

Real World Evidence Analysis Platform Design Based on Medical Big data

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Agenda



The Definition of RWD&RWE



Advance Analytics Methodology in RWE



The Architecture of SAS RWE platform



The Advantages of SAS RWE technology

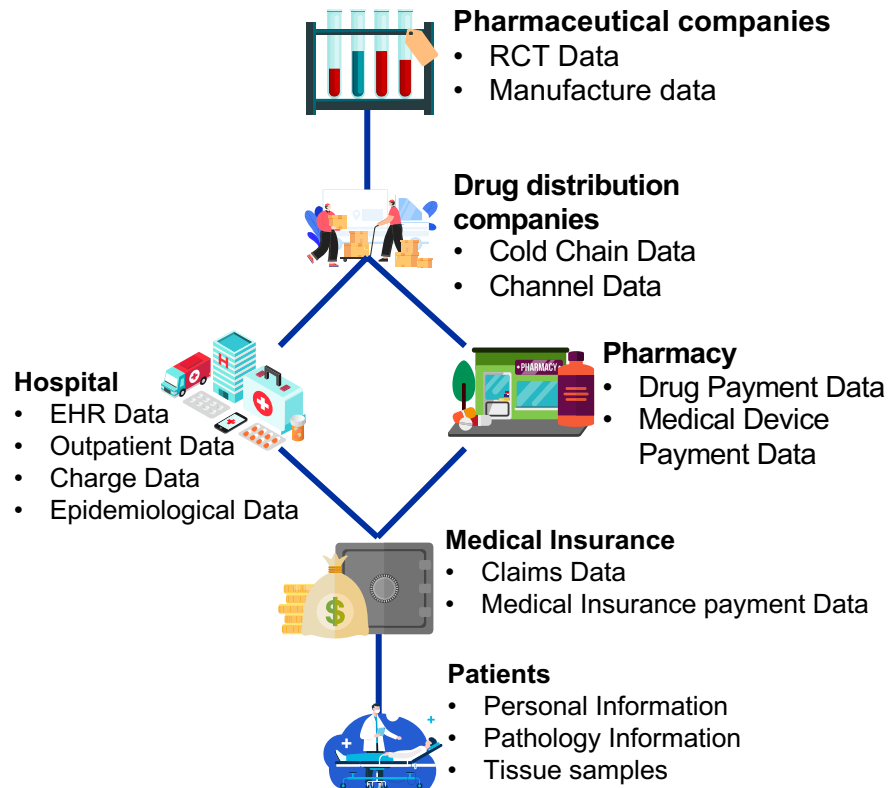
The Definition of RWD&RWE



Real-World Data (RWD) are data relating to patient health status and/or the delivery of health care routinely collected from a variety of sources.



Real-World Evidence (RWE) is the clinical evidence about the usage and potential benefits or risks of a medical product derived from analysis of RWD.



Life Science & Healthcare Industry Challenges



- R&D costs and drug price increases
- Growing use of evidence syntheses and outcomes research



- Informed patients, aging population, and personalized treatments



- DRG payment reform for medical insurance funds
- Medical Insurance Fraud



- People and skills have become a precious commodity
- Internationalization and strengthening supply chains

RWE Application Scenarios



R&D

Trial Design innovation

- Design synthetic control arms

Optimize RCT Design

- Improve inclusion & exclusion criteria and end-points
- Accelerate recruitment
- Understanding the safety and efficacy profile of drugs



Manufacturing

Production Process

- Drug solubility consistency check
- Production Scheduling
- Quality control of key production processes

Equipment Testing

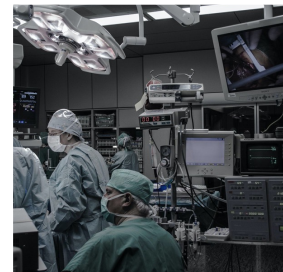
- Predictive production equipment maintenance



Sales & Marketing

Refine commercial strategy

- Shape product positioning
- Avoid complaints and claims from adverse reactions
- Pricing strategies can be based on the results of RWE
- Explaining the Economic value of the treatment plan to the payer



Medical service

Make clinical decision

- Provide accurate medical advice
- Predict health outcomes, risk and disease progression

Clinical Research

- Monitor RWD for safety and adverse events
- Identify subpopulation with outperform-effect



