HiMSS® Türkiye

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ANTALYA, TÜRKIYE

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PREDICTIVE ANALYTICS

Tool of Providence or the End of Coincidence?

He who does not expect the unexpected will not find it out.

Unless you expect the unexpected you will ever find truth, for it is hard to discover and hard to attain.

Heraklit of Ephesus
(540 - 480 B.C.)

Who is your Presenter ?

Elmar Flamme
s(trategic) CIO / s(enior) Consultant

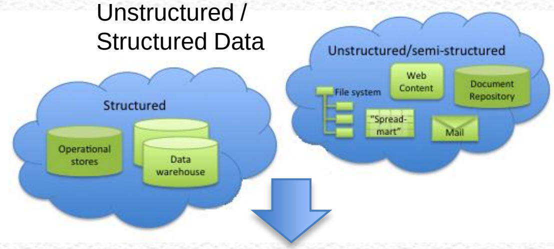
Started working in healthcare as a nurse, spending 15 years on intensive care and emergency units

Currently **strategic CIO** for Klinikum Wels Grieskirchen, the biggest convent Hospital in Austria.

Thinking about Big Data since developing and implementing a Clinical Meta Data Archive

The walls have been demolished

Unstructured / Structured Data



Data Mining / Real Time Analytics / Prediction

between Healthcare Provider

In Focus:
DATA CONTENT INFORMATION KNOWLEDGE

„Internet of Everything"

between Diagnostic and Site Location

Intersectoral / Interdisciplinary Healthcare

„Cloud Services"

between IT Infrastructure and Site Location

The Story behind the Story …….

Display relevant Information

At the right time
At the right place
At the right device
In the right context
In the right role

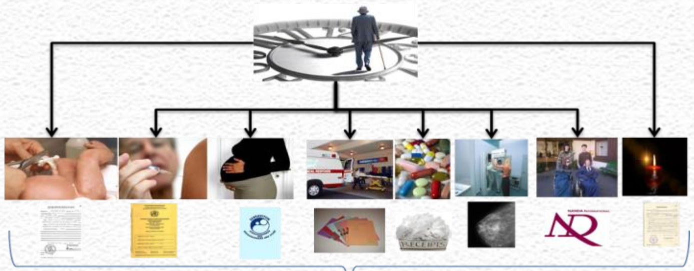
2009 VNA for Clinical Data

2014 Analytics on structured Data
(CDAL2 Discharge Letters)

(……) Knowledge Assistant

Looking for solutions which help us to prevent the medical staff from being overwhelmed by information and to help them find the necessary content in the nightmare of information

The „World of Healthcare“ BIG DATA



from „Birth“ to „Death“

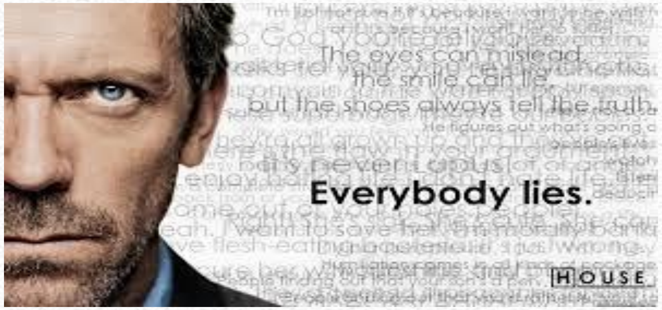
Personal, Health, Medical Data
- Is continuous Growing
- Is present in diff. Sectors
- Is present in diff. Data Forms

Decisions can be based on:
- A Single piece of Information
- A Summary of Information
- An Interpretation of all Information

