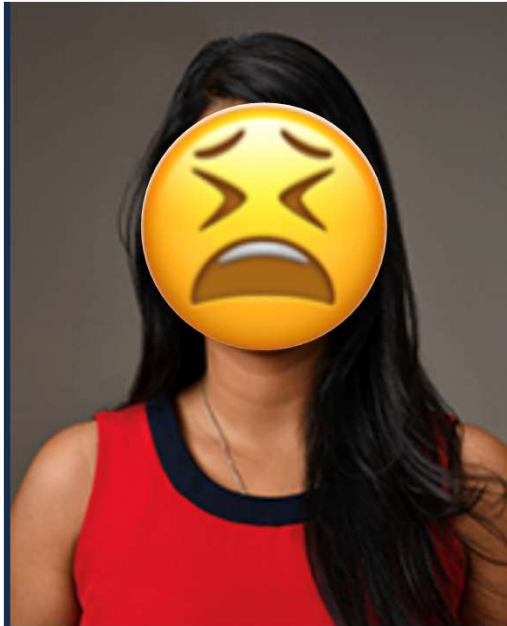
Disclosures

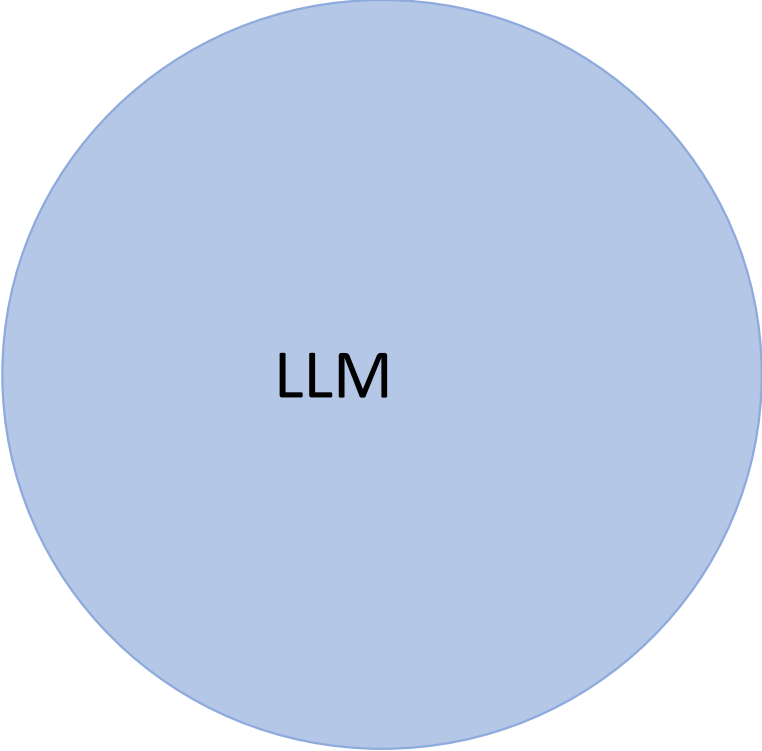
- Co-Founder of Voythos



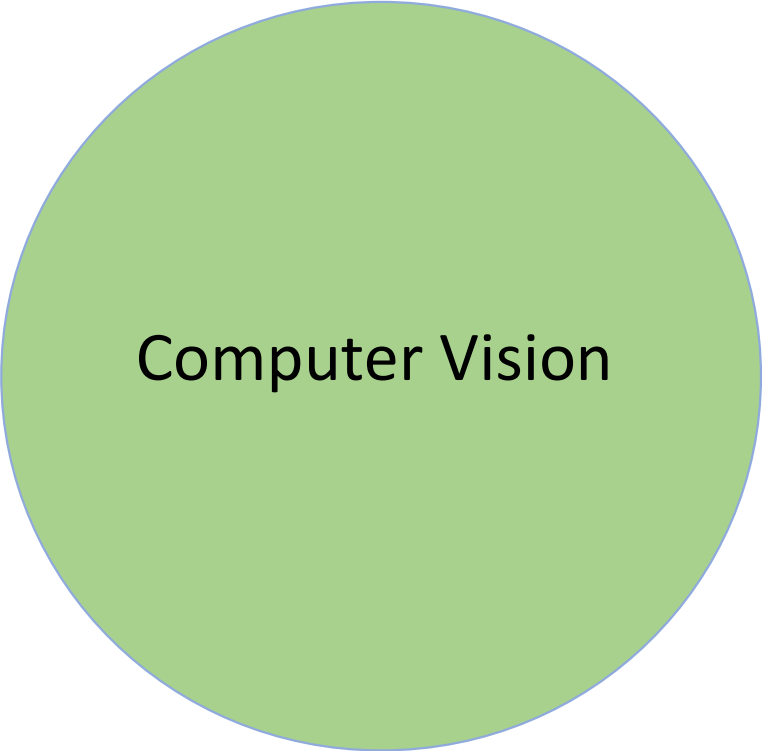




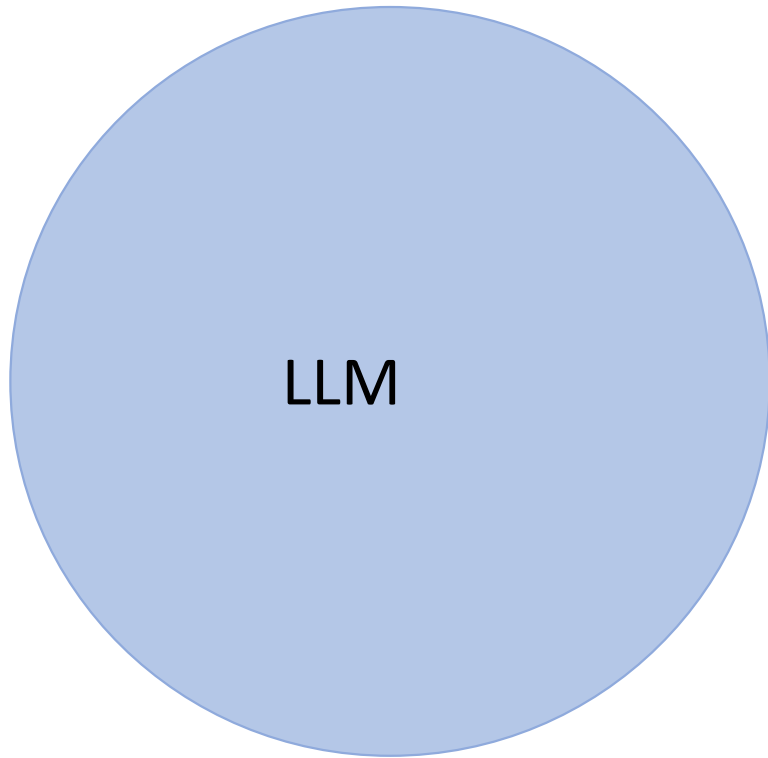




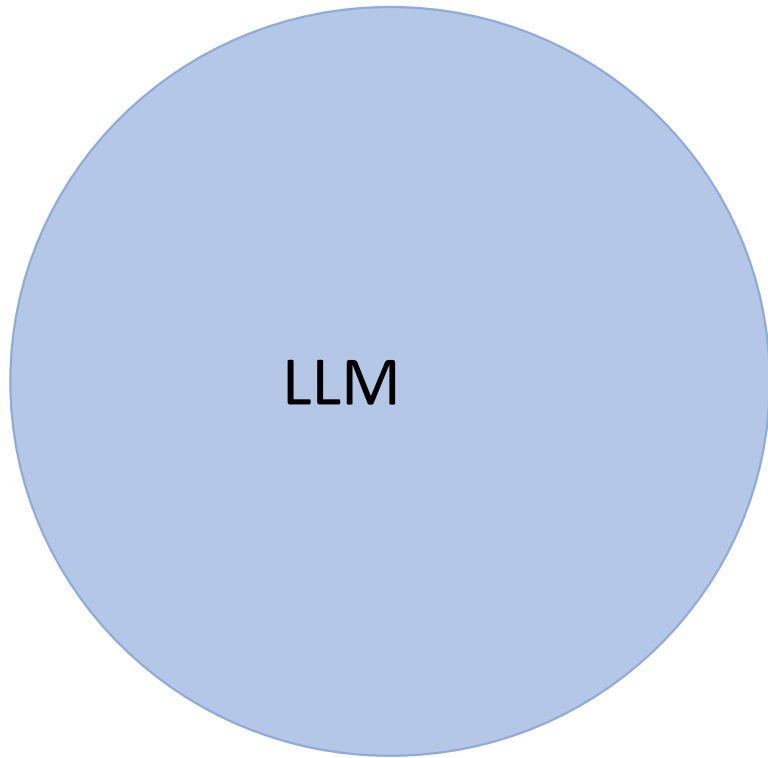
LLM



Computer Vision



- **Drafting clinic notes from dictated conversations**
- **Writing prior authorization letters**
- **Generating discharge summaries**
- **Drafting patient portal responses**
- **Summarizing new guidelines or clinical trials**



