



Leveraging Innovative Data and AI Capabilities to Improve Healthcare Outcomes

June 4, 2019

*“a system’s ability to correctly interpret external data,
to learn from such data, and to use those learnings to
achieve specific goals and tasks through flexible adaptation”*

-K. Andreas, M. Haenlein, 2018

Landscape

Within the healthcare domain, Artificial Intelligence and other new technologies are generating more headlines than actual substantive application. This continually makes A.I. feel just around the bend, but this theme has been a recurring one for years.

- Forbes, January 2019

Will Artificial Intelligence Soon Tell Us How To Live?



Michael Ashley Contributor
COGNITIVE WORLD Contributor Group 
AI & Big Data

Variability of data

Data access

Personal information risks

Changing government policies

High punishment for error

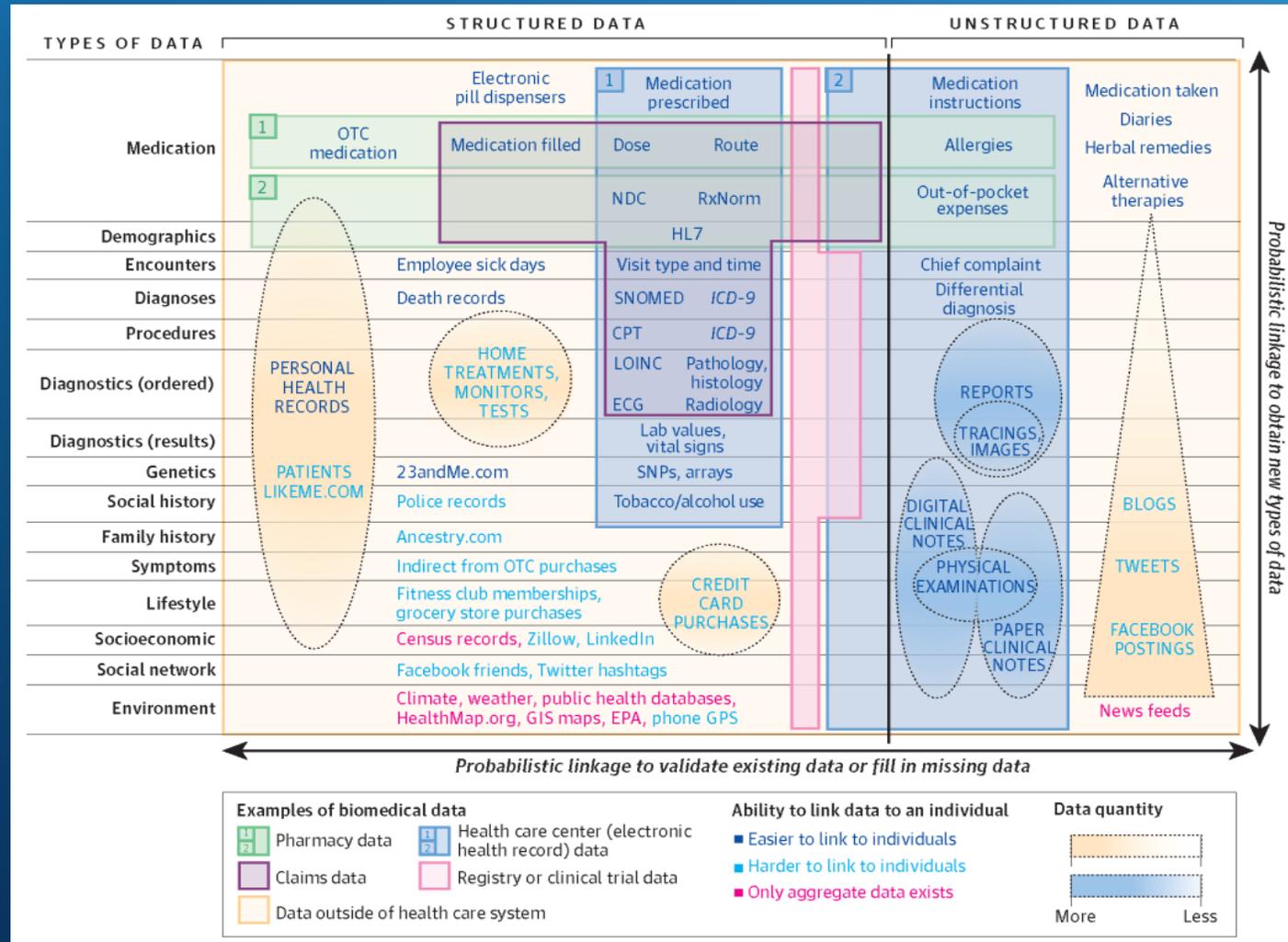
Data Sources

Claims Data

Great at describing a patient, are widely available, and have growing government-backed availability (*ICD Codes, etc.*)

XML/JSON Forms

Structured records stored in a systematic defined structure are easy to work with (*MDS, OASIS D*)



Medical Records