Out of Big Data ……

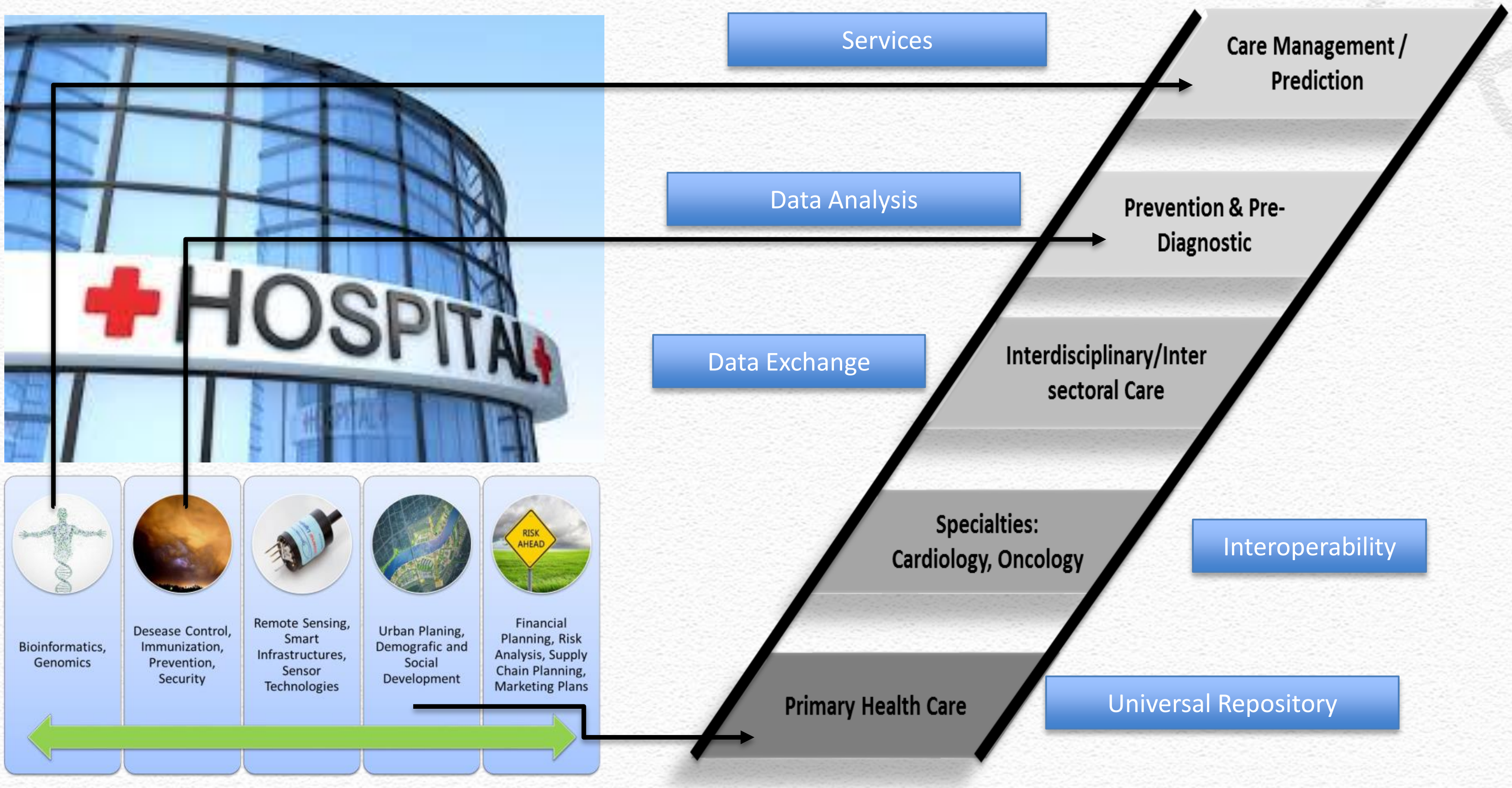
only a specific information is important

for the consumer in a specific Situation



Dr. House Syndrom (whole Body Scan)
- Cause they're useless. Could probably scan every one of us and find five different doodads that look like cancer.

Healthcare Development and Challenges



„Demographic Data“ View in Time of Demographic Challenges, MEGA Cities, Economic Crisis, extreme Pollution / Climate Change)

Healthcare Providers

Demographic Data

Population Development

Income Distribution / Wellfare / Property

Public and Health Infrastructure

Economic Infrastructure

eHR / PHR Data

Cancer Prevention

Cronicle Desease Management

Immunization

Health Promotion

Longterm Prediction for Strategy / Ressource Development / Social Development on Districts / Region / Countries

