Problem (opportunity?) in Clinical research

- Big Data
- Knowledge hidden in data
Problem (opportunity?) in Clinical research

Patients
- Several sites

Variables
- Clinical data
- Biological/Research data
Problem (opportunity?) in Clinical research

Patients MILLIONS

Available?

Site 1  Site 2  Site 3  Site ...

Clinical

Biological/Research

-omics

Variables BILLIONS
Problem (opportunity?) in Clinical research

Barriers
- Vertical: geo, buro, will
Problem (opportunity?) in Clinical research

Barriers
- Vertical: geo, buro, will
- Horiz: heterogeneity, tech

Variables BILLIONS
-omics

Clinical

Biological/Research

Site 1   Site 2   Site 3   Site ...

Patients MILLIONS
Problem (opportunity?) in Clinical research

Barriers
- Vertical: geog, buro, will
- Horiz: heterogeneity, tech

Variables BILLIONS

Biological/Research

-omics

Clinical

Site 1 Site 2 Site 3 Site ...

Patients MILLIONS

CLINICAL DATA

From knowledge to practice

CLINICAL TRIAL

RESEARCH DATA

Knowledge discovery

ANALYSIS
i2b2: BigQ-NGS extension

- Next Generation Sequencing
- NoSQL database
- Fast query of variants (and associated data)
- 1 M variants => 1 sec
OUR SOLUTIONS

Patients MILLIONS

Clinical

Biological/Research

-omics

Variables BILLIONS

Site 1

Site 2

Site 3

Site ...

i2b2 extension:
Shared Health Research Information Network

Shrine
i2b2: Shrine extension

- Clinical Trials:
  - design (patient recruitment)
  - monitoring (clinical outcomes)

<table>
<thead>
<tr>
<th>Networks</th>
<th># Institutes</th>
<th># Patients</th>
<th>Pathology</th>
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<td>SHRINE East</td>
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<td>National Demo</td>
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i2b2

