

TRACE3



# Proposal Overview

IT OPS DATA PREDICTIVE ANALYTICS  
REFERENCE IMPLEMENTATION

July 17, 2020

# Goals & Objectives

## IT OPS DATA PREDICTIVE ANALYTICS REFERENCE IMPLEMENTATION

### Objective:

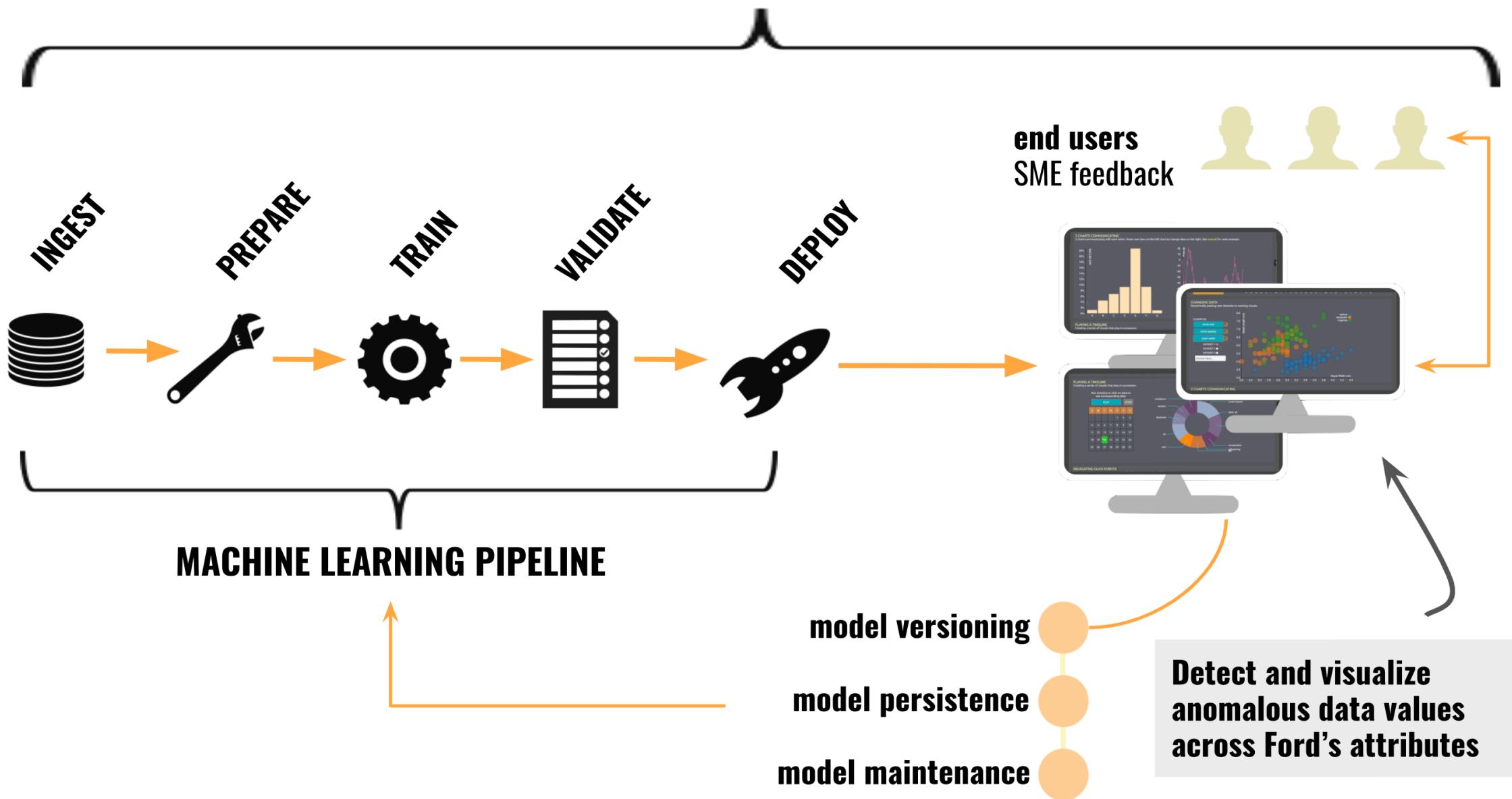
Engage with the Ford IT Operations team to construct a practical ML pipeline **MVP** to demonstrate consumption and mutation of systems telemetry and change/incident event data to train a model and score/infer against it for subsequent refinement and exposure of actionable insights

