Splunk Your Brain

Analyze Brainwaves using Machine Learning to Predict Activity or Mental State

Brian Guilfoyle | Sr. Sales Engineer

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Data Acquisition and Analysis

How to Build an ML Model using EEG data

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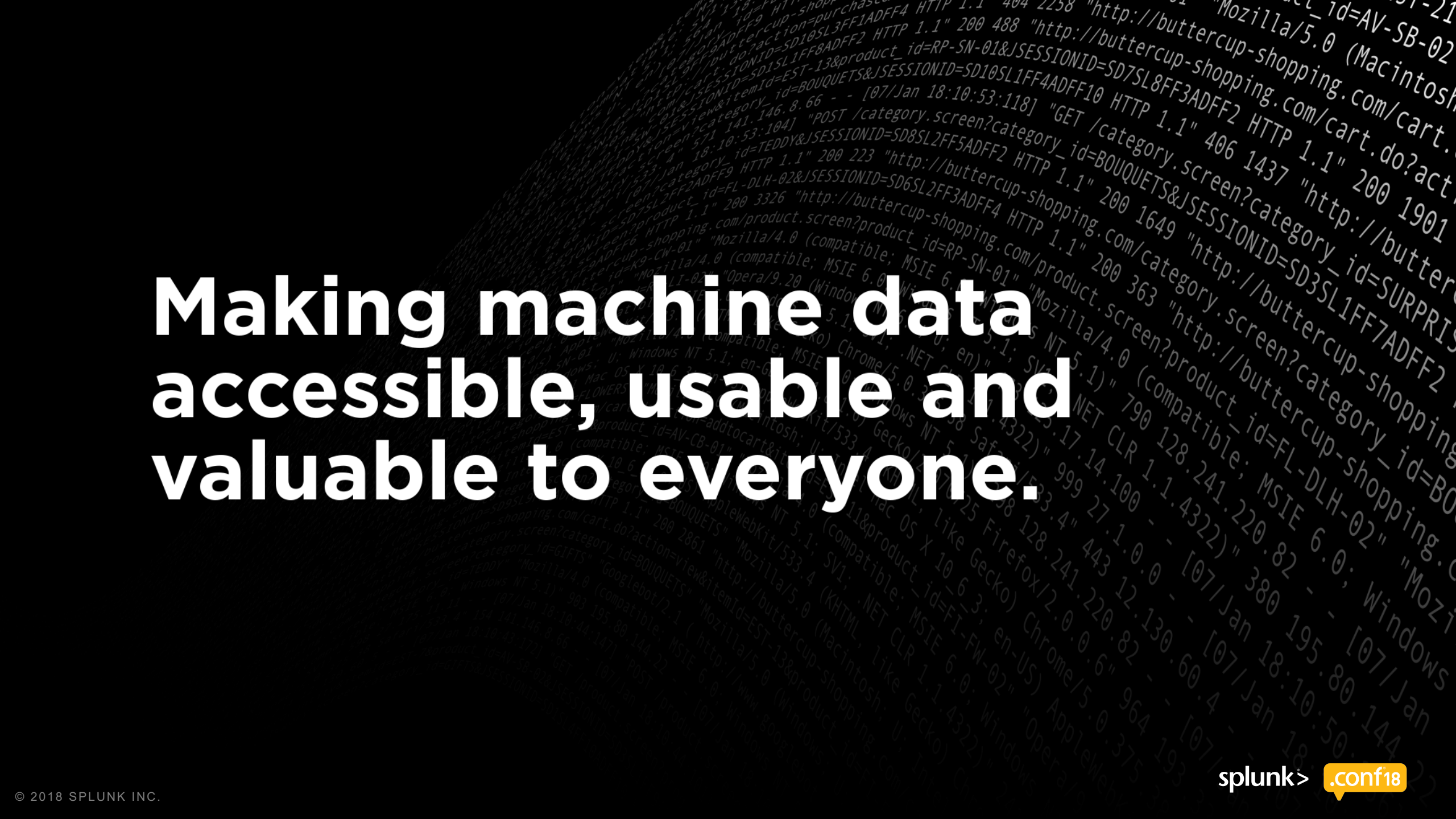

Making machine data accessible, usable and valuable to everyone.

