

ConvergeHEALTH™

Miner™

Research Trust



A standards-compliant data repository and vocabulary for both research and real world data sets.

The Right Place at the Right Time

The health care ecosystem is driving toward patient-centric, value-based paradigm. This new normal requires a connected ecosystem with aligned incentives and virtuous information cycles. For life science innovators, a connected ecosystem means direct engagement with stakeholders in a way that enables and supports targeted therapies and services designed to treat the patient wholly, and therefore change the way disease is fought, helping to improve patient health outcomes.



Connect and Converge

Imagine a connected health system. One without barriers that allows data to flow constantly from the individual patient to all stakeholders, allowing the best possible care. By coupling deep industry knowledge and product development ingenuity, Deloitte is enabling a Learning Health Care System with its ConvergeHEALTH solution. Deloitte is committed to building scalable platforms and novel analytical approaches for its life sciences clients as the industry shifts towards a more value-based, personalized paradigm.

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CONNECT.

Life sciences innovators have the opportunity to engage with a health care ecosystem that is demanding a new level of connectivity. Leveraging cloud-based, digital health platforms to engage with patients, providers, payers, and regulators in new ways can fill evidence gaps to create a virtuous learning health care system.

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The proliferation of health care data has created the opportunity for life sciences innovators to drive insights across the value chain, but requires a convergence of capabilities from new technology platforms to external partnerships to new operating models. Organizations utilize evidence as a critical asset to inform decision making across the value chain.

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A digitally connected, patient-centric, scalable network that aims to reimagine every aspect of a patient’s journey to enable a learning health care system driving better outcomes and innovation.

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Miner’s technical components include Data Asset Explorer (DAE), Research Trust (RT), Cohort Insight Suite (CI), and Deep Miner. These components can be combined or used separately as accelerators to empower users to visualize data and analyses, enhance collaboration, and manage their data assets, increasing organizational efficiencies related to data-driven decision making.

Research Trust

A foundational component of the evidence platform, Research Trust enables data integration from internal and external phenotype and genotype data assets, harmonizing data coded in disparate terminology systems to standardized vocabularies for use in downstream analytic and visualization tools. Research Trust covers various standards for different subject areas. Research Trust is designed to support research data sources as well as the rapidly growing area of real world data, Research Trust includes ETL packages that help ingest source data in standard formats, such as SDTM, into integrated, production-ready data. When processing is complete, the data can undergo any necessary additional processing, such as data aggregation and then the data are ready for loading into an appropriate data mart by ConvergeHEALTH, a third-party, or custom solution. A data de-identification package is included in Research Trust to assist users in managing sensitive health information if needed.

Capabilities

- Provide access to clinical data sets for research community
- Leverage research data across research community, supported by scalable informatics architectures and frameworks
- Support growth of innovation portfolio and facilitate new opportunities around innovation
- Leverage existing relationships and investments for opportunities around cloud and bigdata
- Establish infrastructure and strategies to support the vision of creating “learning health care loops” in the health care system

Impact

Recording and analyzing different data types, such as various ‘omics, in conjunction with routinely collected medical data, enables data-driven decision making. Research Trust provides clarity and on-demand access to integrated data while also accommodating the ever-changing universe of research structures.

Link and Integrate Data Sources into Common Data Entities

Research Data

- **Bio-specimens (tissue, fluid, cell)**
Biobank data, sample collection, sample processing, storage location, additives, assays, analyses
Samples
Preparation, treatment, storage/LIMS data
- **Cancer registry – Pathology**
Tumor (type, size, site), tumor margins, tumor grade, tumor staging, pathology procedure, pathology event
- **Research subjects (homo sapiens, mus musculus)**
Demographics, treatment, consent forms, case report forms (CRFs), contacts, cell line dimension table, human and animal dimension tables
- **Clinical trials/studies**
Protocols, study design, inclusion/exclusion criteria, treatments, medications, adverse events, finding, exposure

RWD Sources

- **EMR**
Observations, inpatient data, diagnoses, procedures, labs, orders, medications/eMAR, vaccinations, radiology, and oncology, narratives
- **Patient**
Patients, appointments, notes, allergies, medication list, problem list, panels (attribution), vital signs
- **Corporate provider master**
Institutions and clinics, sections and specialties, providers
- **Claims & billing**
Medical claims and lines, Rx, Claims, Charges and Payments, DRGs
- **Insurance**
Payer, subscriber, authorization, and membership
- **Omics**
Genetic test results

Standards Platforms

- Cloudera 5.x
- Amazon Redshift
- Oracle
- SQL Server 2012 and above
- HL7 CG
- BRIDG 4.0
- CDISC SDTM v3
- FHIM
- NAACCR