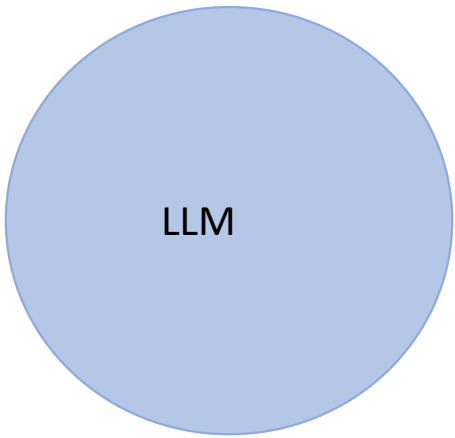
- **Drafting clinic notes from dictated conversations**
- **Writing prior authorization letters**
- **Generating discharge summaries**
- **Drafting patient portal responses**
- **Summarizing new guidelines or clinical trials**

- **Maybe even helping you with your HAS talk**

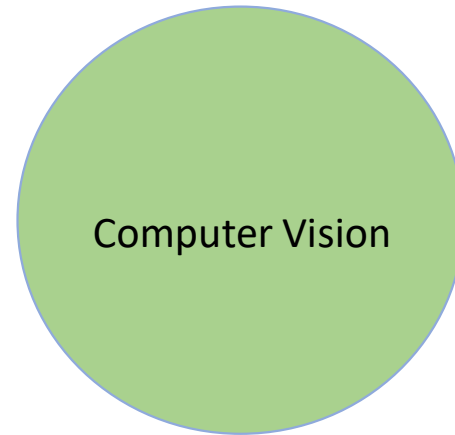
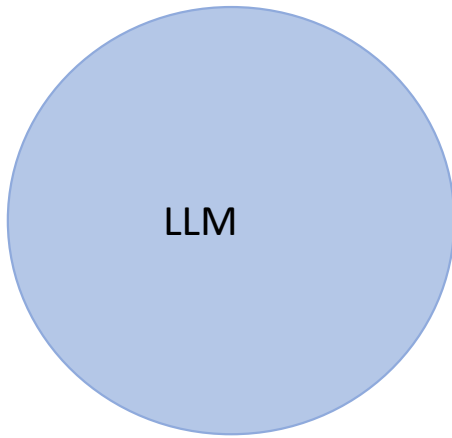
- Flags suspected hemorrhage on head CT
- Identifies possible PE
- Detects pneumothorax
- Highlights fractures
- Prioritizes abnormal scans in the radiology queue



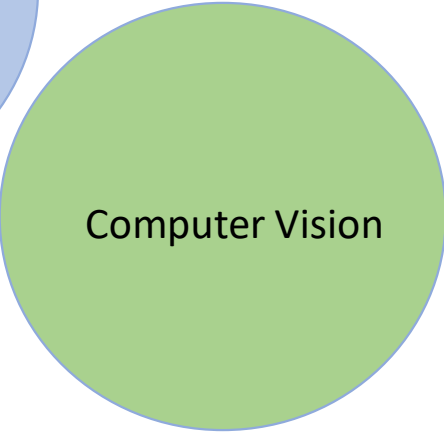
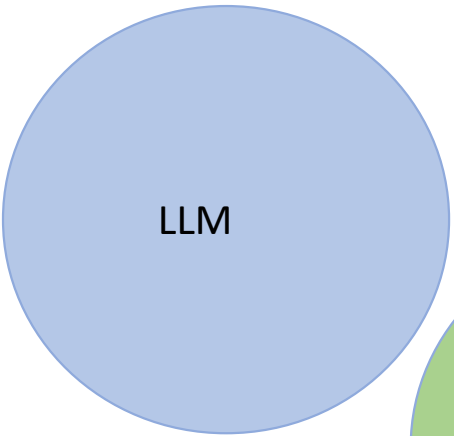
Computer Vision