Difficult to parse effectively, but highly patient specific.

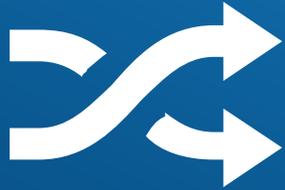
Threatened by growth of interest in HL7 FHIR (*Scans, EMRs, EHRs*)

HL7 FHIR Data

Currently not adopted, however in 3-7 years likely to be dominant format for health data (*JSON format for API use*)

Image obtained from Weber, Griffin M., Kenneth D. Mandl, and Isaac S. Kohane. "Finding the missing link for big biomedical data." *Jama* 311.24 (2014): 2479-2480.

Applications



Opportunities are Ranked

- Find the most risky patients or providers
- Ranking medical records from a query



There are a Large Number of Variables

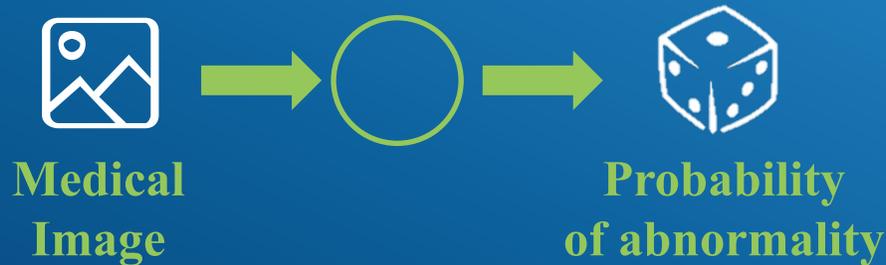
- Image processing
- Language processing
- Sociodemographic data



Probability is Important

- Financial estimates
- Finding patients over a specified risk threshold

Provider | Radiology

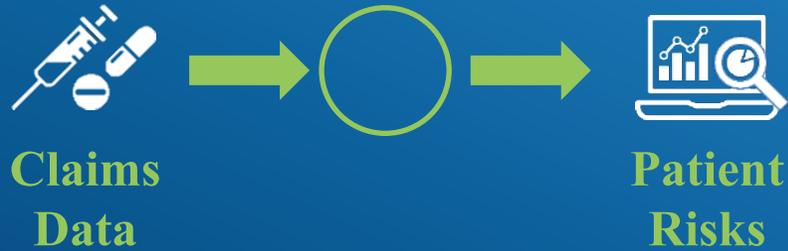


- The very first FDA-approved screening tool that does not require a clinician was approved in mid-2018. IDx-DR detects diabetic retinopathy.
- Radiology has seen increasing interest, but is most challenged in that a provider is still needed to confirm after the



