



**DATA SCIENCE  
INSTITUTE®**  
AMERICAN COLLEGE OF RADIOLOGY

## Ongoing Clinical Monitoring



# Disclosures

- Novocure Grant Recipient
- Canon Medical Consultant
- Avicenna.ai Shareholder, consultant

# Outline



**WHY IS IT IMPORTANT?**



**HOW DO WE GO ABOUT  
CLINICAL MONITORING?**



**WHAT ARE TARGETED  
RESULTS?**



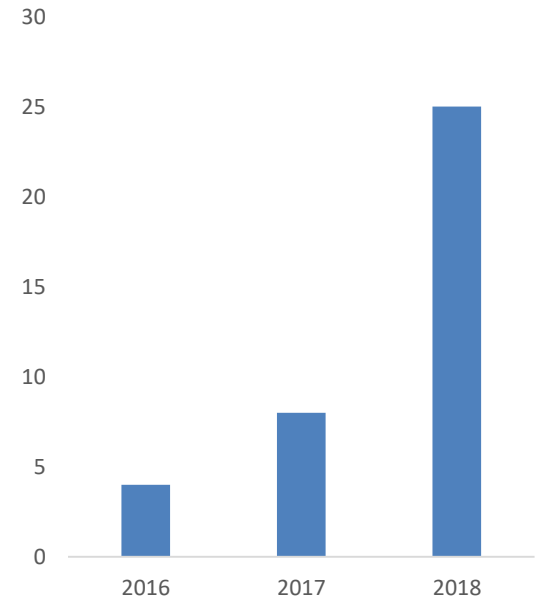
# Why ?

## 1. Accountability

- Patients get the right care for their specific situation
- Referrers having their questions / needs met
- Assess impact on our own workflows

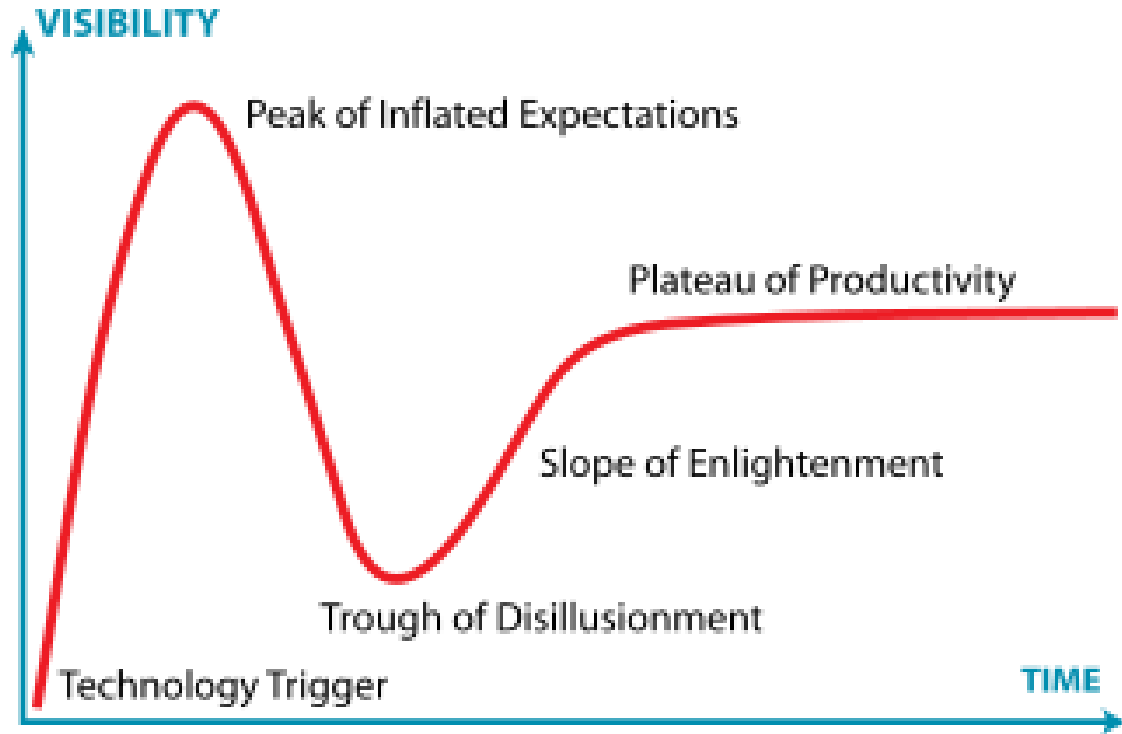
## 2. Early Adopters for this developing technology