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Data Asset Explorer 1.2



A hosted, secure, web-based application to inventory, search, manage, access and understand the breadth and depth of available information assets

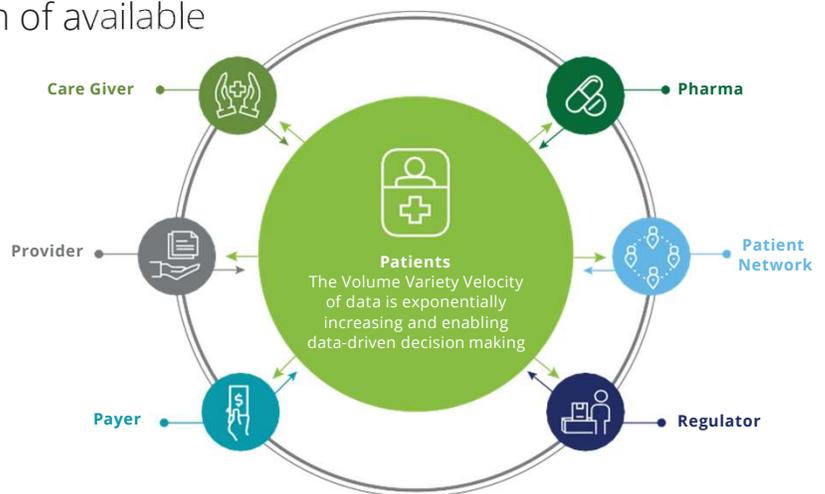
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Data Asset Explorer

DAE is a hosted, secure, web-based, software as a service (SaaS) solution built for life sciences organizations. It enables life science users to inventory, search, manage, and access their information assets, oversee projects, and track internal and external partnerships.

Impact

The evidence value behind each data source is different during the product life cycle. Understanding the breadth and depth of available data will lead to more informed research design and subsequently more targeted insights. DAE can increase data transparency, increase understanding around data set characteristics, create a governance policy for data use, and facilitate the creation of business cases for purchasing new assets.



Catalog: Data Assets/Bioassay Types

Enables storing, editing and viewing metadata of data assets that are needed to generate insights

Information Discovery: Find Data

Enables searching across a data catalog, filtering exploring, and exporting the resulting data for analysis

Collaboration: Information Sharing

Enables sharing of information through notes, attachments, user feeds

Governance: Workflow

Provides rule based workflows to onboard, conduct compliance verifications, and manage access requests for data assets, and studies

Reporting: Custom Reports

Enables viewing reports demonstrating data assets value such as utilization for each data asset

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Cohort Insight Suite



Self-service web-based cohort building application enabling clinical researchers to create cohorts without coding then synchronize those cohorts across toolsets and platforms.

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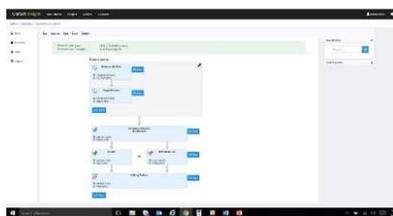
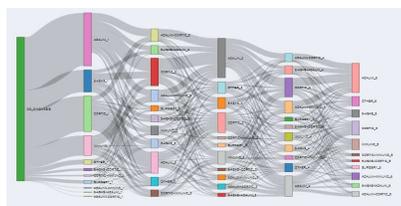
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Cohort Insight Suite

Cohort Insight is a self-service, web based cohort building application with a user-friendly user interface to enable a clinical researcher to create cohorts using phenotypic or genotypic data from multiple data sources with no coding required. Further, the user can invoke packaged analyses such as Treatment Pathway for the cohort(s) selected. This accelerates analytic workflows by enabling cohorts to be synchronized across select toolsets and platforms while allowing for comparative visualization across cohorts. In addition, by sharing the cohort definition across the organization, clients will improve the ability to compare insights across the evidence lifecycle.

Impact

Cohort Insight allows for the democratization of insight creation by allowing researchers with deep clinical and research expertise who do not use code-based statistical tools (such as SAS or R) to be able to create and analyze cohorts with powerful query and visualization tools. In addition, the elastic computing power of the cloud speeds time to insight, and the ability to share cohort definitions and analyses allows for uniformity of analyses across the organization.

Components

Dashboard:

A light weight knowledge management app and the launch pad for running cohort driven workflows.

Cohort Integrator:

Backend services designed to accelerate sophisticated research or RWD analytic workflows by enabling data of selected cohorts to be synchronized across multiple tool sets and platforms.

