Achieve Dynamism and Automation through Machine Learning

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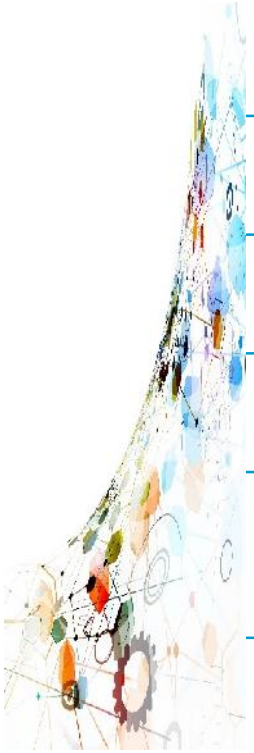
Outline



- Trends - Dynamism and automation in data integration and analytics
- Machine Learning Concepts
- Representative Use Cases Overview
- ML - Data Standardization
- ML - Analytics – Data Validation, Risk Management
- Q and A

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Trends - Dynamism and Automation in Integration and Analytics

Drivers

- Source, target and transformation metadata vary across studies
- Data dictionaries may vary across studies
- Important to minimize code change, transformation pre-processing in ingestion layer
- Dynamic transformation rules needed
- New Data Scenarios - Data quality issues, data anomalies in source
- Cost and time efficiency needed to encourage adoption within enterprise

Dynamism

- Pre-defined programs have limited efficiency
- Rules are not clear
- Challenge of handling exceptions for new structure and data scenarios
- Complexity of pre-defined programs increase to handle dynamism
- Need for a self learning dynamic mechanism

Automation

- Parameters for programs need to be automatically identified
- Parameters for programs should be refined automatically based on additional data flow and experience

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Machine Learning Concepts

Machine Learning Categories

- Supervised Learning
  - Provide Sample inputs and outputs
  - Learn general rules for input to output mapping
- Unsupervised Learning
  - No labels given to learning algorithms
  - Find structure in input on its own
  - Recognize patterns or identify features
- Reinforcement Learning
  - Program interacting with dynamic environment (learning to drive, competitive game play)

Key ML Tenets

- Clever program whose parameters are automatically learned from Data
- Use data to train program in situations where rules are not clear, number of exceptions are high so hardwiring program logic is not feasible
- Use Training Database (Based on Legacy Data)
- Data Pattern Recognition
- Feature Recognition

Deep Learning?

- Type of Machine learning around neural network based algorithms
- Software trains itself to perform tasks by Exposing multi layered neural networks to vast amounts of data
- Convolutional Neural Network (CNN) for object recognition
- Long-Short Term Memory (LSTM) network used for sentiment analysis, machine translation, or part-of-speech tagging.

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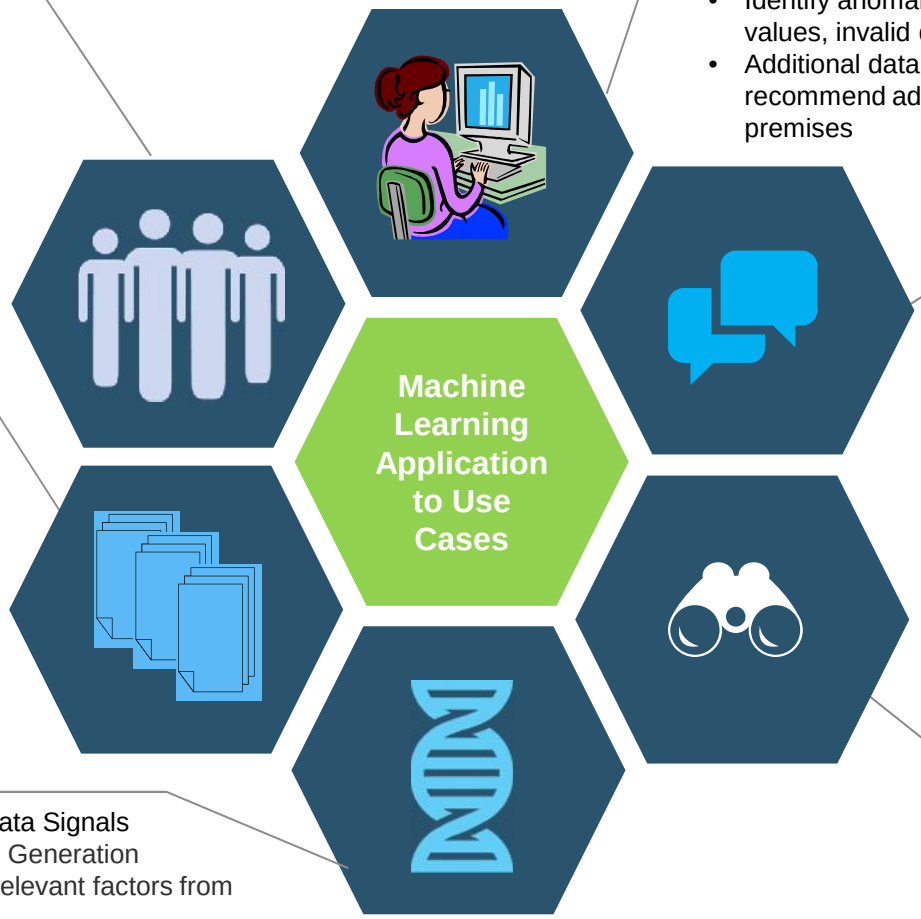
Representative Clinical Machine Learning Use Cases