AI Writes Things



AI Writes Things or Sees Things



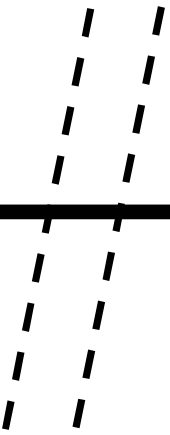
Presentation

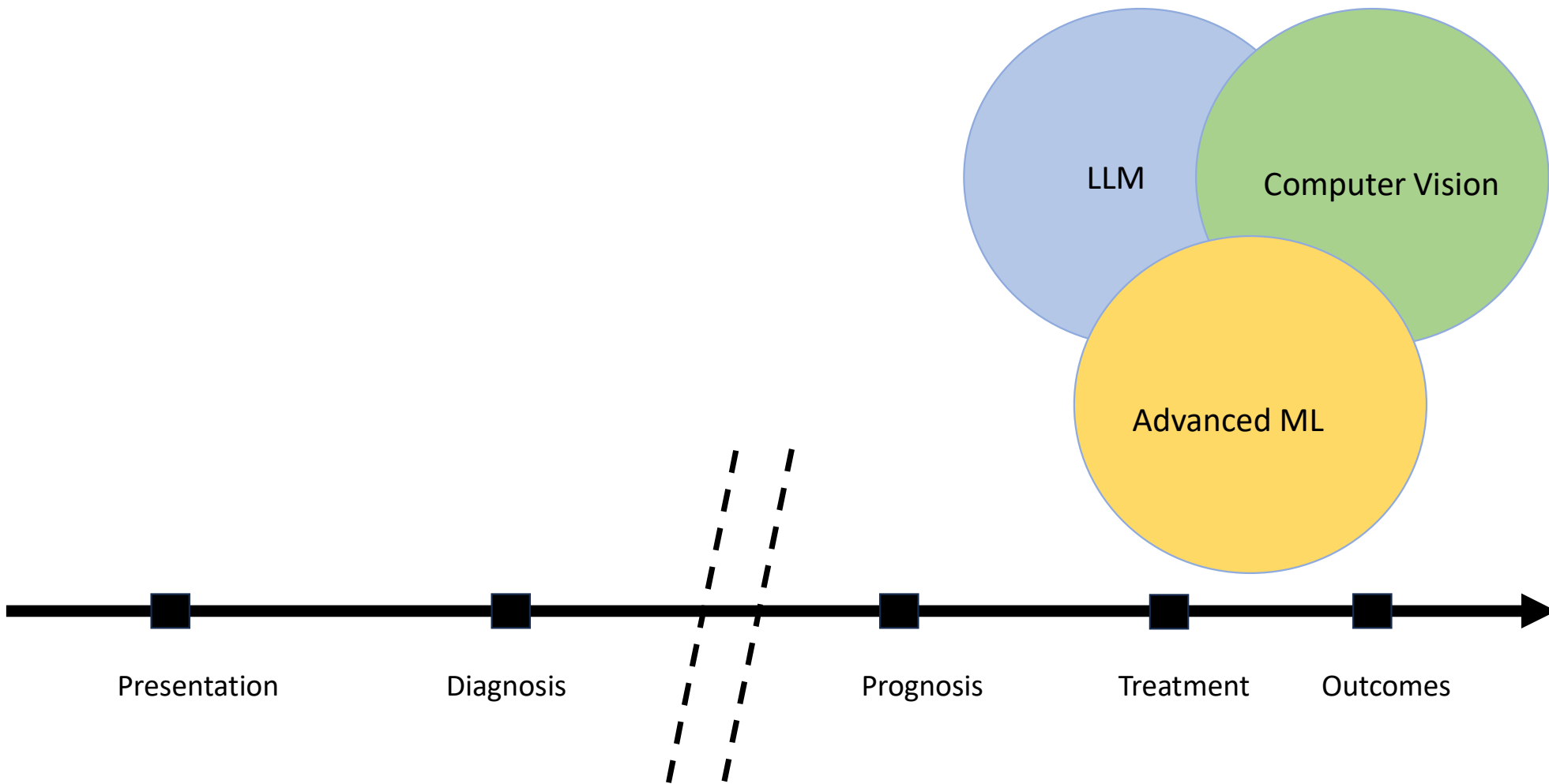
Diagnosis

Prognosis

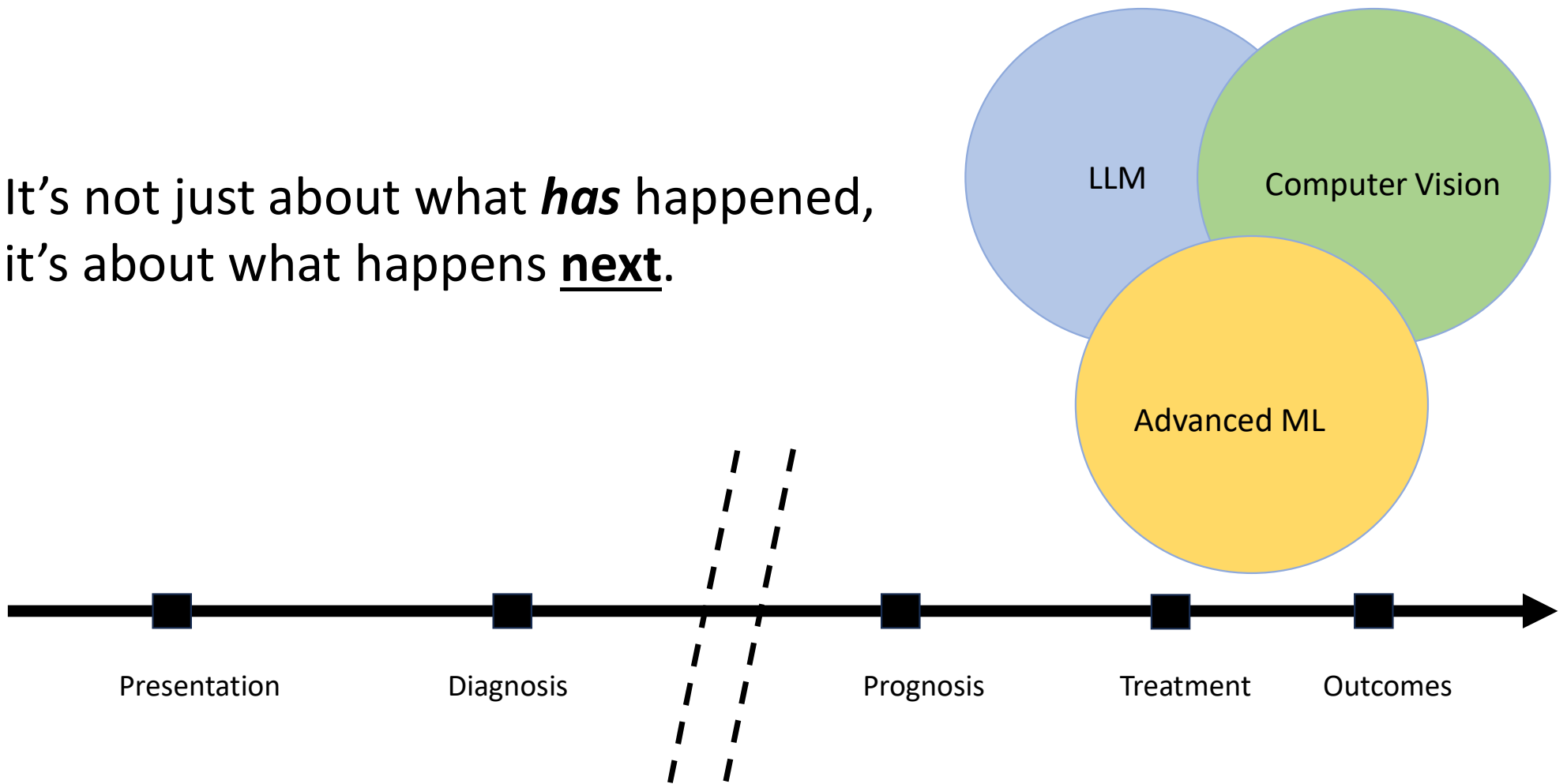
Treatment

Outcomes





It's not just about what *has* happened, it's about what happens next.



Hypotheses (Sophie Beliefs)

- We should be able to intervene on AAA before they rupture despite current size criteria



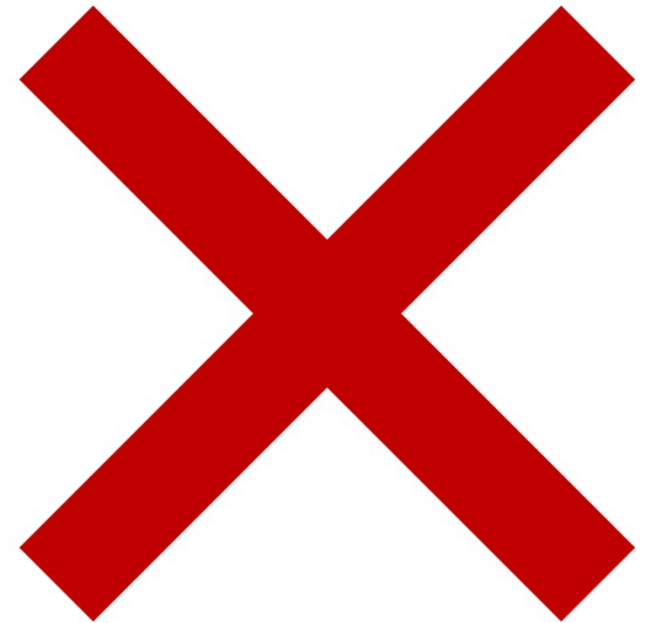
Hypotheses (Sophie Beliefs)

- We should be able to intervene on AAA before they rupture despite current size criteria
- Type B dissections should have a more standardized treatment pathway



Hypotheses (Sophie Beliefs)

- We should be able to intervene on AAA before they rupture despite current size criteria
- Type B dissections should have a more standardized treatment pathway
- Type A dissections should never happen



Why Should Anyone Care?

- We all secretly want to be heroes.
- Better patient outcomes.
- More surgery on the right patients at the right time.
- Less complications.



Why Should Anyone Care?

- We all secretly want to be heroes.
- Better patient outcomes.
- More surgery on the right patients at the right time.
- Less complications.
- Healthcare systems stand to save money.