Regulation

For CDER/CDE

- Accelerating more evidence to support the safety and effectiveness of drugs
- More ways to conduct clinical trials on special populations such as children and pregnant women

Medical Insurance

- Medicare Anti-Fraud



Different Types in RWE Studies

Research Type	Objective	Methodology
Risk Assessment	Analyze EHR to Build risk model for evaluating the probability of specific diseases	Cohort
Treatment Adherence	Determine the degree to which a patient correctly follows medical device	Cross-sectional studies
Treatment pattern	Examine the treatment pattern for a disease indication based on history data	Case-control
Post-Marketing safety profile	Large sample to monitor drug safety profiles	Cohort
Incidence Rate	A survey study on the incidence of a new disease in a specific period	Ecological Research/Cross-sectional studies
Quality of Life	A study on the quality of survival of a regional population, including physiological and psychological related data	Case-control
Hospital Admission	Find associations between hospital readmission rates and pre-treatment or environmental factors	Retrospective study
Comparative Effectiveness	Comparison of multiple treatment options for the same disease to determine the best treatment in a broad sense	Retrospective study
Medicare Anti-Fraud	Identify fraudulent behavior and patterns through data from the first page of the case and the health insurance billing list	Retrospective study/Rule

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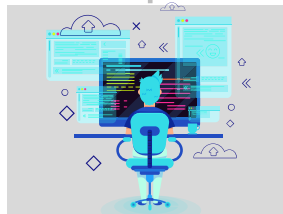


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Traditional VS. Advanced Methodology



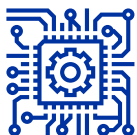
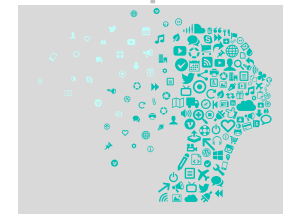
Traditional Analytics Methodology

- Static data
- Fixed analysis plan
- Small sample size
- Based on hypothesis
- Interpretability of the

VS

Advanced Analytics Methodology

- Dynamic data
- Fitting the optimal model
- Big data from different sources
- Data-driven
- Focus on model accuracy

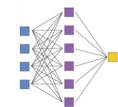


Machine learning technologies

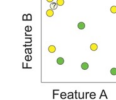
have the potential to transform health care by deriving new and important insights from the vast amount of data generated during the delivery of health care every day.



- Logistic regression
- Neural Network
- Xgboost
- Random Forrest



- Anomaly Detection
- K-means clustering
- Island Forrest
- Factorial analysis



Hybrid Approach

Machine Learning

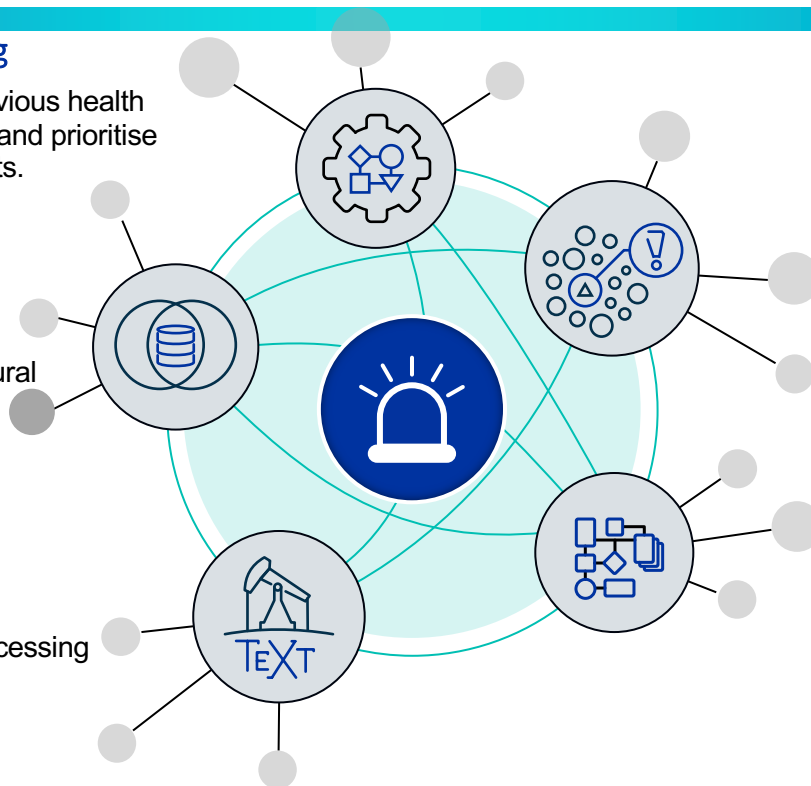
Predictive modelling based on previous health outcomes. Reduce false positives and prioritise risk. Discover new emerging threats.