### Goals:

- Demonstrate consumption of multiple data sources as landed and available in Data Lake
- Demonstrate data preparation techniques as dictated by specific modeling approach
- Implement model training/validation/scoring example
  - Unsupervised approaches preferred
  - Open to both “traditional” ML techniques as well as Deep Learning (likely requires GPU)
- Demonstrate interactions with other Ford systems/tooling (e.g. visualization) where relevant
- Expose Ford personnel to best practices and approach for future model development

# ANOMALY DETECTION FRAMEWORK

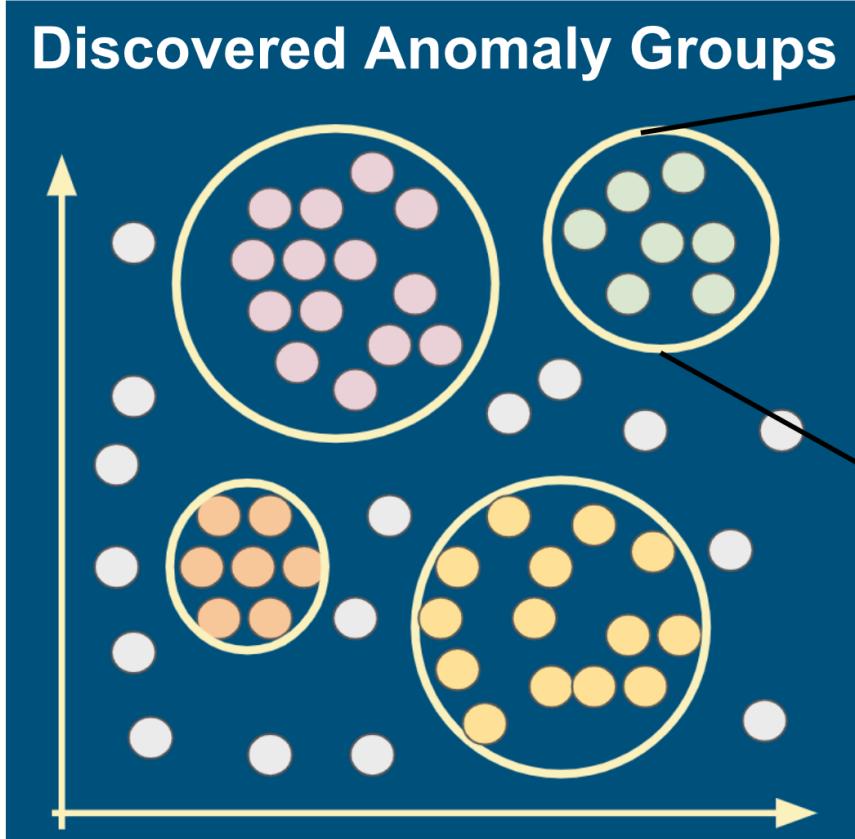
All possibilities live in technology



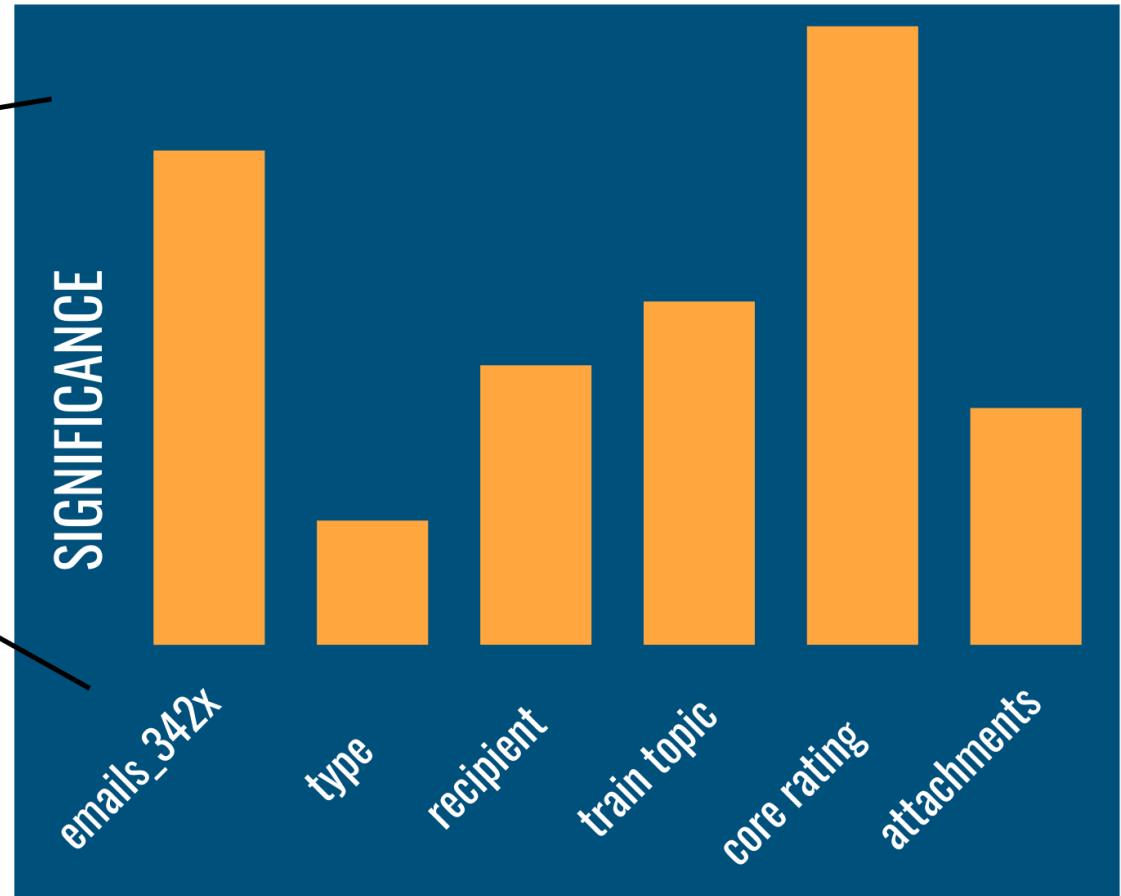
# SOLUTION PROPOSAL

## APPROACH

**Attributes that deviate from normal behavior are exposed.**



## PROBLEMATIC ATTRIBUTES

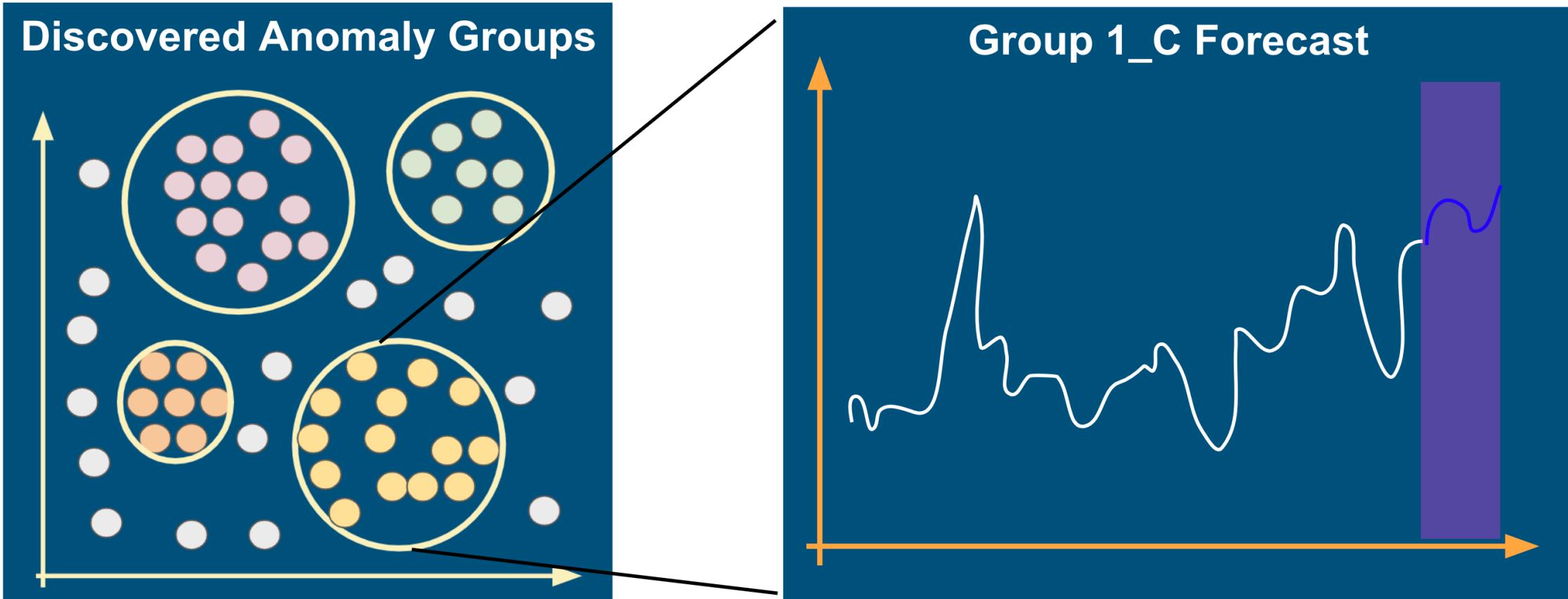