DATA SOURCES

Integration

DATA WAREHOUSE

Query

DATASET

Analysis

RESULTS

Data integration

pentaho
DATA SOURCES
Integration
DATA WAREHOUSE
Query
DATASET
Analysis
RESULTS

i2b2

Data integration
Cloud computing
Advanced data analysis

Cloud computing
Amazon Web Services

Advanced data analysis
R
WEKA
i2b2

- Hundreds of i2b2 projects for cohort management and population-based studies

CTSA (Centers for Translation Science Awards) or components thereof:
- Albert Einstein College of Medicine
- Boston University
- Case Western Reserve University (including Cleveland Clinic)
- Children's National Medical Center (GWU), Washington D.C.
- Duke University
- Emory University
- Georgetown University
- Harvard University
- Indiana University
- Johns Hopkins University
- Medical College of Wisconsin
- Medical University of South Carolina
- Northwestern University
- Ohio State University
- Oregon Health & Science University
- Penn State Milton S. Hershey Medical Center
- Tufts University
- University of Alabama at Birmingham
- University of Arkansas for Medical Sciences
- University of California Davis
- University of California, Irvine
- University of California, Los Angeles
- University of California San Francisco
- University of Chicago
- University of Cincinnati (including Cincinnati Children's Hospital Medical Center)
- University of Colorado Denver (including Children's Hospital Colorado)
- University of Florida
- University of Kansas Medical Center
- University of Kentucky Research Foundation
- University of Kentucky Research Foundation
- University of Kentucky Research Foundation
- University of Maryland Medical Center
- University of Massachusetts Medical School, Worcester
- University of Massachusetts Medical School, Worcester
- University of Michigan
- University of Michigan
- University of Minnesota Twin Cities
- University of New Mexico Health Sciences Center
- University of North Carolina at Chapel Hill
- University of Pennsylvania (including Children's Hospital of Philadelphia)
- University of Pittsburgh (including their Cancer Institute)
- University of Rochester School of Medicine and Dentistry
- University of Texas Health Sciences Center
- University of Texas Medical Branch (Galveston)
- University of Texas Southwestern Medical Center at Dallas
- University of Utah
- University of Washington
- University of Wisconsin - Madison
- Virginia Commonwealth University
- Weill Cornell Medical College
- Academic Health Centers:
  - Arizona State University
  - Central Michigan University
  - City of Hope, Los Angeles
  - Georgia Regents University (Augusta)
  - Hartford Hospital, CN
  - HealthShare Montana
  - Michigan State University
  - Massachusetts Veterans Epidemiology Research and Information Center (MAVERICK), Boston
  - Nemours Biomedical Research (DuPont Hospital for Children)
  - RENCI
  - Rush University Medical Center
  - Thomas Jefferson University (including Kimmel Cancer Center)
  - University of Connecticut Health Center
  - University of Delaware
  - University of Maryland Medical Center
  - University of Missouri School of Medicine
  - University of Tennessee Health Sciences Center
  - University of Texas San Antonio
  - Wake Forest University Baptist Medical Center
- HMOs:
  - Group Health Cooperative
  - Kaiser Permanente
- International:
  - Georges Pompidou Hospital, Paris, France
  - Hospital of the Free University of Brussels, Belgium
  - Inserm U936, Rennes, France
  - Institute for Data Technology and Informatics (IDI), NTNU, Norway
  - Institute for Molecular Medicine Finland (FIMM)
  - Karolinska Institute, Sweden
  - Landspitali University Hospital, Reykjavik, Iceland
  - Medical University of Vienna
  - National Consiglio del Research, Pisa, Italy
  - Tokyo Medical and Dental University, Japan
  - University of Bordeaux Segalen, France
  - University of Erlangen - Nuremberg, Germany
  - University of Goettingen, Goettingen, Germany
  - University of Kiel, Germany
  - University of Leipzig, Germany
  - University of Pavia, Pavia, Italy
  - University of Seoul, Seoul, Korea
  - Vergen del Rocio University Hospital, Spain
- Companies:
  - Johnson and Johnson
  - GE Healthcare Clinical Data Services
• **Our i2b2 projects**

- IRCCS Mondino (Pavia – IT)
  - Headache
- IRCCS San Matteo (Pavia - IT)
  - HLA
  - Hematology
- IRCCS Monzino (Milano - IT)
  - Intensive Care Unit
- IRCCS Medea (Bosisio Parini - IT)
  - Autism
- FP7-INHERITANCE: La Coruña - PT
  - Cardiomyopathies
- IMI-SUMMIT (Lund - SE)
  - Cardiovascular complications
- MOSAIC : Diabetes
  - ASL, Maugeri Pavia – IT
  - Valencia –ES
  - Athens- GR)
- IRCCS Maugeri (Pavia - IT)
  - Arrhythmias
  - Administrative data
  - Oncology
BIOMERIS

Spin-off

• Founded in **2012**
• **Private limited** company
• **Innovative startup**
• Awarded as “**academic spin-off of excellence**”
• Born from an academic **lab. of biomedical Informatics**
• Sited in Pavia (PV) ITALY

Team

• High level skills in different areas of **biomedical informatics**
• Many **PhD** in Bioengineering and Bioinformatics
• Solid experience in **collaborating** with physicians and biologists
PRODUCTS

i2b2
A system to integrate clinical and research data, allowing the user to easily select and analyze patient data

Shrine
A software to aggregate more cohorts from different institutes managed by different i2b2 instances

IceTrack
A biobank information management system maximizing flexibility (fully configurable) and usability (drag & drop)

OpenClinica
A clinical trial software for Electronic Data Capture (EDC) through web-based Case Report Forms (CRF)

OpenPPM
A software to manage research projects by planning and monitoring activities and resources
THANK YOU !!!

For more information:

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