Database Searches

Identifying susceptible populations in natural population cohorts

Text Mining

Data extraction and natural language processing of the literature



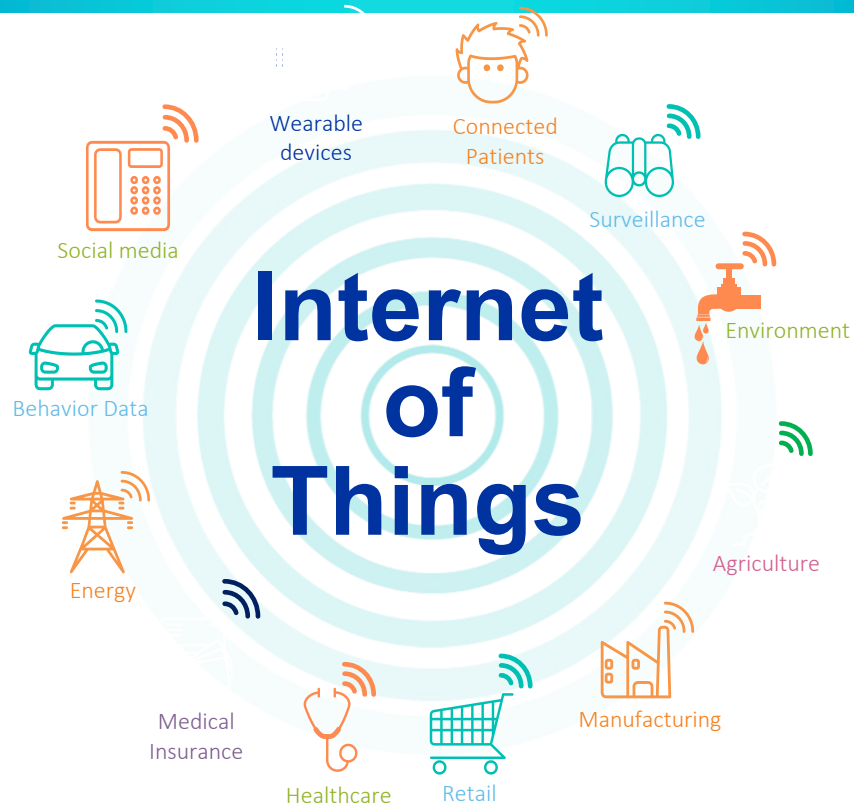
Anomaly Detection

Identify patients at risk for abnormal outcomes

Automated Business Rules

Automated processes to update data and medical rules

Real Time Analysis of RWE: Internet of things



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SAS Life Sciences Product Ecology