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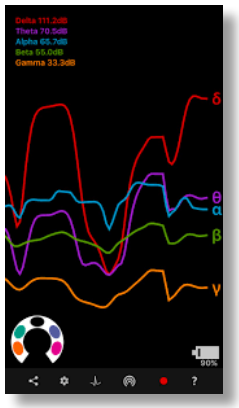
Getting EEG Data In Splunk

Brainwave Data = Machine Data!

Muse EEG Headset

Bluetooth



Mobile Phone with
Muse Monitor App

UDP 5000

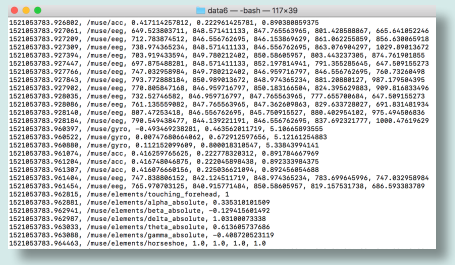
MacBook Pro

MusePlayer

Reroute, replay, and convert Muse data to and from multiple file formats

OSC Server

Splunk Indexer



Log File Output

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Exploring EEG Data

What does the raw data look like?

data6 — -bash — 117×39

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Transforms.conf

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FORMAT = alpha_absolute::$1
WRITE_META = true