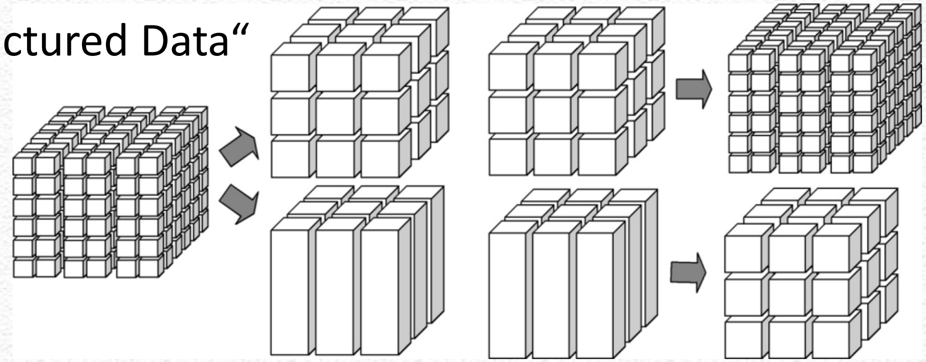
Benefits of (Predictive) Analytics

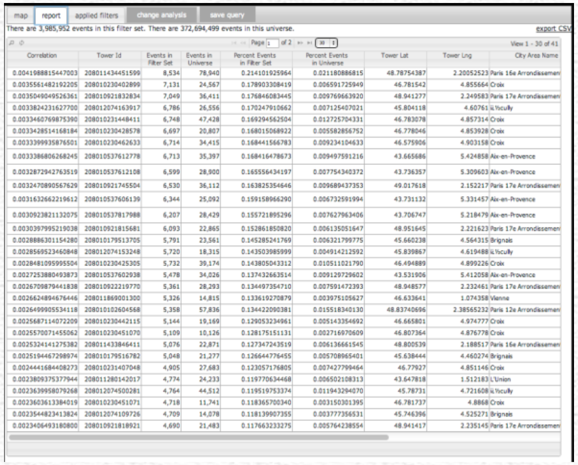
- **Disease management** – this can be used to drive a predictive risk of cost for each member in a healthcare plan by asking such questions as, "How probable is it that this person will be high risk, high cost?"
- **Enhancing patient care** – healthcare facilities can take a more proactive approach to treatment. For example, by more precisely predicting which patients will develop chronic conditions, or which ones will respond best to certain types of medications or therapies, healthcare organizations can focus not only on treating existing conditions, but also on preventing recurrences.
- **Optimizing resource utilization** – patterns and trends in patient admissions, bed utilization, length of stay, and other metrics can be analyzed and used to predict future volumes – particularly when peaks may occur. Hospitals can be more prepared and ensure there are enough resources on hand to provide superior care, thereby better allocating nurses, clinicians, diagnostic machinery, and other resources.
- **Fraud detection** – predictive analytics can help healthcare professionals determine claims that need additional review for fraud by increasing the likelihood of discovering fraudulent claims.
- **Improving clinical outcomes** – health care organizations can pull clinical data from large amounts of patient information to understand patient histories and predict future outcomes. By closely analyzing which treatments work best, providers can make more intelligent decisions about treatment plans, minimizing complications and patient readmissions.
- **Increasing income and revenue** – identify opportunities to collect missing income, including claims that are wrongfully rejected by payers or overdue monies from patients.

Source: Andrew Pearson, 2012, Qualex Asia Limited

From „Data Warehouse“ to „Predictive Analytics“

„Structured Data“





„Big Data Analytics“

Predictive analytics encompasses a variety of statistical techniques from modeling, machine learning, and data mining that analyze current and historical facts to make predictions about future, or otherwise unknown, events

(Source: Wikipedia)