Clinical
Research
Analytics



Outcomes
Research &
Epidemiology



Connected
Quality



Market Access &
Commercial



Population
Health



Health
Operations

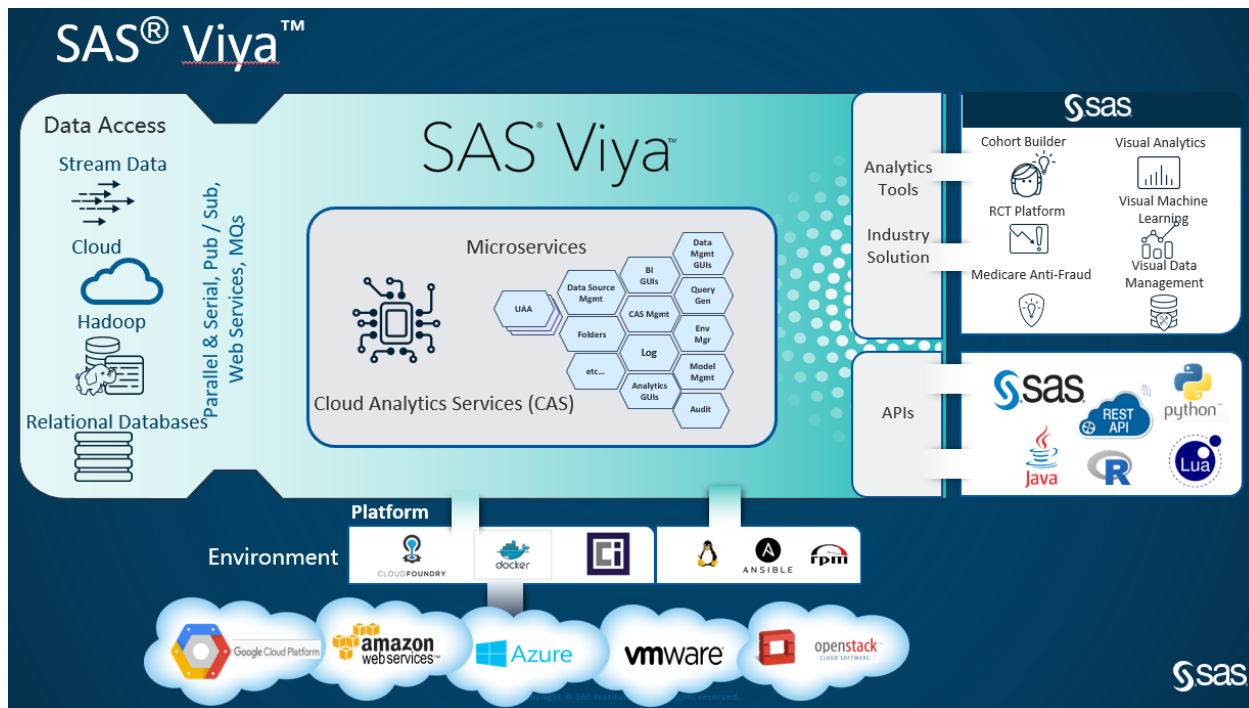


Health Care
Finance





SAS Solution Architecture

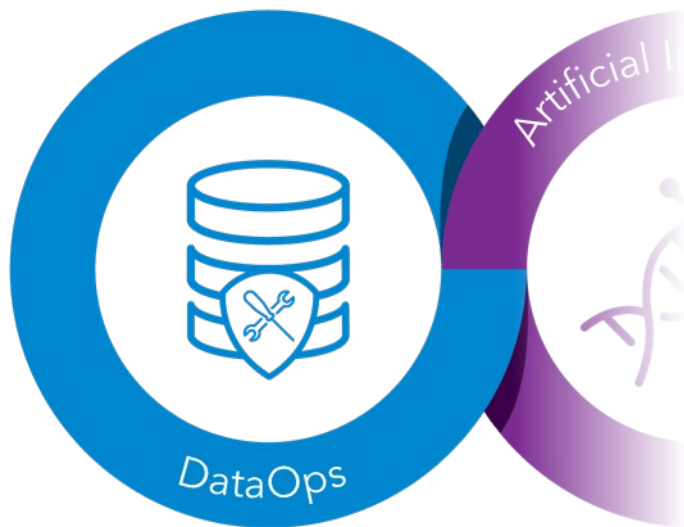




Design Logic of SAS Analytics Platform



The Analytics Life Cycle



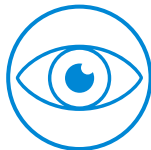
Access

Access data, regardless of size or complexity



Prepare

Transform raw data, including AI powered suggestions



Visualize

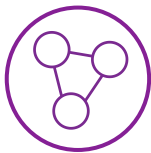
View important relationships in data and share insights



Govern

Build trust in data, understand lineage and gain transparency

The Analytics Life Cycle



Model

Build models with multiple AI techniques to solve real world problems



Automate

Automate manual tasks for feature engineering and model tuning



Collaborate

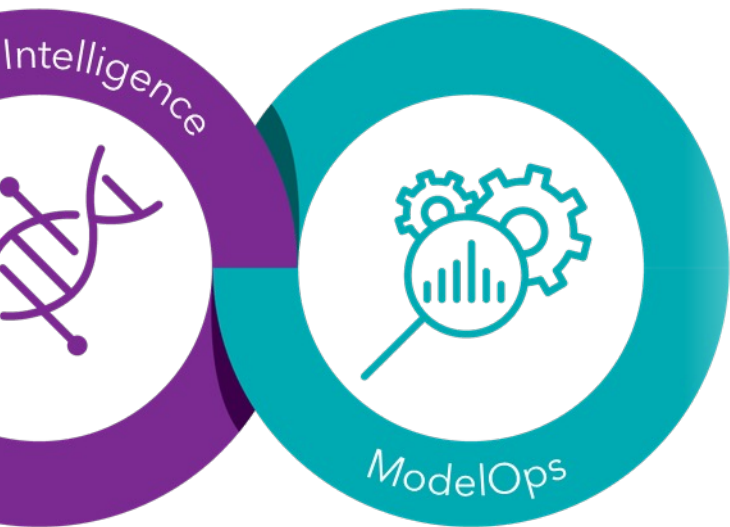
Users with different skill sets collaborate on solving analytics problems