[elements_beta_absolute_value]
REGEX = \/muse\/elements\/beta_absolute\,\s([-]?[0-9]*\.?[0-9]+)
FORMAT = beta_absolute::$1
WRITE_META = true
```

- Granular updates – 100ms
- Clear field boundaries
- Pre-processed EEG metrics

Ideal for Splunk and the MLTK!

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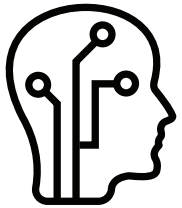
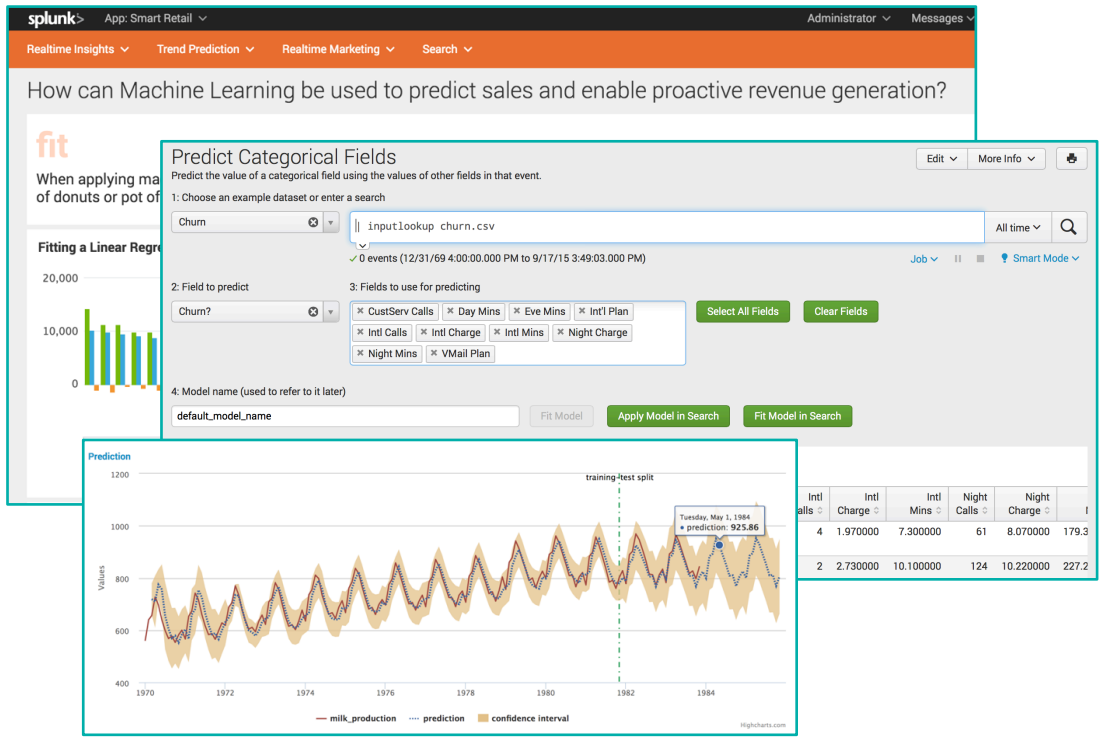


Splunk Machine Learning Toolkit

Extends Splunk platform functions and provides a guided modeling environment

- Assistants: Guide model building, testing & deploying for common objectives
- Showcases: Interactive examples for typical IT, security, business and IoT use cases
- Algorithms: 25+ standard algorithms available prepackaged with the toolkit
- SPL ML Commands: New commands to fit, test and operationalize models
- Python for Scientific Computing Library: 300+ open source algorithms available for use



Build custom analytics for any use case

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Guided Model Building with the MLTK

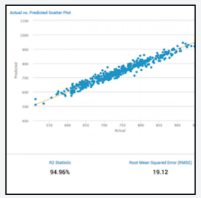
Showcase Provides Real-World Examples of ML Concepts

Showcase

Welcome to the Showcase, which exhibits some of the analytics enabled by this app. Click on one of the examples to see that Assistant applied to a real dataset. Please see the video tutorials for more information.

Select which examples to show

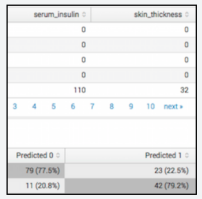
All Examples



Predict Numeric Fields

Predict the value of a numeric field using a weighted combination of the values of other fields in that event. A common use of these predictions is to identify anomalies: predictions that differ significantly from the actual value may be considered anomalous.