„(Un)structured Data“

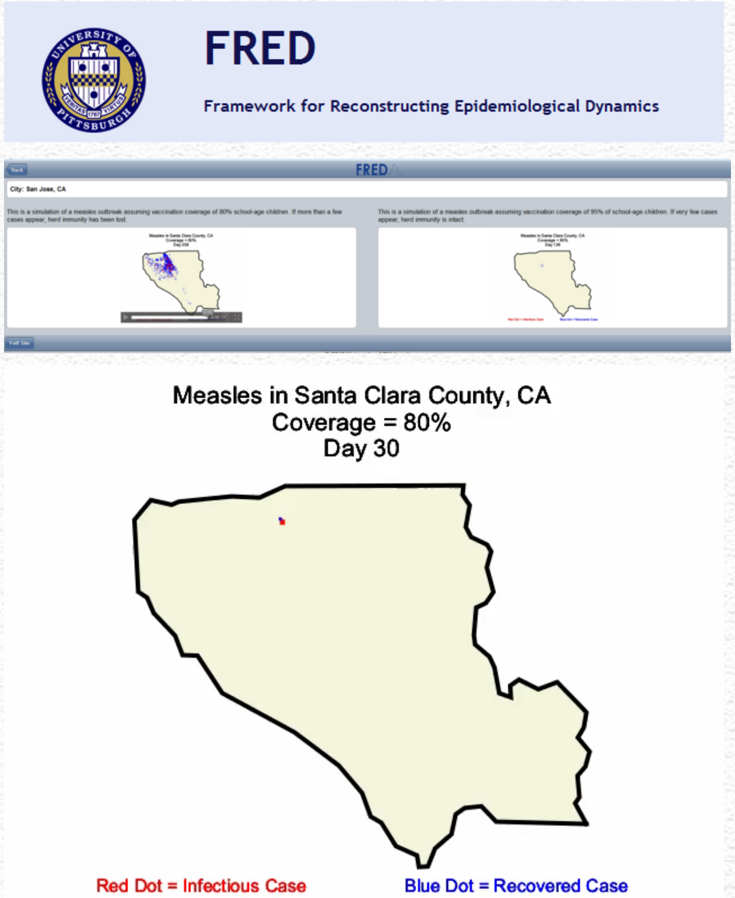
A1. Basic Analytics - FRED

Computer Simulation Models Measles Outbreaks

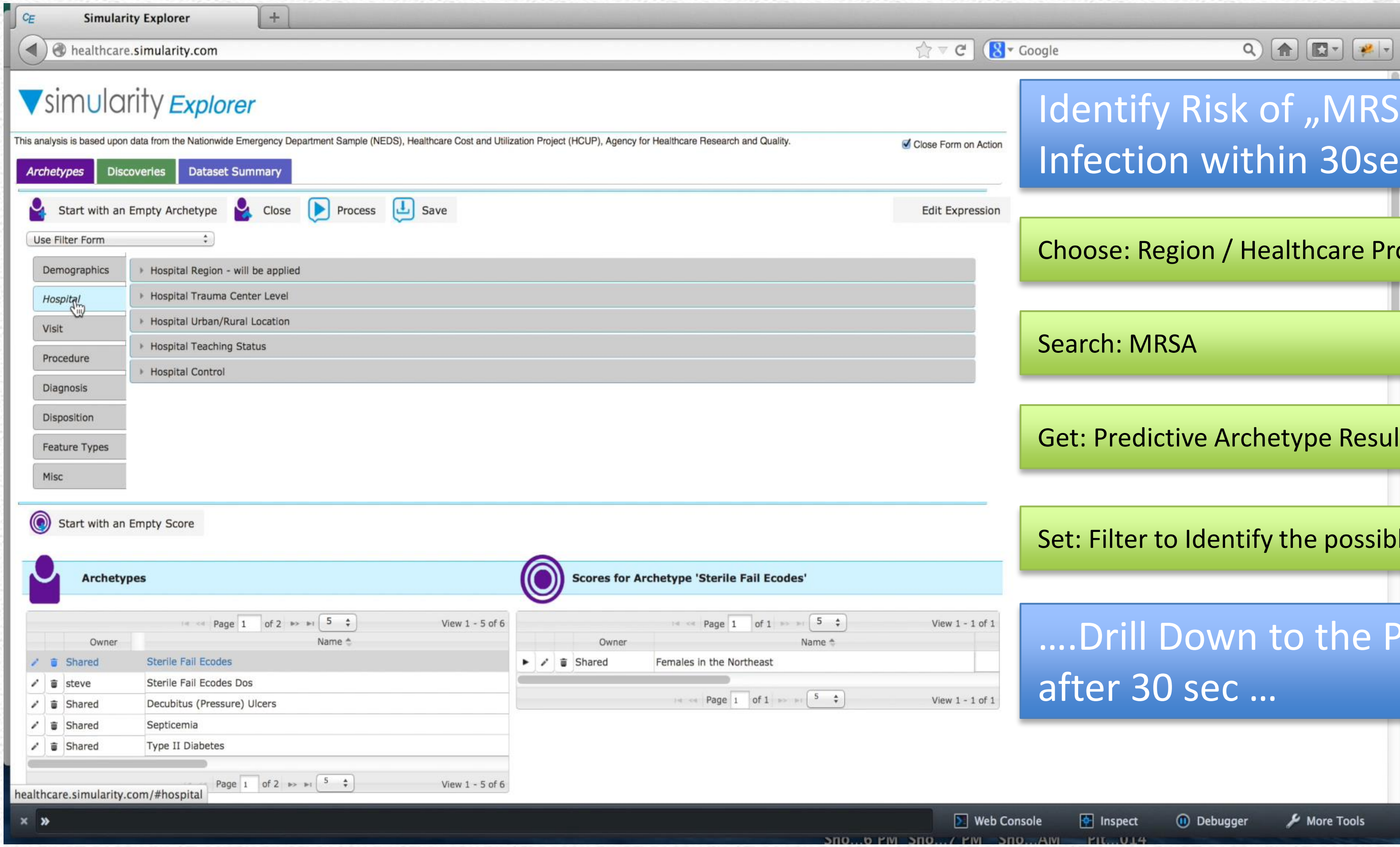
FRED supports research on the dynamics of infectious disease epidemics and the interacting effects of: mitigation strategies, viral evolution, and personal health behavior.

The system uses agent-based modeling based on census-based synthetic populations that capture the demographic and geographic distributions of the population, as well as detailed household, school, and workplace social networks. Multiple circulating and evolving strains can be simulated. Mitigation strategies in the framework include vaccination, anti-viral drugs, and school closure policies. FRED supports models of health behavior change to facilitate the study of critical personal health behaviors such as vaccine acceptance, personal hygiene and spontaneous social distancing.

FRED is available through open source in the hopes of making large-scale agent-based epidemic models more useful to the policy-making community, the research community, and as a teaching tool for students in public health.