Number of FDA Approved AI Applications



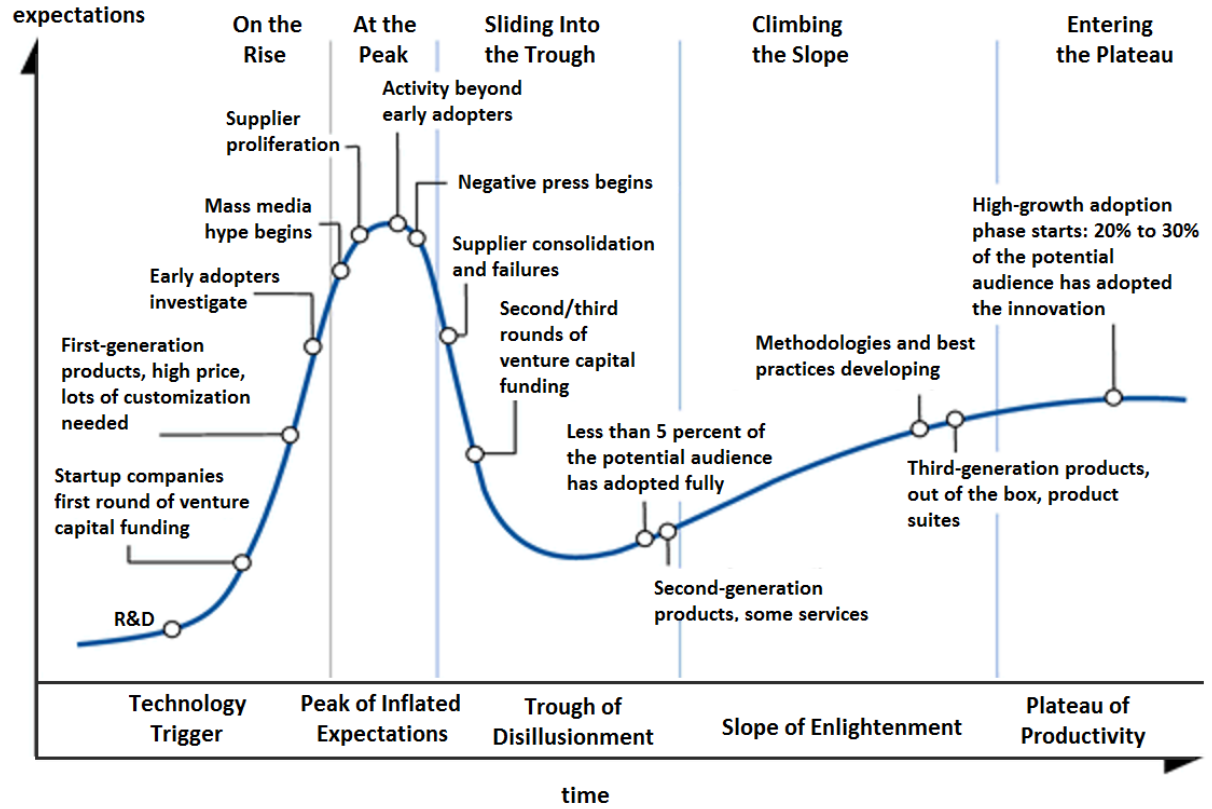
# Why ?