Integrate

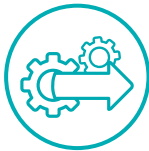
Work smarter with SAS Viya & open source analytics

The Analytics Life Cycle



Validate

Ensure models will perform as expected in the actual, real world



Deploy

Embed models into operational systems and monitor them



Govern

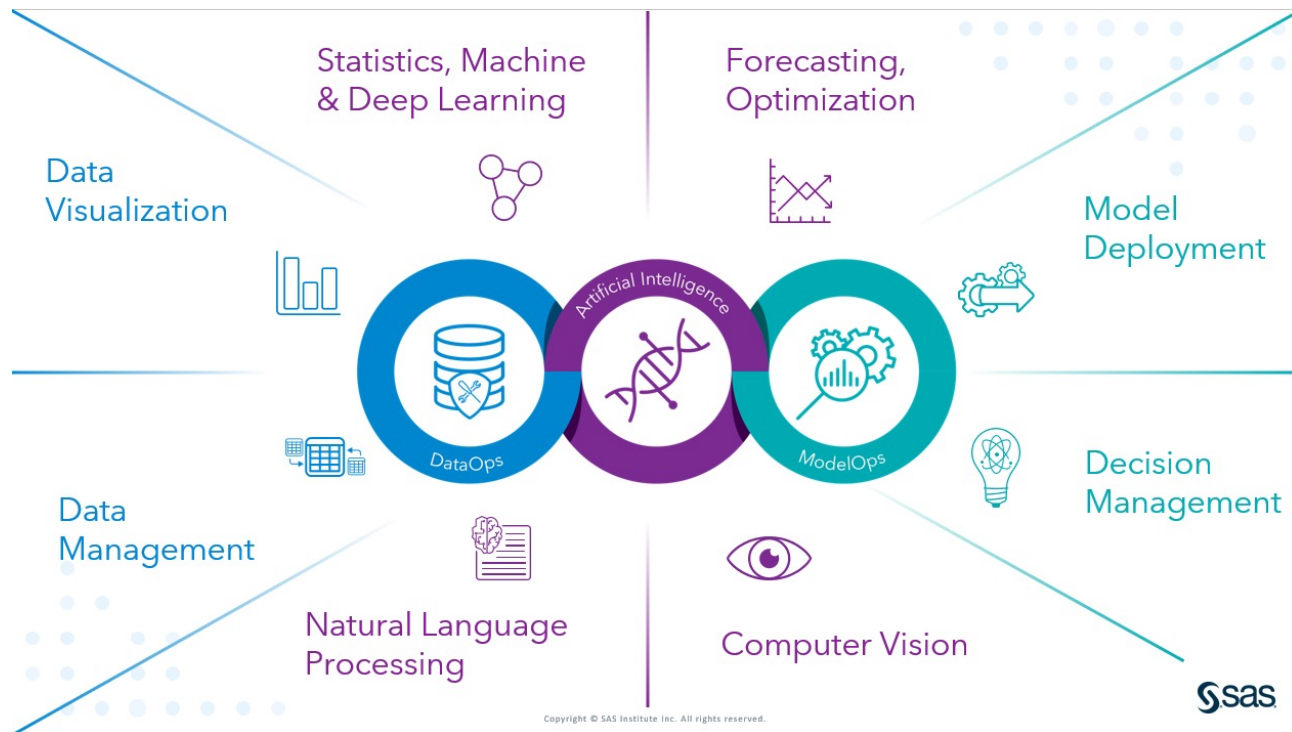
Ensure decisions are safe and transparent over the life of the model