A$_2$. Basic Analyze – MRSA



Identify Risk of „MRSA“ Infection within 30sec

Choose: Region / Healthcare Provider

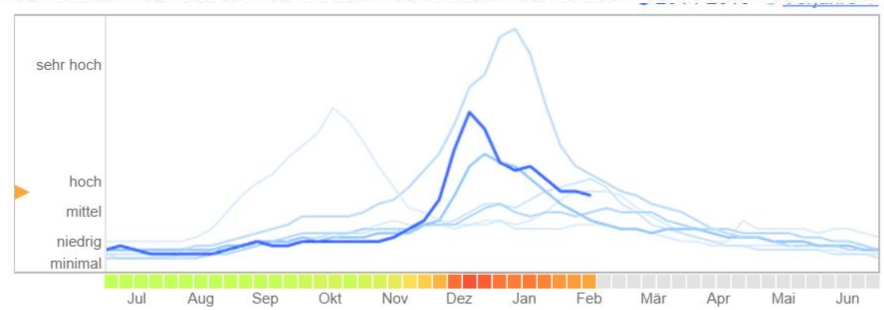
Search: MRSA

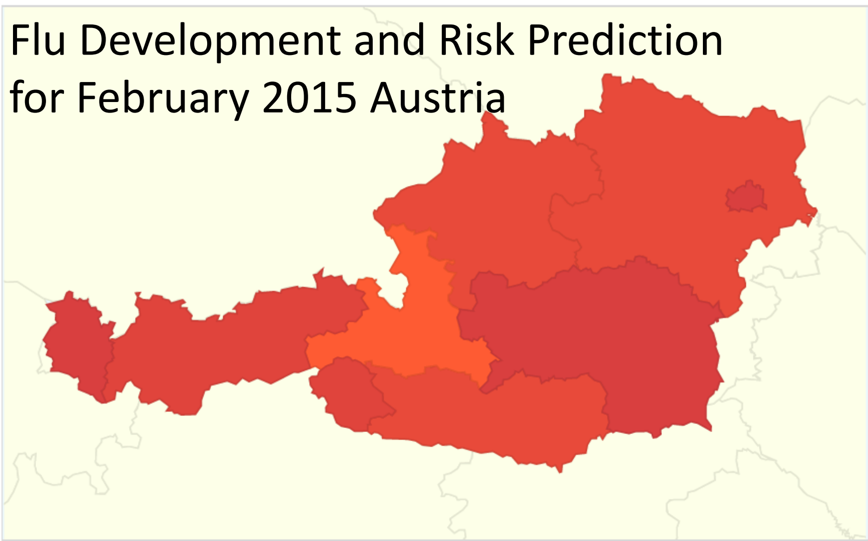
Get: Predictive Archetype Result

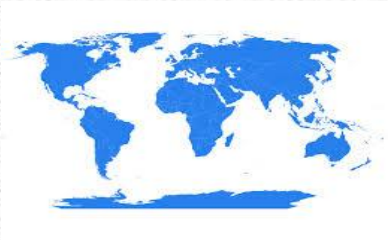
Set: Filter to Identify the possible affected

....Drill Down to the PHR after 30 sec ...

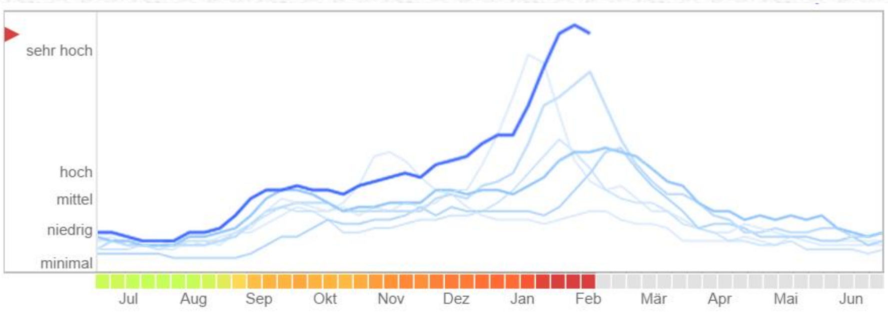
B1. Predictive Analytics – Google Flu







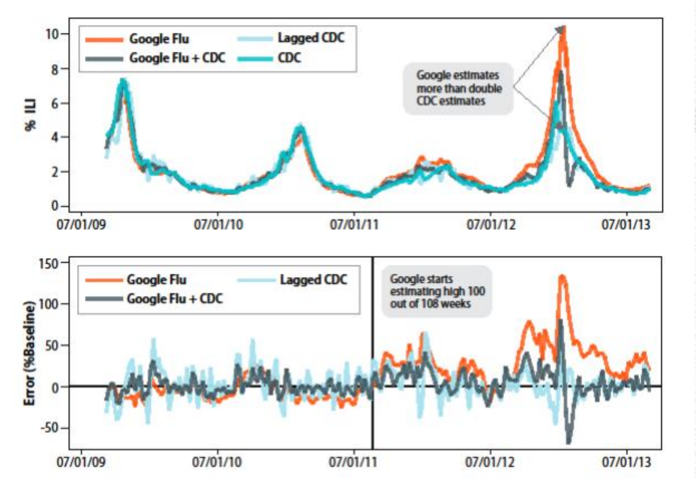
Prevention
Immunisation



B2. Google Flu in (short) Detail

- Tracking Data since 2009
- Monitoring millions of users’ health tracking behaviors online
- Google also implemented the policy to anonymize IP address in their search logs after 9 months
- The initial Google paper stated that the Google Flu Trends predictions were 97% accurate comparing with CDC data
- However subsequent reports asserted that Google Flu Trends' predictions have sometimes been very inaccurate—especially over the interval 2011-2013, when it consistently overestimated flu prevalence, and over one interval in the 2012-2013 flu season predicted twice as many doctors' visits as the CDC recorded.