## 3. Navigating the hype



# Why ?

## 3. Navigating the noise



8:52  
 Search  
 You Retweeted

**Sam.Payabvash**  
 @SamPayabvash

While being swamped during weekend call, I had few moments of amusement with epic failures of computer assisted diagnosis! picking up streak artifact for bleed while missing actual hemorrhage; calling ASPECT of 0 in right hemisphere because of large hematoma on the left

#AI 🤔 🧠

9:08

**Prachi Dubey** @prachi\_rad · 1d  
 Replying to @SamPayabvash  
 Thanks, great examples! We saw similar pitfalls with [redacted]. The utility of computing and analytics as a part of a Radiology Department is undeniable but we need to remain more demanding in our expectations from these tools.

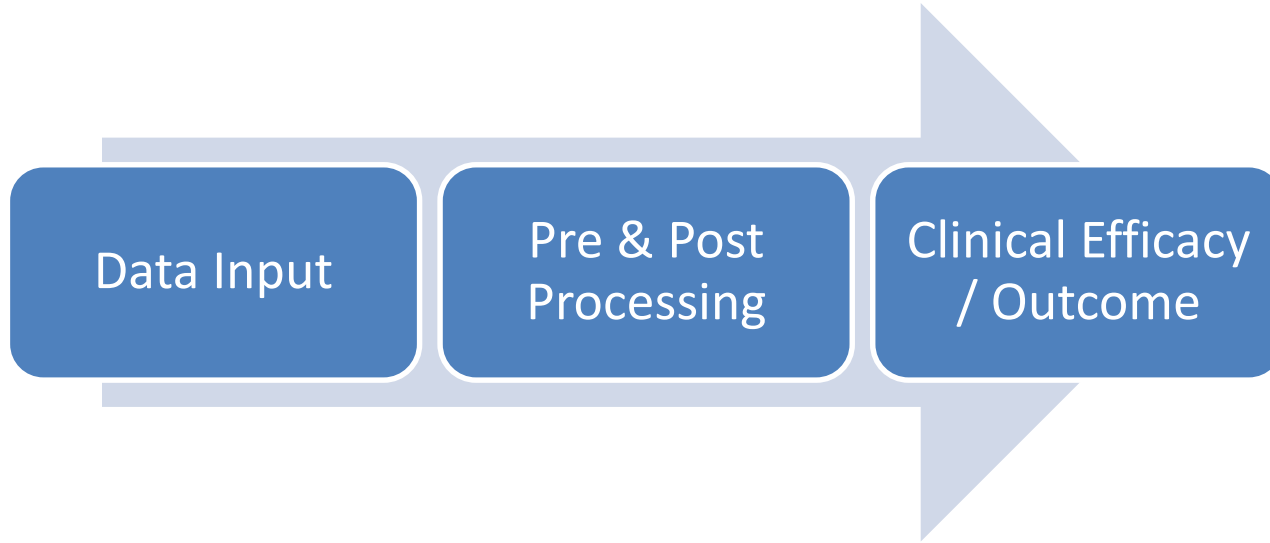
**Georgios Karas** @gbkaras · 1d  
 Replying to @SamPayabvash and @WendeNGibbs  
 Garbage in - garbage out. First step in any AI algorithm would be to determine if algo is applicable to the dataset. Great catch, thanks!!

**We're a basketball school** @sport... · 1d  
 And that's a human task evidently. See you in another 30 years, AI.

**Ali Salavati, MD, MPH** @AliSalavati... · 1d  
 Replying to @SamPayabvash  
 My personal experience of reading around 600 head CTs with [redacted]. Too many false positives. Because of that, after the first 200 cases, I simply ignored the AI read and didn't miss a single ICH! 🤔



# How





# How



## 1. Data Input

- Is data representative of the population the application was trained on?
- Clinical Setting?
- Demographics?
- Disease Prevalence?



广州呼吸健康研究院    Guangzhou Institute of Respiratory Health

### Calculation Tool For Predicting Critical-ill COVID-19 At Admission

Please answer the questions below to calculate.