Embed

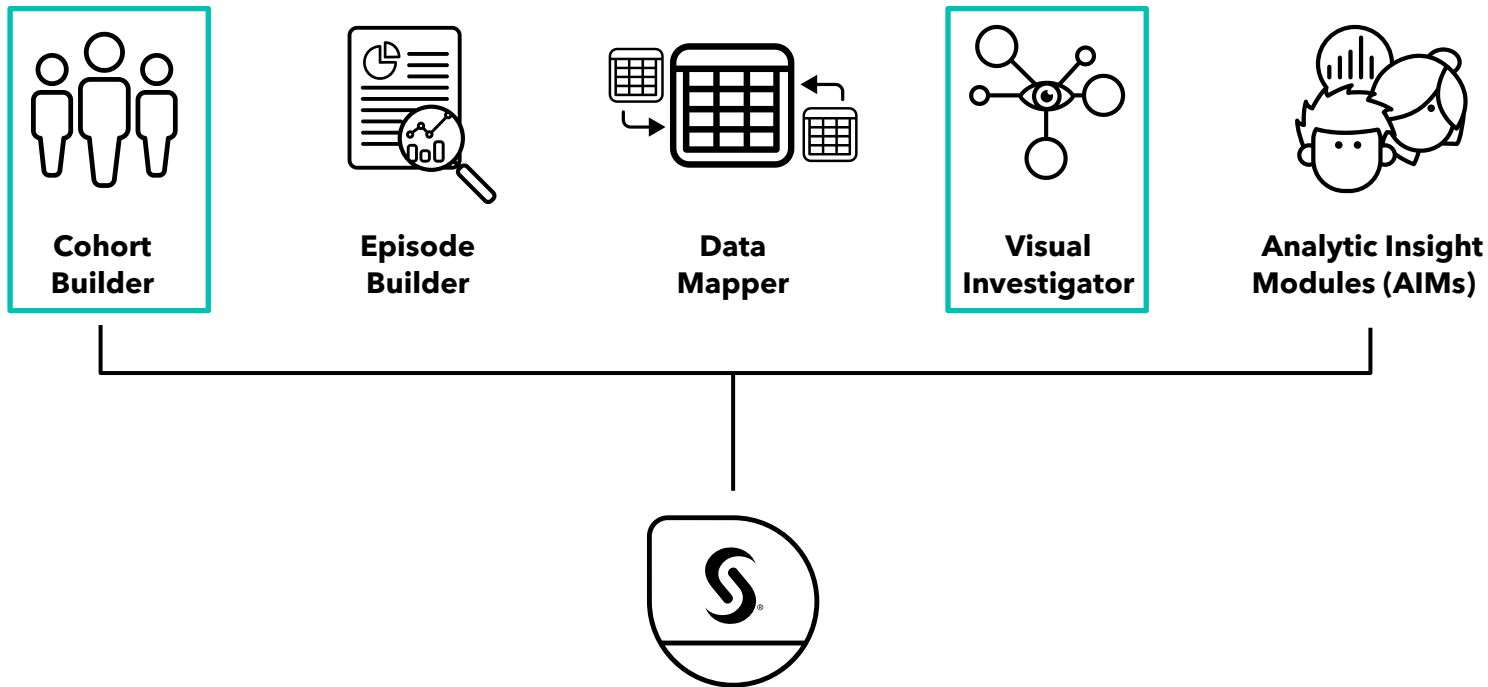
Integrate business rules to ensure up-to-real-time results