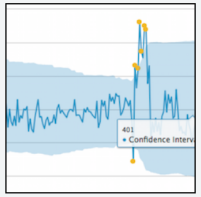
- Predict Server Power Consumption
- Predict VPN Usage
- Predict Median House Value
- Predict Power Plant Energy Output



Predict Categorical Fields

Predict the value of a categorical field using the values of other fields in that event. A common use of these predictions is to identify anomalies: predictions that differ significantly from the actual value may be considered anomalous.

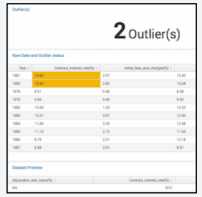
- Predict Hard Drive Failure
- Predict the Presence of Malware
- Predict Telecom Customer Churn
- Predict the Presence of Diabetes
- Predict Vehicle Make and Model



Detect Numeric Outliers

Find values that differ significantly from previous values.

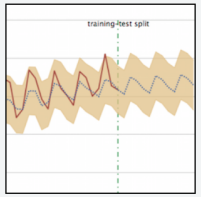
- Detect Outliers in Server Response Time
- Detect Outliers in Number of Logins (vs. Predicted Value)
- Detect Outliers in Supermarket Purchases
- Detect Outliers in Power Plant Humidity



Detect Categorical Outliers

Find events that contain unusual combinations of values.

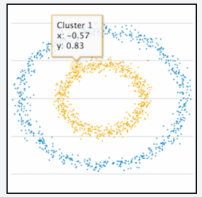
- Detect Outliers in Disk Failures
- Detect Outliers in Bitcoin Transactions
- Detect Outliers in Supermarket Purchases
- Detect Outliers in Mortgage Contracts
- Detect Outliers in Diabetes Patient Records
- Detect Outliers in Mobile Phone Activity



Forecast Time Series

Forecast future values given past values of a metric (numeric time series).

- Forecast Internet Traffic
- Forecast the Number of Employee Logins
- Forecast Monthly Sales
- Forecast the Number of Bluetooth Devices