Yup, that's me.

Ruptured/Emergent

ICU Days

Several

Length of Stay

Long

Complications

High

	Ruptured/Emergent	Planned/Elective
ICU Days	Several	Minimal to None
Length of Stay	Long	Short
Complications	High	Low

	Ruptured/Emergent	Planned/Elective
ICU Days	Several	Minimal to None
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System Impact	Resource Intensive	Controlled Care

Forecasting Biology

1. Large volumes of high-fidelity data

Thousands of patients. Longitudinal follow-up. Real outcomes.

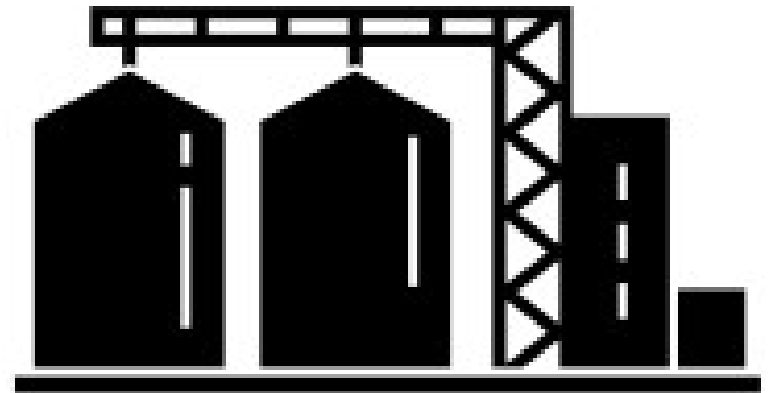
2. Multimodal Architecture

Imaging + Clinical Context



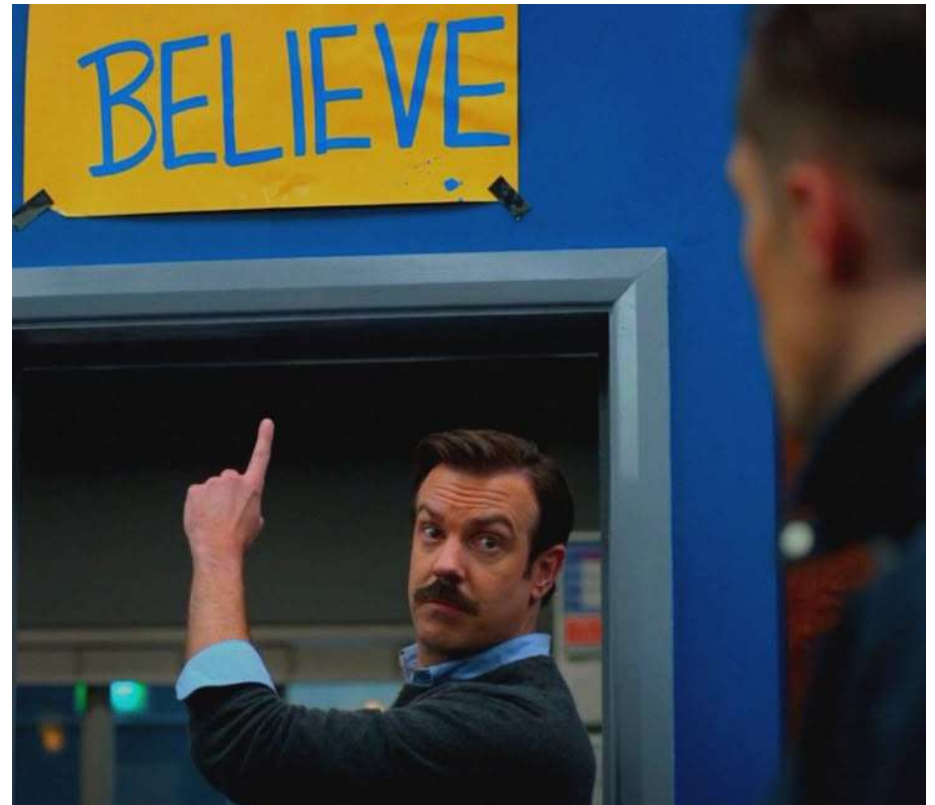
Not That Easy

- Imaging archives are siloed.
- Clinical notes are unstructured.
- Follow-up is fragmented.
- Data sharing is complex.