The Analytics Life Cycle





Reimagining health analytics in the cloud





Reimagining health analytics in the cloud



**Cohort
Builder**



**Episode
Builder**



**Data
Mapper**



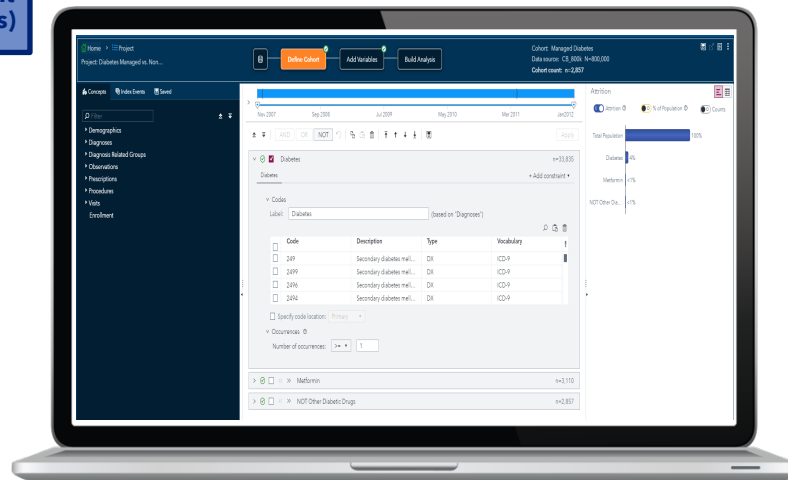
**Visual
Investigator**



**Analytic Insight
Modules (AIMs)**

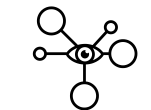
Product Value

- Quick discovery and creation of patient cohorts
- Flexibility to build inclusion and exclusion criteria for rapid data governance
- Conduct population health analytics, clinical feasibility analysis, safety and efficacy
- Accelerate time to insight through improved collaboration and reusable complex concepts, variables and index events





Reimagining health analytics in the cloud

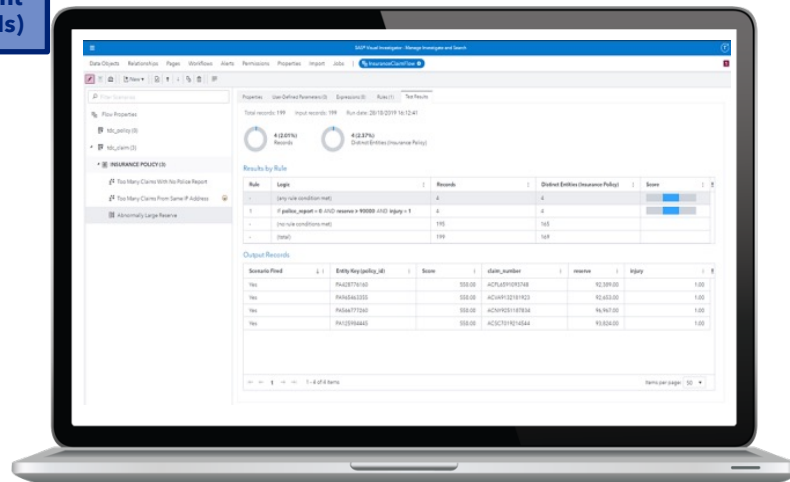


Visual Investigator



Product Value

- Manage the end-to-end process for alert triage and detailed targeted investigations
- Detect, investigate and respond to fraud and other suspicious activity and conduct investigations
- Uncover the likelihood of fraud, waste, abuse and other improper payments that cause loss and compromise payment integrity
- Link and social network analysis



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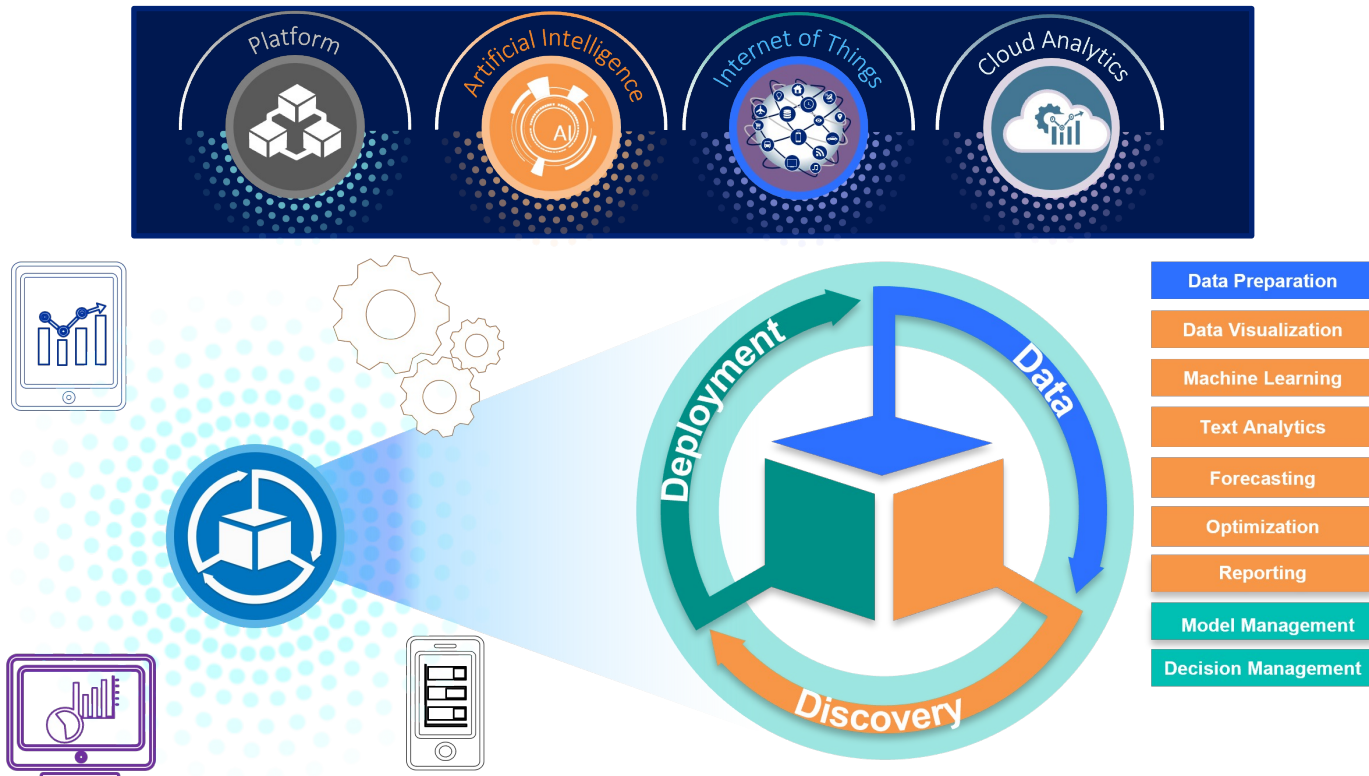
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SAS Capability in RWE Analytics