1. X ray abnormality (平片异常)	<input type="radio"/> No <input type="radio"/> Yes	7. Cancer history (肿瘤病史)	<input type="radio"/> No <input type="radio"/> Yes
2. Age (年龄)	<input type="text"/>	8. Neutrophil/Lymphocytes (NLR) (中性粒细胞/淋巴细胞) 0-80	<input type="text"/>
3. Hemoptysis (咯血)	<input type="radio"/> No <input type="radio"/> Yes	9. Lactate dehydrogenase (乳酸脱氢酶) 0-1500 U/L	<input type="text"/>
4. Dyspnea (气促)	<input type="radio"/> No <input type="radio"/> Yes	10. Direct Bilirubin (直接胆红素) 0-24 umol/L	<input type="text"/>
5. Unconsciousness (意识丧失)	<input type="radio"/> No <input type="radio"/> Yes	<b>Total point (总分):</b>	<input type="text"/>
6. Number of comorbidities (含并发症数量)	<input type="text" value="0"/>	<b>Probability (概率):</b>	<input type="text"/>
		<b>Risk group (危险分层):</b>	<input type="text"/>

Note (备注): Comorbidity includes Chronic Obstructive Pulmonary Disease, Hypertension, Diabetes, Coronary Heart Disease, Chronic Kidney Disease, Cancer, Cerebral Vascular Disease, Hepatitis B and Immunodeficiency. 共病包括: 慢性阻塞性肺疾病、高血压、糖尿病、冠心病、慢性肾脏病、肿瘤、脑血管病、乙型肝炎和免疫缺陷。  
Probability for Critical-ill events (invasive ventilation/ICU/death): low-risk group 0.7%; medium-risk group 7.3%; high-risk group 59.3%。发展为危重症(插管/ICU/死亡) 总体概率: 低危组0.7%; 中危组7.3%; 高危组59.3%。

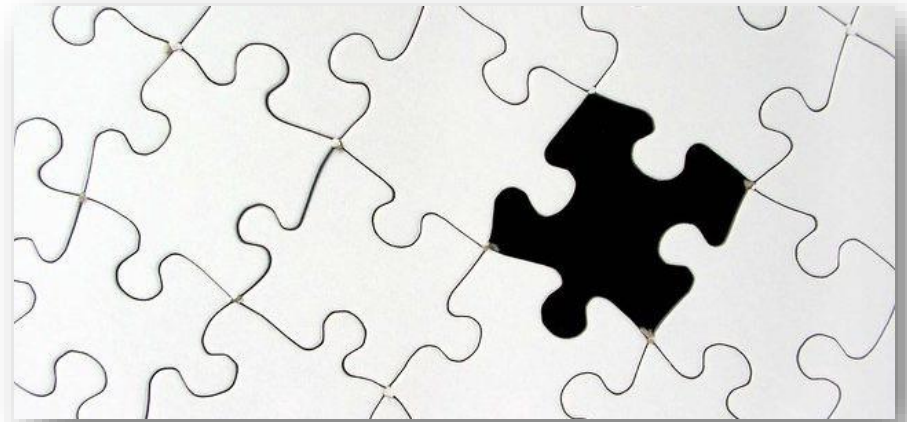


# How



## 2. Pre & Post Processing

- Are cases being identified?
- Are cases being appropriate excluded / included
- Are triggers working intended?



# What are your targeted clinical results?

- Sensitivity / Specificity?
- Radiology time savings?
  - In what setting?
  - By which group of users?
- Treatment time savings?
- ...Prediction?