# SOLUTION PROPOSAL

## APPROACH

Anomaly groups share characteristics that can be used for prediction.

### ANOMALY GROUP PREDICTION



# SOLUTION PROPOSAL

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## FRONT-END MOCKUP

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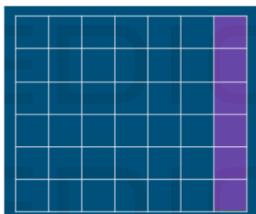
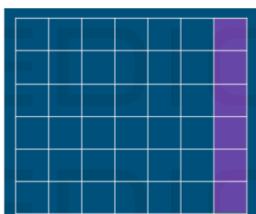
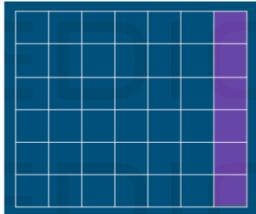
The image shows a front-end mockup for the Ford Anomaly Detector. On the left, there is a sidebar with the Ford logo at the top. Below it are three buttons: 'Choose Data Source...', 'Sensitivity Threshold' (with a slider), and 'RUN Detector!'. The 'RUN Detector!' button has a small gear icon below it. To the right of the sidebar is the main content area. The main content area has a title 'Ford Anomaly Detector' and a sub-section 'Discovered Anomaly Groups' which