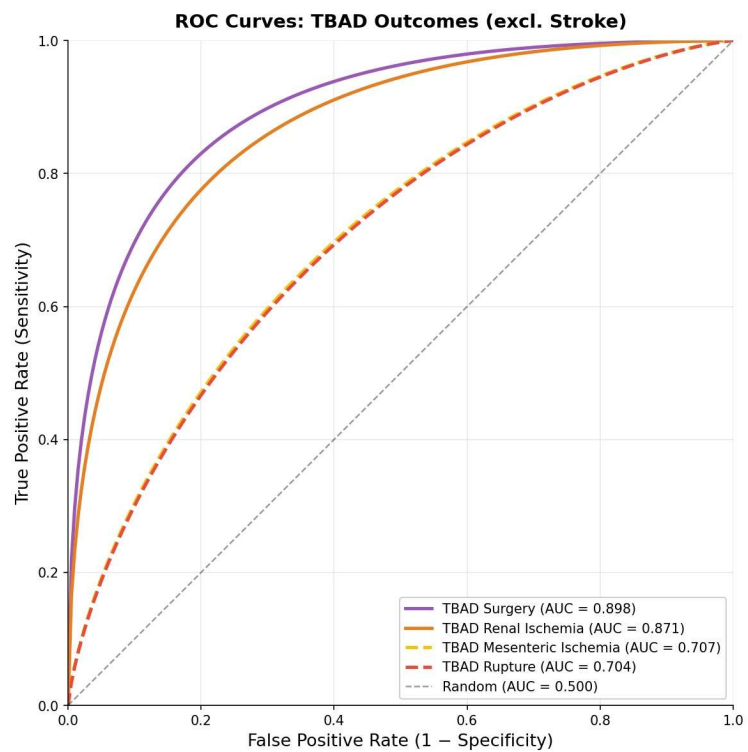


A Calculated Start

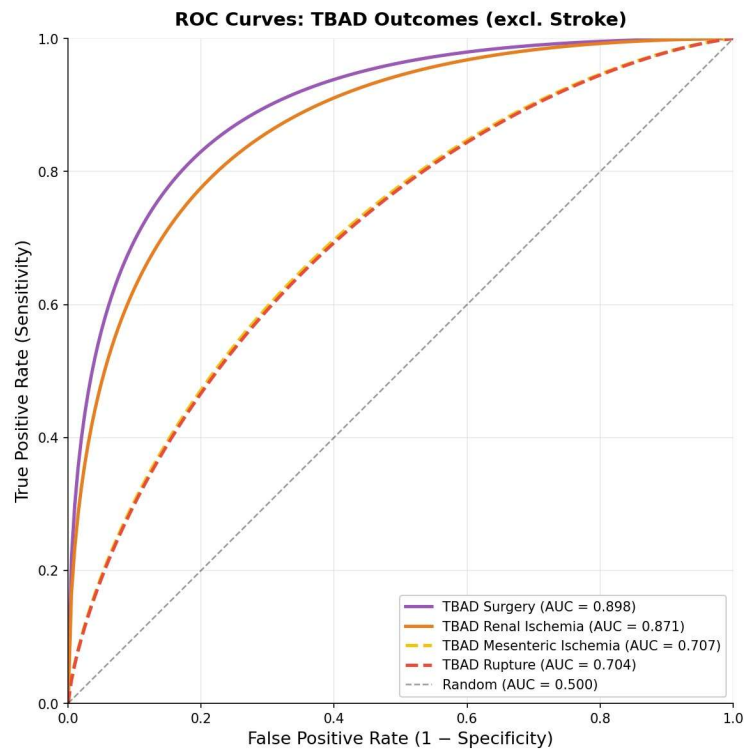
- Large Structured Longitudinal Aortic Dataset
- Used TEVAR as a surrogate endpoint for TBAD
- Predicted endpoints (90 days)
 - TEVAR
 - Renal Ischemia
 - Bowel Ischemia