Source: en Wikipedia 2015

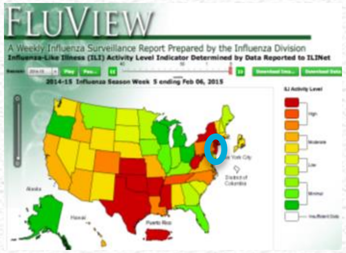


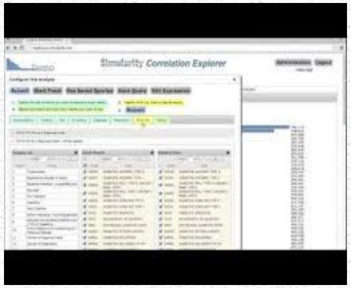
The Parable of Google Flu: Traps in Big Data Analysis David Lazer, 1,2* Ryan Kennedy, 1,3,4 Gary King, 3 Alessandro Vespignani5

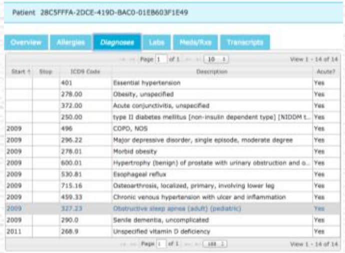
C. NDA PoC: US Healthcare Provider CA

Clinical Admit

Medical Examination







Correlation

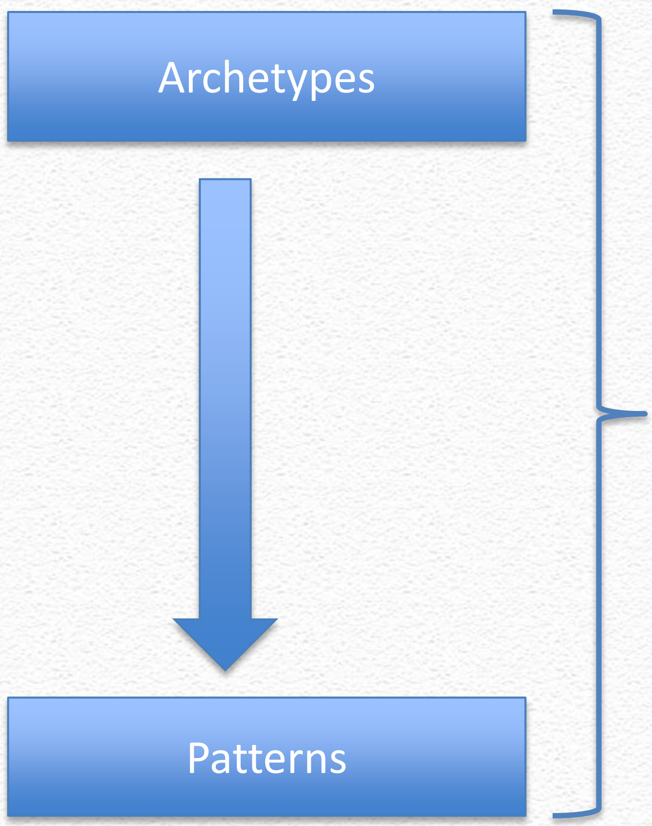
Warning

Summary:

- Patient comes into hospital
- Patient ID bracelet includes QR code
- When doctor scans patient bracelet QR code, patient's clinical history (including COPD, which puts patient at higher risk of Influenca complications) is combined with current flu outbreak data based on location.
- If patient is at high risk of complications and in an outbreak location, the patient record on the smart phone includes an alert indicating high risk of complications, and why.

Example: Step 1 – What you are looking for ?

Predictive Analytics Tools



RISK Ratio on Patients based on:

General Indicators

- Patients in my Enterprise Area possible affected by Influenza - Source based national empiric Data (CDC)
- Finding general Exposures (Age, Gender, Health Status, ….)

Patient / Healthcare Provider Centrific Indicators

- (Expected) Numbers of Patients which could be affected by Influenza cause by patient history (PHR)
- Unexpected Numbers of Patients affected by Influenza caused by the possiblity to get it through main illness and possible complications

Example: Reconstruction – Step 1

This analysis is based upon data from the Nationwide Emergency Department Sample (NEDS), Healthcare Cost and Utilization Project (HCUP), Agency for Healthcare Research and Quality.