lists 'run\_1\_a', 'run\_1\_b', 'run\_1\_c', and 'run\_1\_d'. A cursor is hovering over the 'run\_1\_c' item. To the right of this is a chart titled 'Problematic Attributes' showing the significance of various attributes: 'emails\_342x' (highest), 'type', 'recipient', 'train topic', 'core rating' (highest), and 'attachments'. The 'core rating' bar has a 'Take action!' button with a cursor hovering over it, and the 'recipient' bar has a 'Drill down' button with a cursor hovering over it. The chart has a vertical axis labeled 'SIGNIFICANCE' and a horizontal axis with the attribute names. The background of the main content area is blue.

# SOLUTION PROPOSAL

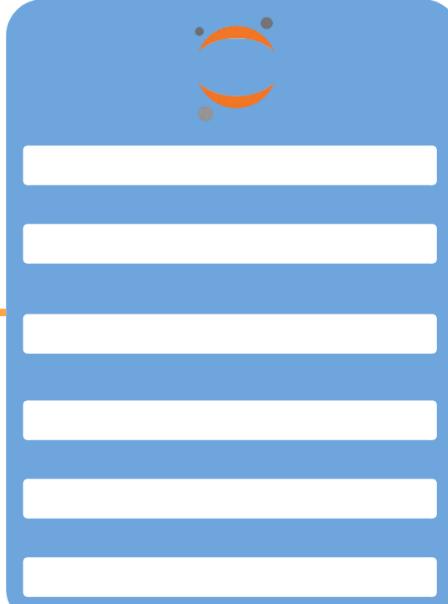
## REPEATABLE ANOMALY DETECTION SOLUTION

### DELIVERABLES

#### SOURCE DATA



#### INTERACTIVE NOTEBOOK



Easily modify and extend trained models interactively.