Biology Leaves Footprints



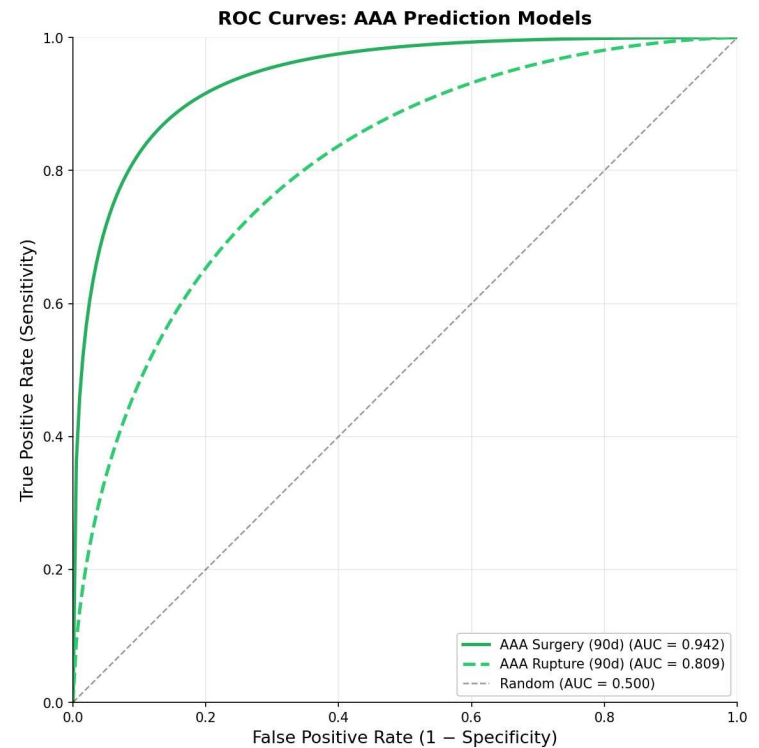
Biology Leaves Footprints



- AUC for TEVAR: 0.898
- AUC for Renal Ischemia: 0.871
- AUC for Mesenteric Ischemia: 0.707
- AUC for TBAD Rupture: 0.704

Biology Leaves Footprints

- AUC for AAA Rupture: 0.809
- AUC for AAA Surgery: 0.942



It's Our Obligation to Follow Them

- Prediction is possible with structured clinical data

It's Our Obligation to Follow Them

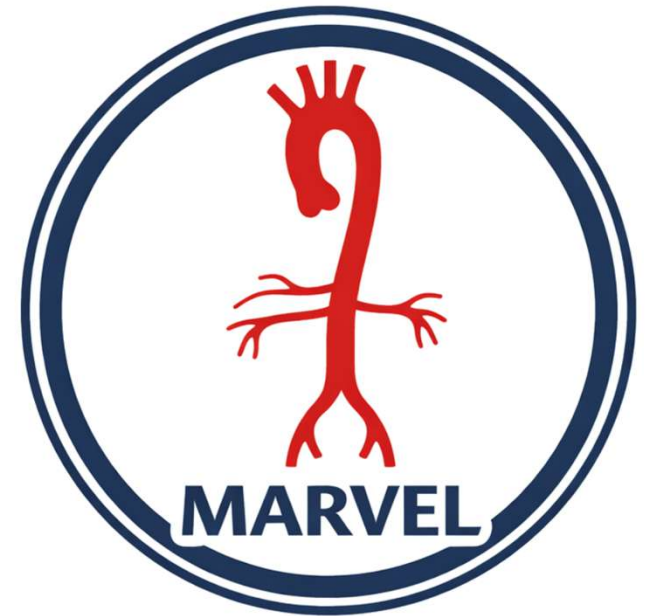
- Prediction is possible with structured clinical data
- True **Forecasting** requires:
Multimodality
 - Imaging
 - Clinical Trajectory
 - Physiologic Signals



The M.A.R.V.E.L. Project

A multicenter data warehouse integrating:

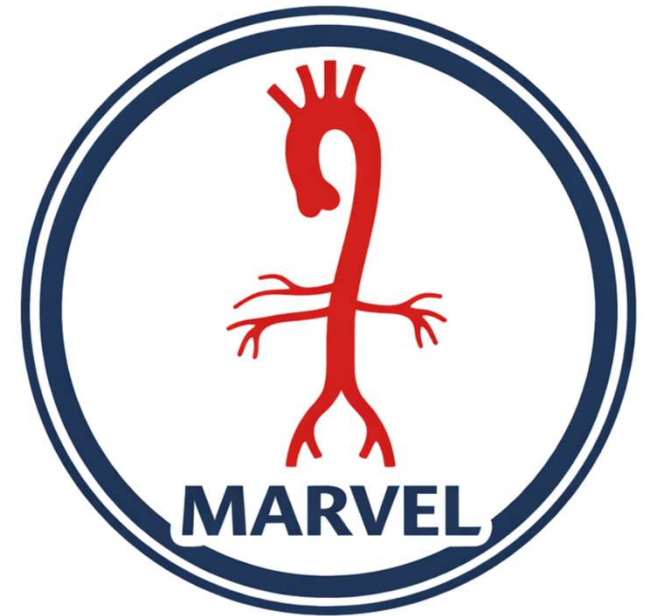
- Longitudinal imaging
- Structured clinical data
- Unstructured clinical notes
- Outcomes



The M.A.R.V.E.L. Project

A multicenter data warehouse integrating:

- Longitudinal imaging
- Structured clinical data
- Unstructured clinical notes
- Outcomes



Many centers. Small contributions. Transformational dataset.

Next Frontier or a Surgeon's Folly?

- AI that writes is convenience.
- AI that sees is assistance.

- AI that forecasts is transformation.
- The frontier is not automation, it's foresight.

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