Fraud Detection

- Identify Recurring vitals patterns in Visits
- Enable Fraud detection, Risk Management
- Additional data informs ML based models to flag new patterns

Data Validation

- Identify anomalies such as out of range, values, invalid data types, missing data
- Additional data allows ML models to recommend additional data validation premises



Data Standardization

- Identify Transformation Patterns
- Across studies within TA
- Across safety domains
- ML based Mapping Engine Learns and Automaps future studies
- Mapping ML models are better informed with additional study data being mapped

Sentiment Analysis

- ML based models for social Medial based sentiment analysis
- Post market analysis, identification of additional adverse effects
- Analysis models evolve with additional data

Drug Discovery

- Identify and Extract Biological Data Signals
- Automated Drug Disease Model Generation
- Feature Identification – Extract relevant factors from model for drug classification
- Candidate analysis and drug efficacy classification using ML

Safety Review

- ML based Predictive analytics models
- Enable Early Safety signal detection

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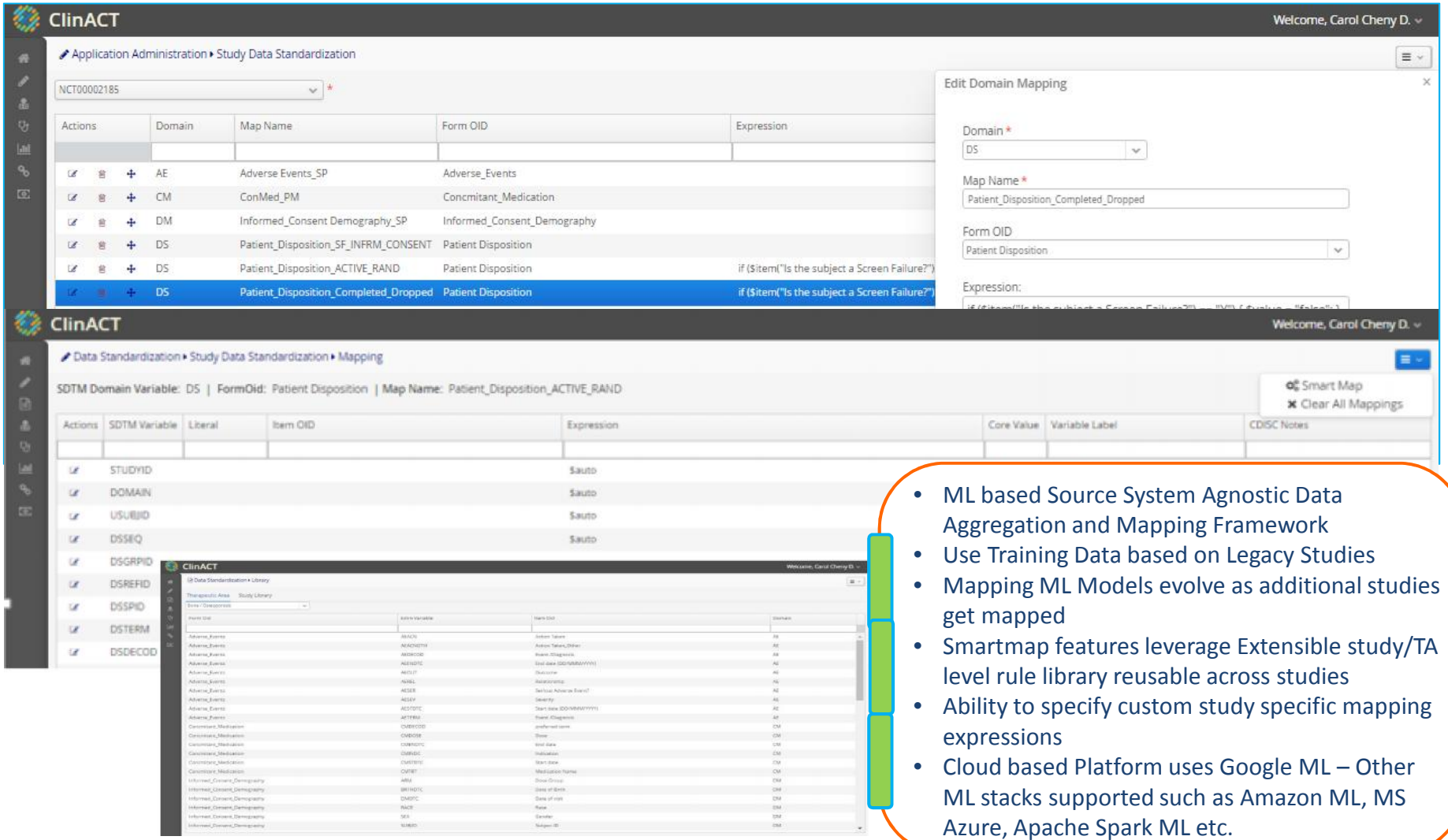
ML - Data Standardization Use Case with Thoughtsphere