Start with an Empty Archetype

Start with an Empty Score | Close | Process, See Now | Save | Edit Expression

Use Filter Form ▾ ☑ Exclude Archetype Events

Start with an Empty Score | Close | Process, See Now | Save | Edit Expression

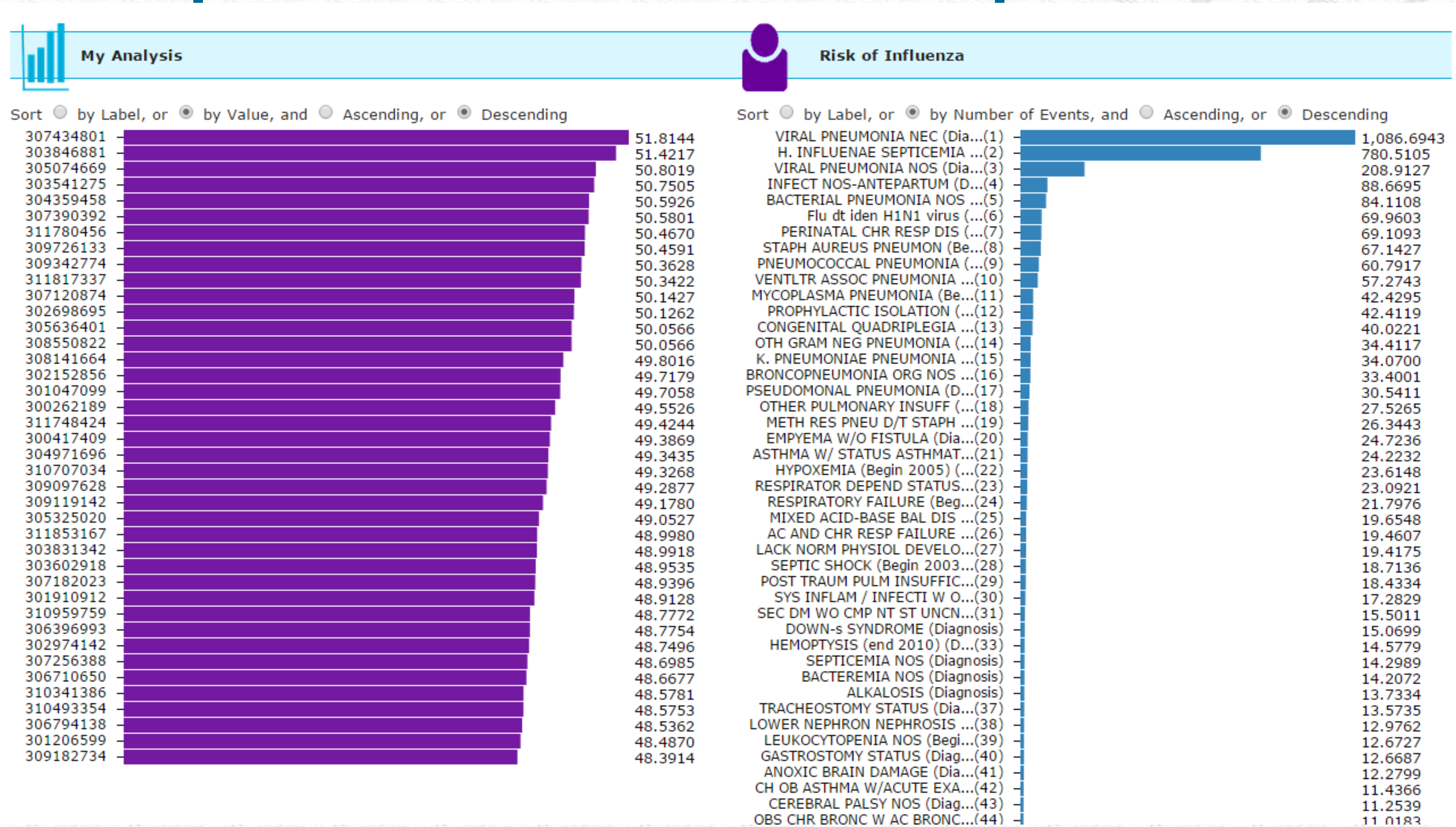
Use Filter Form ▾ ☑ Exclude Archetype Events

Parameters for Archetype 'Risk of Influenza'

Page 1 of 1 | 25 ▾ | View 1 - 7 of 7

Verb	Value
⊟ Diagnosis	
is	(0415) H. INFLUENZAE INFECT NOS
is	(4802) PARINFLUENZA VIRAL PNEUM
is	(4822) H.INFLUENZAE PNEUMONIA
is	(4870) INFLUENZA WITH PNEUMONIA
⊟ Feature Types	
is one of	Admission month, Age Range, Diagnosis, Median household income national quartile for patient ZIP Code, Patient Location: NCHS Urban-Rural Code (V2006), Region of hospital
⊟ Significance	
is	5
⊟ Metric for Feature Selection	
is	(log_likelihood) Log-likelihood Ratio

Example: Reconstruction – Step 3



Must have`s for the future

- **Analytics Easy to Use for Healthcare Staff:** Analytics executed by Physician and Nurses as Part of Daily Work and Daily Information Management
- **Analytics without being a statistician or Data Scientist:** Analytics no longer reserved only to data specialists and their special knowledge
- **Analytics as part of Clinical Application:** Analytics not only reserved for complex, expensive and limited Data Warehouse Systems
- **Analytics as part of Daily Decision Support:** Real Time Access and Results without extensive preparations on top of Knowledge Assis
- **Analytics on Demand as Service on Smart Platforms:** Independent from "Hardware Battles", affordable in Invest and Maintenance and without Core/CPU license woes