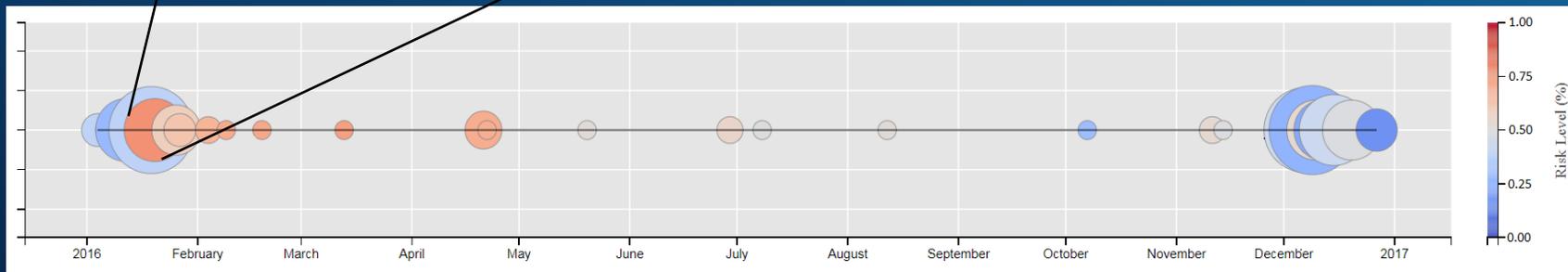
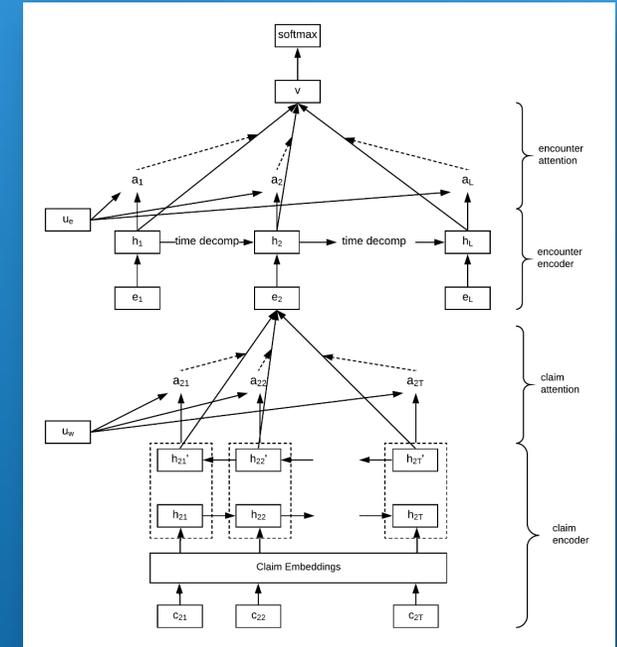
CheXNet heat map* showing pneumonia indicators

Provider | Predictions with Claims



ICD10DX-R350 Frequency of micturition
 ICD10DX-R351 Nocturia
 ICD10DX-R197 Diarrhea, unspecified
 ICD10DX-R072 Precordial pain

- CMS has shown strong interest in adverse event prediction with claims.
- Consistency of and availability of claims data make predictive models with it valuable for payers and providers.



Fall risk visualization of a patient, performed by seeking encounters where a spike or peak in risk occurred with deep learning.