# How

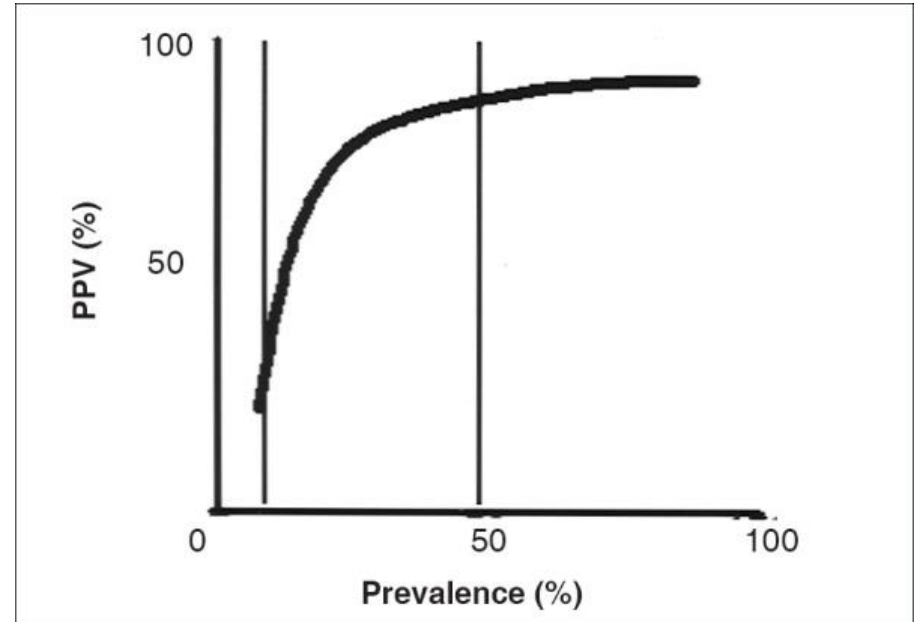


## Sensitivity / Specificity

- Specificity – Ability to correctly classify an individual as *disease free*
- Sensitivity – Ability to correctly classify an individual as *diseased*

## PPV / NPV

- PPV - % of patients with a positive test who have disease
- NPV - % of patients with a negative test who are *disease free*



# How



## Sensitivity / Specificity

	ICH	No ICH
Test +	900	50
Test -	100	950

Company X trains a new AI to diagnosis ICHs from 2,000 patients with a balanced set of 1000 ICHs and 1000 no ICHs.

- Sen/Spec: 90.0% and 95.0%
- PPV / NPV: 94.7% and 90.5%

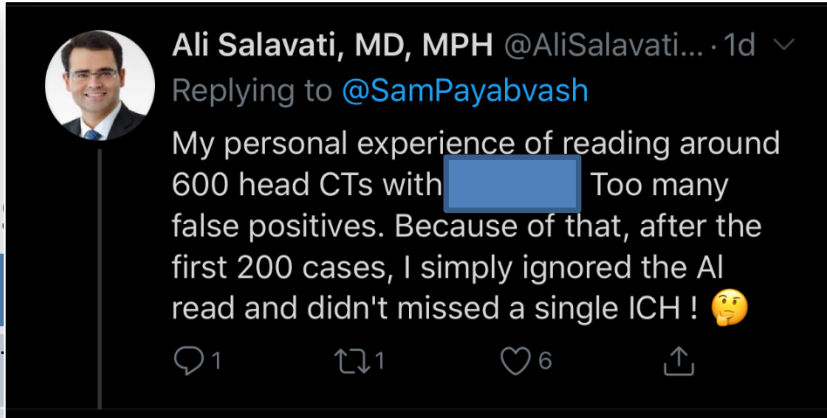
## Real World PPV / NPV

	ICH	No ICH
Test +	900	1000
Test -	100	19000

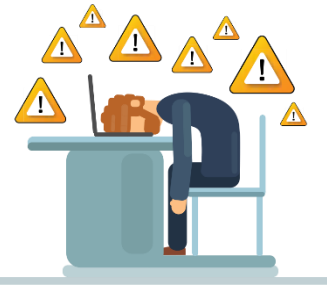
Hospital X sees about 20,000 CTs in the ER per year with about 5% positive rate.

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- PPV / NPV: 47.3% and 99.5%





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**Thank you**