- ML based Source System Agnostic Data Aggregation and Mapping Framework
- Use Training Data based on Legacy Studies
- Mapping ML Models evolve as additional studies get mapped
- Smartmap features leverage Extensible study/TA level rule library reusable across studies
- Ability to specify custom study specific mapping expressions
- Cloud based Platform uses Google ML – Other ML stacks supported such as Amazon ML, MS Azure, Apache Spark ML etc.

thoughtsphere
THE SMART WAY TO RESULTS

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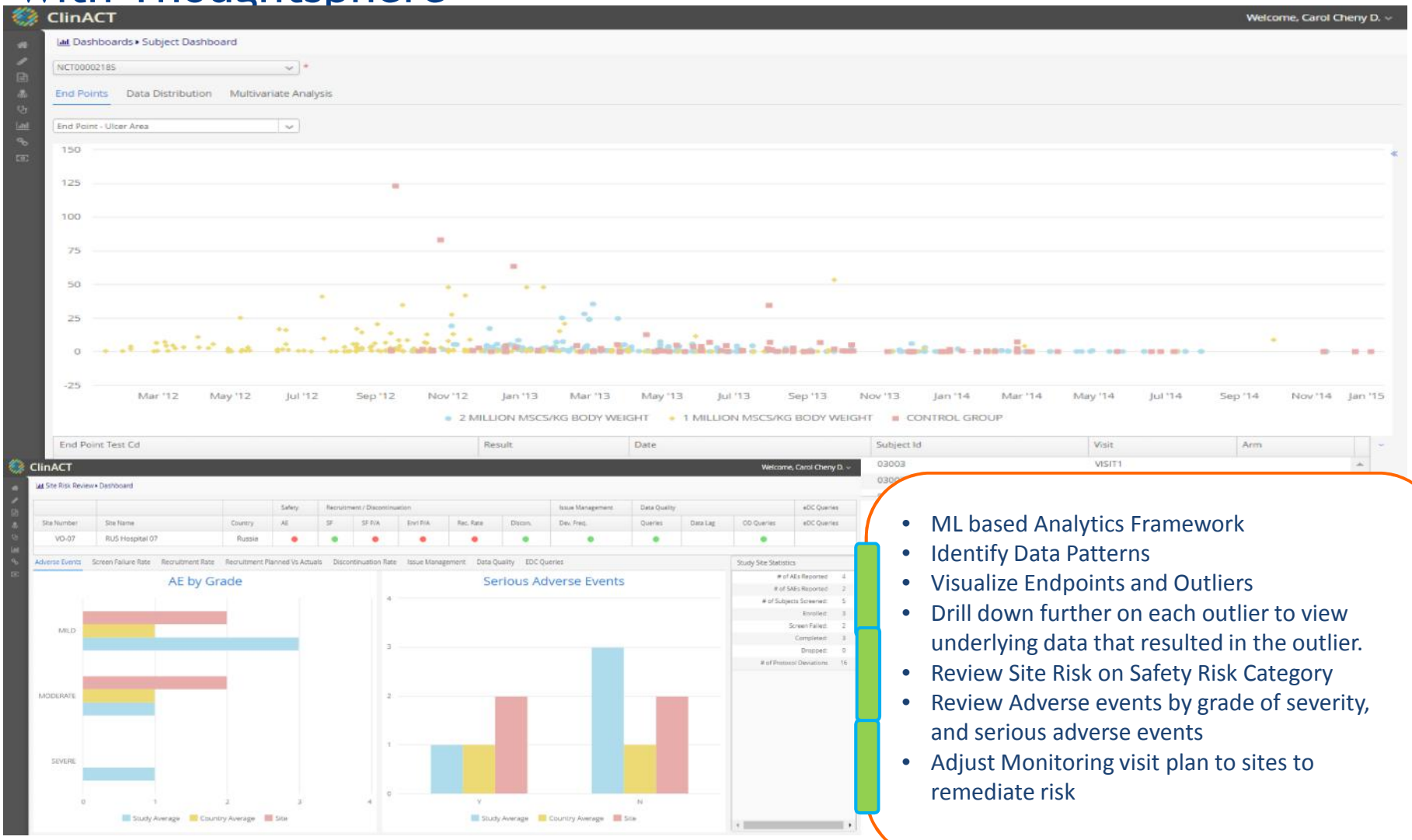
ML – Analytics for Data Validation, Risk Management use case with Thoughtsphere



- ML based Analytics Framework
- Identify Data Patterns
- Visualize Endpoints and Outliers
- Drill down further on each outlier to view underlying data that resulted in the outlier.
- Review Site Risk on Safety Risk Category
- Review Adverse events by grade of severity, and serious adverse events
- Adjust Monitoring visit plan to sites to remediate risk

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