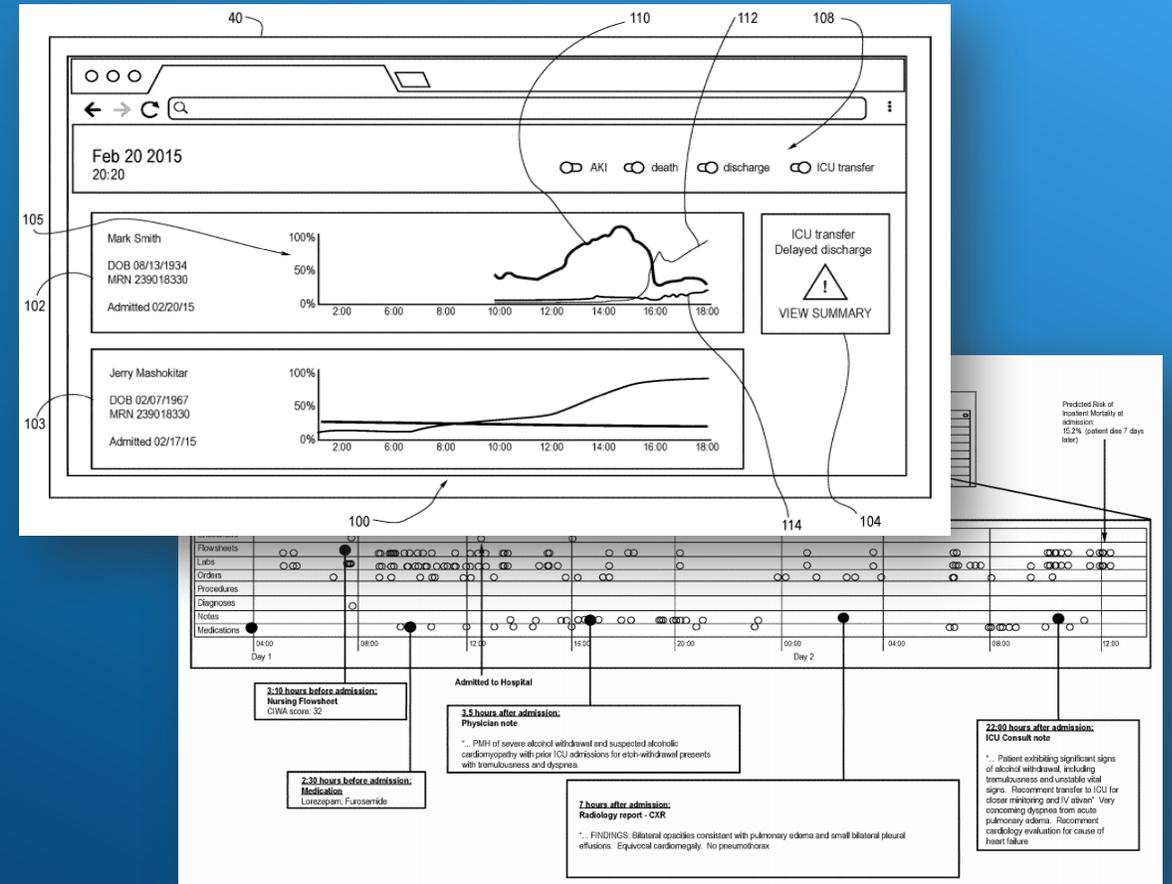
Provider | Predictions with FHIR



Patient FHIR
HL7 data

Patient
Risks

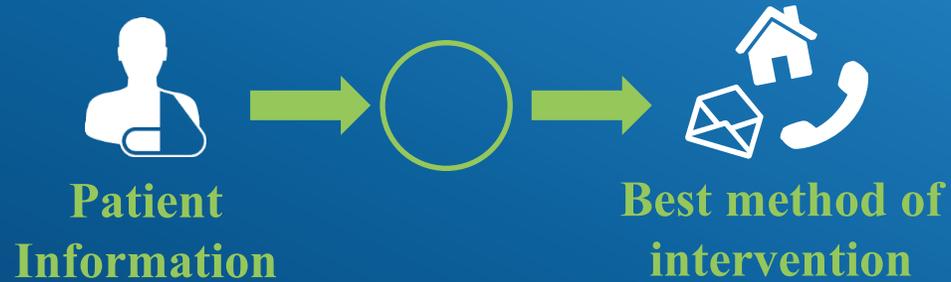
- Google demonstrated in early 2018 that HL7 events can be used to accurately predict events such as readmission or emergency room risk*.
- They have further doubled down with multiple patent applications that include conceptual sketches.



Google Patent

*Rajkomar, Alvin, et al. "Scalable and accurate deep learning with electronic health records." npj Digital Medicine 1.1 (2018): 18.