#### SCRIPTS



- Data Ingestion
- Data Preparation
- Model Training
- Model Validation

#### FRONT-END

#### REST API



#### CONTAINERIZED APPLICATION



#### REPO

TRACE3

# SOLUTION PROPOSAL

## OPEN SOURCE TOOLING

### Python environment (Python 3)



NumPy



SciPy



pandas



TensorFlow



scikit-learn



PyTorch



Keras

Data Processing

Model Training / Validation

Development Env

Deployment

Custom Front-End



Kubeflow

### HTML/Javascript



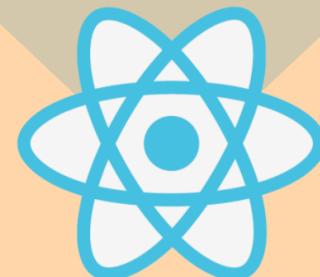
CSS



HTML



JS



React

TRACE3

# SOLUTION PROPOSAL

## TIMELINE & WORKFLOW

All possibilities live in technology



**DEPLOY**



**VALIDATE**



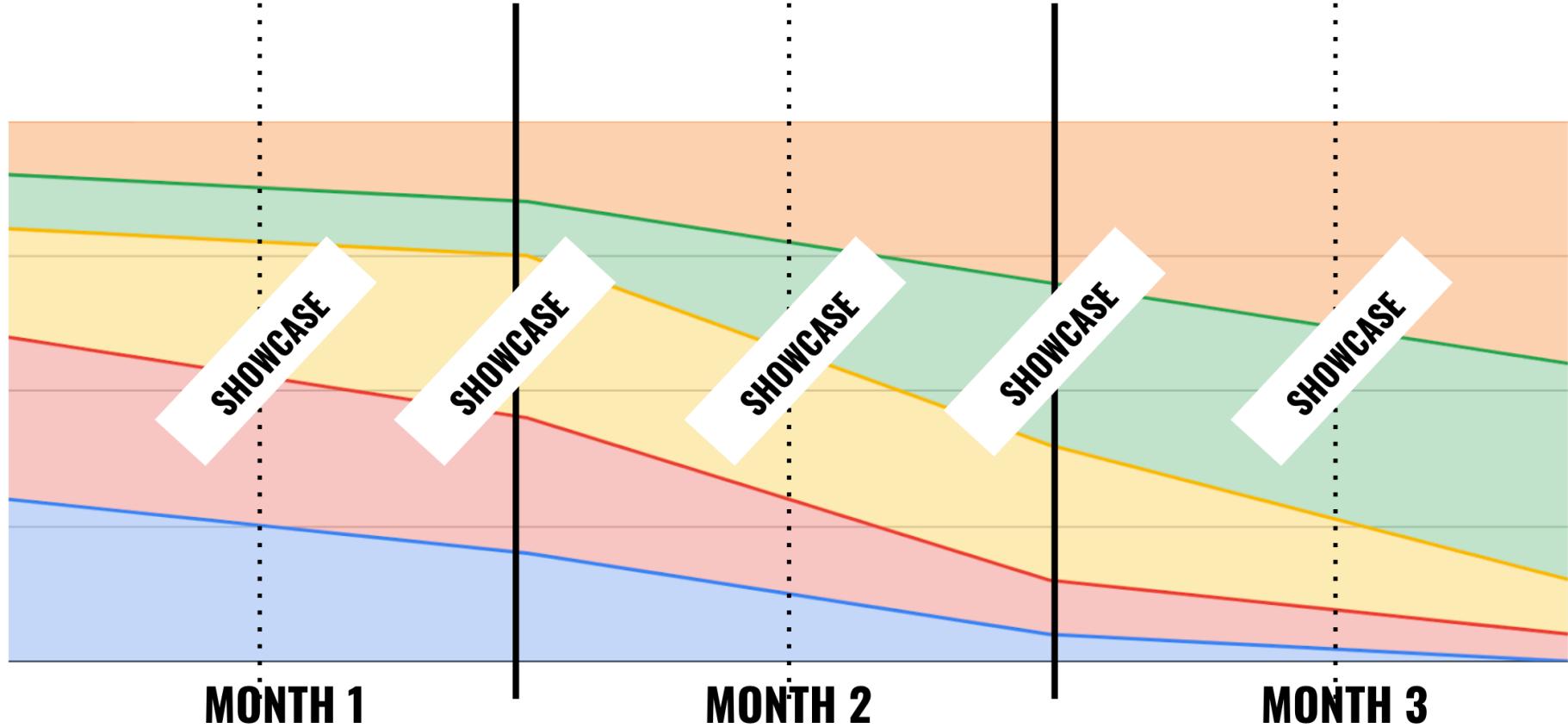
**TRAIN**



**PREPARE**



**INGEST**



# Outcomes

## IT OPS DATA PREDICTIVE ANALYTICS REFERENCE IMPLEMENTATION

- Deliver a reference project to be consumed, refactored, and iterated upon for related future projects
- Provide expertise and thought leadership in the areas of ML/DL, Data Engineering, and the design, construction, and management of related platforms
- Uplevel Ford personnel as relates to current leading/bleeding-edge techniques, technologies, and processes
- Establish ongoing partnership between Ford and Trace3+Kedion