SAS Value to RWE in Life Science

Focus areas

Operational insights

automate and optimize health care operations for maximum access for the patient

Population Health

Trusted and actionable insights for optimal health outcomes.

Health Care Finance

Manage cost and avoid fraud, waste and abuse

Value Propositions and Use cases

Virtual Health

Optimise remote health care by measuring performance and enterprise-wide analytics

Health Outcomes

analyze clinical and operational data to uncover hidden insights that can improve patient lives.

Cost analysis

Use claims data and clinical data to adjust for acuity within provider populations

Medical Resource Optimization

Aligning capacity with demand and expectations, optimizing operations

Continuous Patient Monitoring

Realtime patient monitoring for immediate physician support

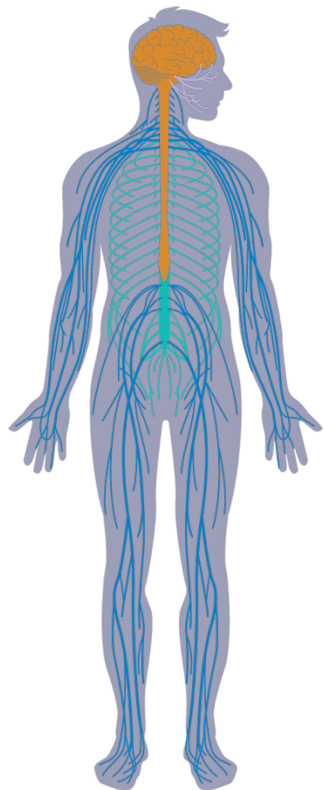
Whole Person Care

With advanced analytics, behavioral health organizations can get a more complete picture of client needs, understand barriers to care, forecast demand for services within high-risk populations, and measure program effectiveness.

Health Care Fraud, Waste and Abuse

Uncover suspicious activity and proactively identify issues in health care payment flows with the goal to contain costs and waste, and detect fraud and abuse more quickly with an end-to-end framework

SAS Value to RWE in Life Science

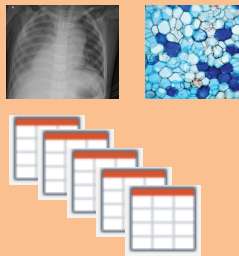


Analytics Tech

- Statistical Models
- Randomization
- Factor analysis
- Survival analysis
- Machine Learning
- Deep learning
- Image Processing
- Edge Computing



Medical Big Data



Natural Sciences

- Evidence-Based Medicine
- Pharmacology
- Genomics
- Transcriptomics
- Proteomics
- Bioinformatics



Application

- Pharmaceutical Research and Development
- Health Management
- Ancillary Care
- Hospital Management
- Quality Assessment