Treatment Pathway:

A UI driven way for users to define treatments and business and gain a deeper understanding of how patients moves through the treatment path.

Cohort Analytics Portal:

Application that provides a set of packaged analytical methods to end users, enables analysis to be run on a selection of cohorts, and visualize the results in an integrated environment.

Cohort Insight:

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Deep Miner



A quick start toolkit that enables real world data analysts to investigate their complex disease questions across the drug lifecycle by applying advanced cognitive learning technologies using a prepackaged code base

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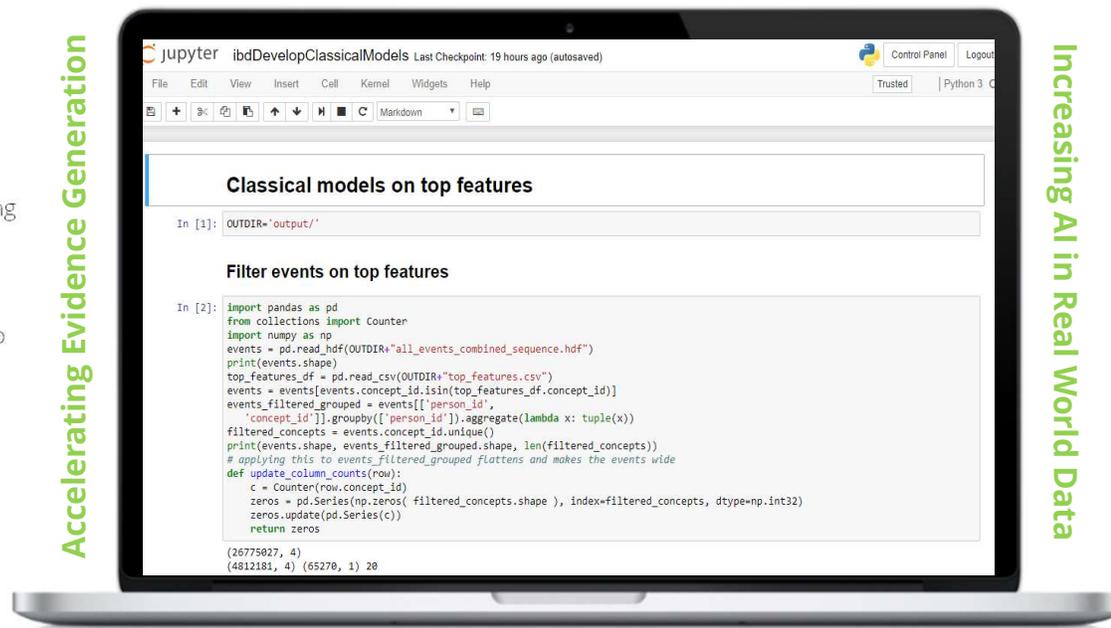
Deep Miner

Deep Miner runs on Amazon Web Services (AWS) and enables researchers to build and train their own disease-specific machine learning models, including deep learning models, using real world data (RWD).. Building and training scalable and accurate patient-level prediction models is heavily dependent on using an elastic, cloud-first approach. Deep learning methods have the potential to model thousands of parameters simultaneously more accurately than traditional, linear methods. However, they are also computationally greedy and require an elastic, on-demand infrastructure to flexibly spin-up EC2 instances to meet this demand.

The Deep Miner module of ConvergeHEALTH Miner provides a scalable, repeatable framework for model development—including identifying the right cohort, generating a comparator, applying techniques to control for bias, and comparing various modeling techniques head-to-head to find the best performance for a specific hypothesis.

Deep Miner combines open source methods, proprietary data transformation, machine learning and neural network algorithms to generate insight from RWD across the development life cycle in areas such as real world disease etiology, identification of “digital biomarkers” (such as clustering patient characteristics in a clinical trial protocol), and medication adherence studies.

Accelerating Evidence Generation



Increasing AI in Real World Data

WHAT DIFFERENTIATES DEEP MINER

Integration with Miner Platform

- Launches from Miner Analytics Portal
- Integrated cohort driven workflow allows the user to derive multiple insights from their patient cohorts without coding

Open Models & Open Architecture

- Models are delivered in interactive format (Jupyter Notebooks) with prewritten code, documentation and visualizations
- Plug-in of open source classical and neural network frameworks (e.g. TensorFlow)

Life Science and Health Care Specific

- Domain specific platform includes proprietary RWD transformation capabilities
- Models are optimized to the nuances of patient data (e.g. bias, confounding)

Optimized for Cloud Computing

- Leverages best suitable cloud computing resources for each step of the model development

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