CLINICAL META DATA REPOSITORIES

Physician / Nurses

Specialized Department

MedController

Data Analysts

BIG DATA Analytics needs Reliability and Responsibility

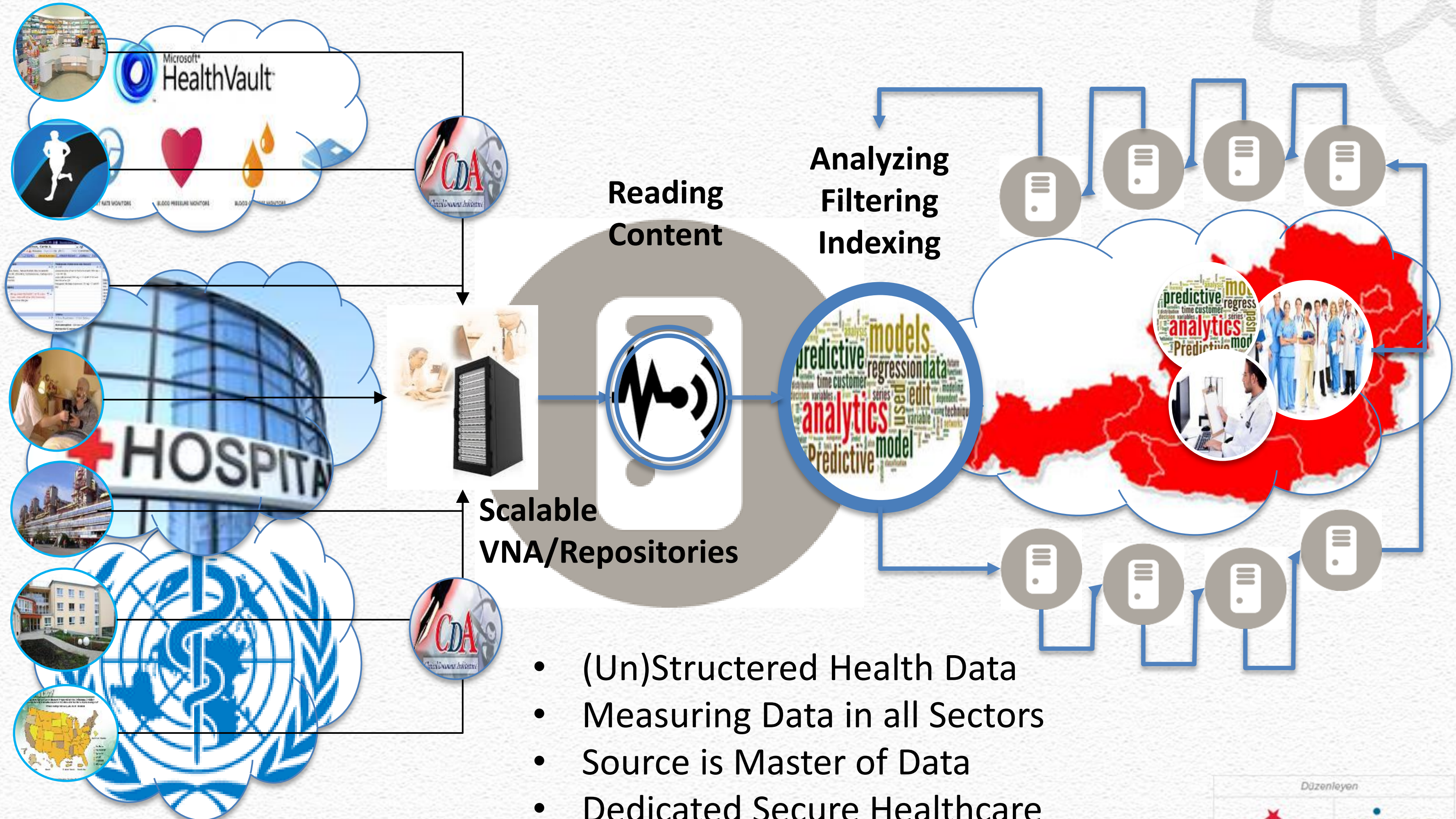
Predictive Analytics do not solve any Healthcare insufficency

Predictive Analytics in Healthcare needs Human Interpretation

Predictive Analytics needs assistant measurement in legal regulation and data privacy

The Success of implementing Predictive Analytics in Healthcare depends on the acceptance by Patients / Clinicians / Public

A Vision for the Future



- (Un)Structered Health Data
- Measuring Data in all Sectors
- Source is Master of Data
- Dedicated Secure Healthcare Clouds

Dikkatiniz için teşekkürler!

Thank you
For your
Audiance !

INFORMATION AND CONTACT

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