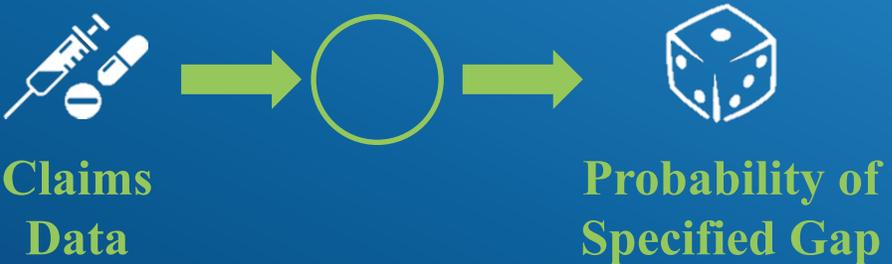
Payer | Patient Outreach



- Finding which patients are in need of seeing a clinician and the best way to has large implications for payers as well as for providers.
- They have further doubled down with multiple patent applications that include conceptual sketches.

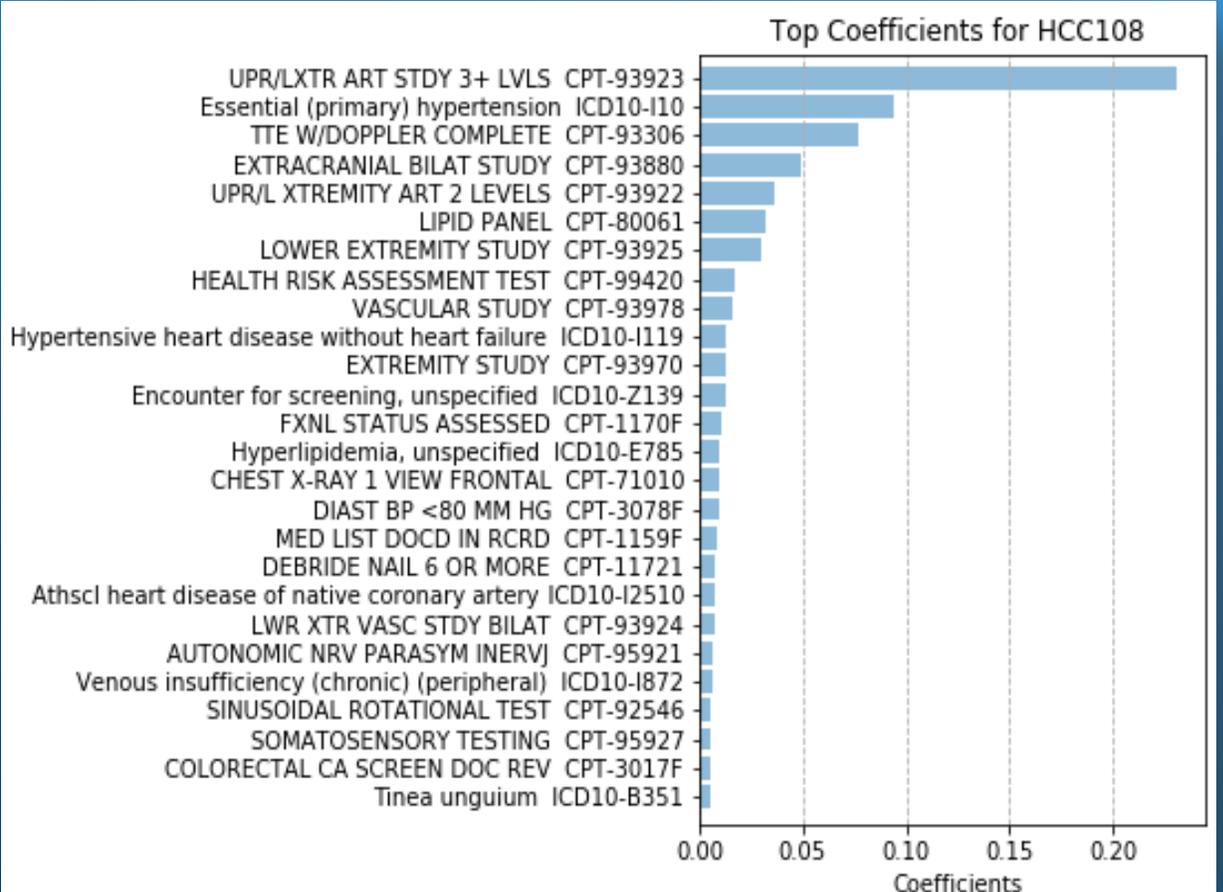


Payer Case | Gap Detection



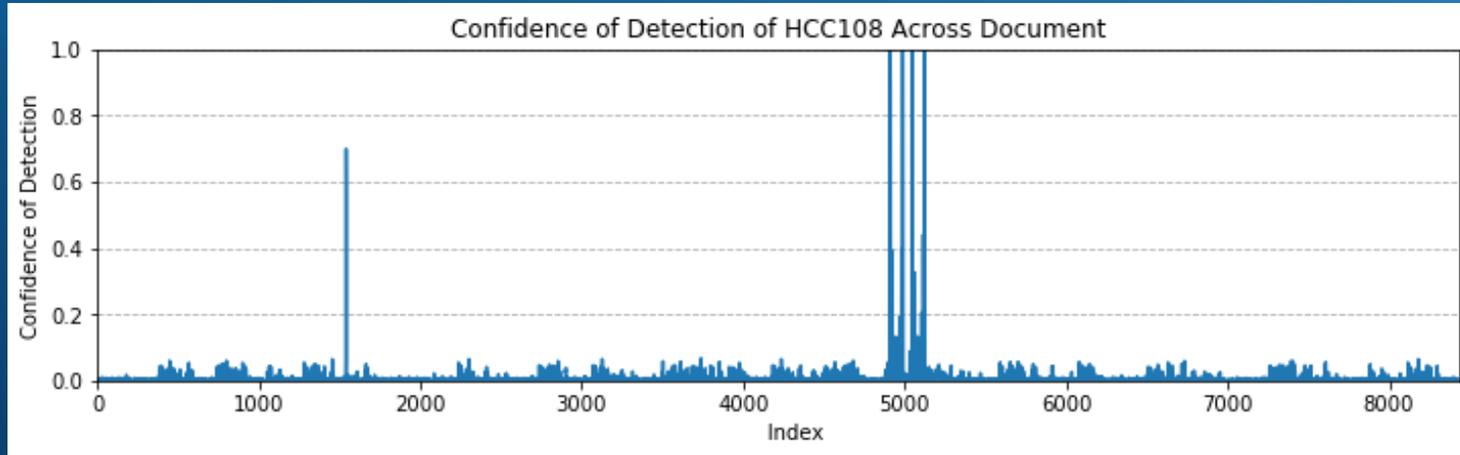
- Payers are incentivized to find specified conditions that are not reported within alphanumeric claims codes
- Currently a number of payer and technology companies have built AI systems to perform or assist with this

Top Indicators of Peripheral Vascular Disease



Payer Case | Medical Record Review

Condition Detection with Machine Learning



- Supports Medicare Advantage, Affordable Care Act, and Medicaid
- Chart visualization with ML
- Condition highlighting with ML
- Duplicate page identification
- Online user interface in development
- Medical record prioritization by specified or multiple conditions

The screenshot displays the NLPaaS™ medical record review interface. It features a central document viewer with a red highlight on a section of text. To the right, a summary dashboard includes: a "DEMOGRAPHICS" section with patient name (James Doe), DOB (Mar 21, 1952), and age (66); a "LOCATION" map of the United States; a "PROVIDERS" list including David Gooden and Jane White; a "MEDICAL DETAILS" section with service dates; a "TIMELINE" showing a sequence of events; and a "CONDITIONS DETECTED" section with a bar chart and a "FOCUS" anatomical diagram. A "Past Medical History" section lists conditions like atrial fibrillation and hypertension. The interface is branded with the "inovalon" logo.

NLPaaS™

4 Keys to Success

Transparency

Algorithms often do not focus on buying user trust through explaining reasoning behind a decision in easy-to-digest ways

Communication

It is critical in development to work closely with clinicians and other stakeholders in the creation of health algorithms



Time to Market

It is common in development to overweight optimization and underweight getting to product release

Maintenance

Models often lack scalability or shelf life due to dependencies, runtime, retraining requirements, or government policy changes



Healthcare Empowered[®]