- Forecast Exchange Rate TWI using ARIMA



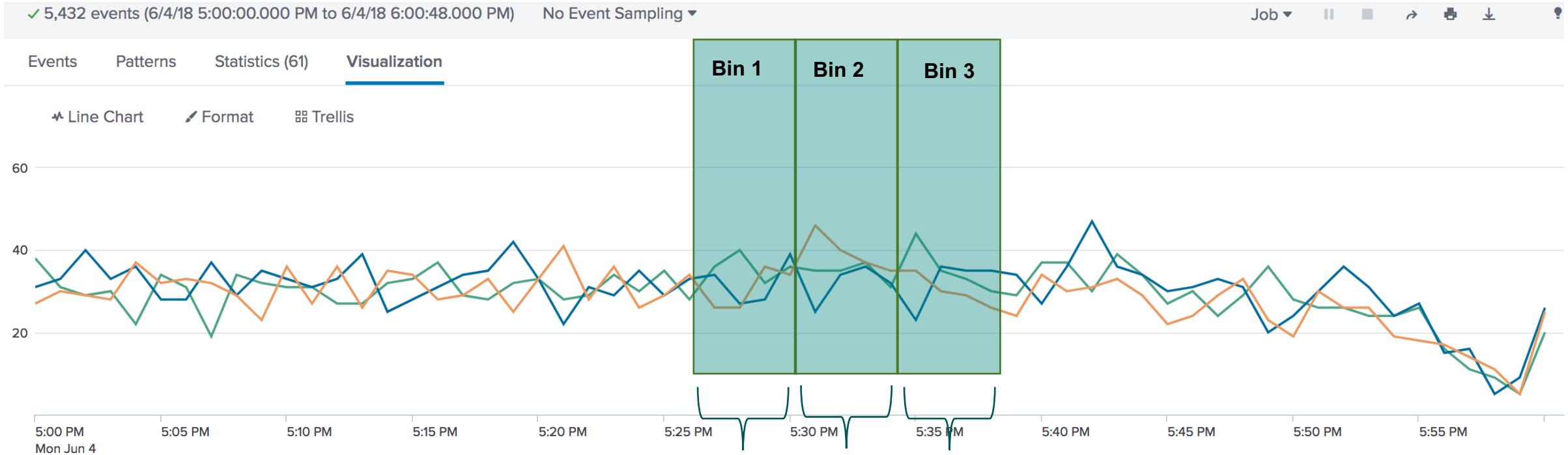
Cluster Numeric Events

Partition events with multiple numeric fields into clusters.

- Cluster Hard Drives by SMART Metrics
- Cluster Behavior by App Usage
- Cluster Neighborhoods by Properties
- Cluster Vehicles by Onboard Metrics
- Cluster Power Plant Operating Regimes

ML Approach

Predict Categorical Field (Mental State) using Time Series EEG Data



- Bucket time into 10 second bins
- Calculate stats on EEG data within bins
- Use calculated stats fields as features for the model

stdev	stdev	stdev
med	med	med
mod	mod	mod
var	var	var
avg	avg	avg

- Tag training data with “action” being performed by EEG wearer
- Use MLTK to test algorithms and model accuracy
- Apply model on real-time data for predictions

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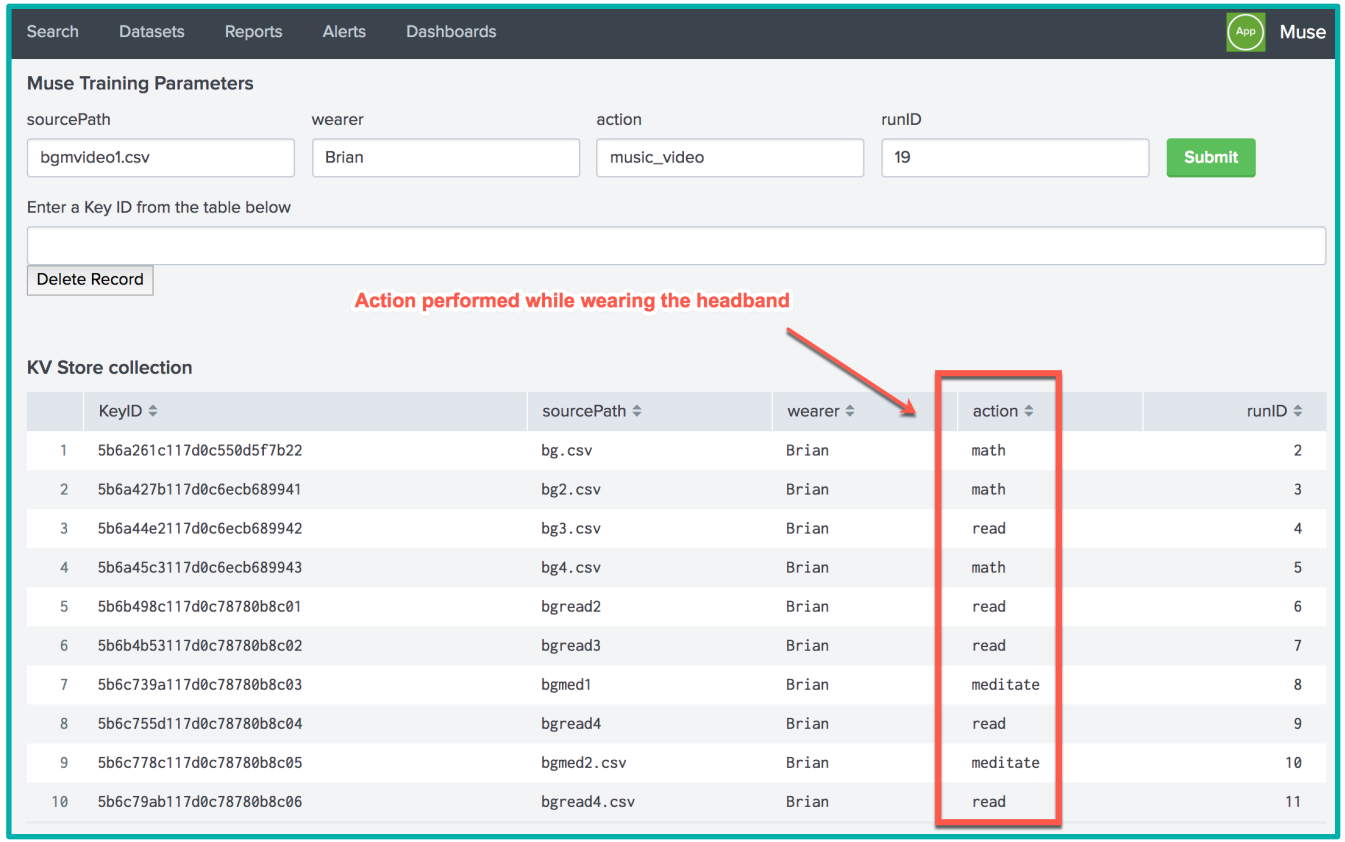
Preparing Training Data for ML

Tag EEG Data with Wearer Info Prior to Analysis

- Use KV Store Lookup to tag EEG data with user “action” when wearing headband
- Create custom form to enter “action” field
- Create scheduled search to perform stat calculations on data, lookup “action” tags and save to summary index
- Build ML model from searches against summary index



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Machine Learning Process with Splunk

Fit Model

Collect Data

ML Toolkit

Train model

Clean Transform

props transforms

Save to summary index

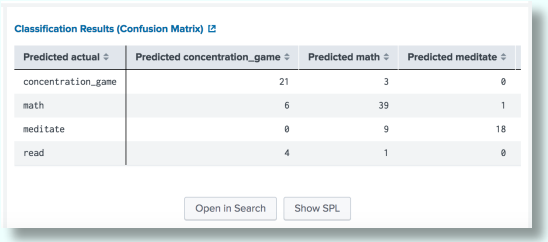
Add "action" field

KV Store

Perform stats calculation

Apply Model

Collect Data



Clean Transform

props transforms

Predict "action" field

Perform Stats calculation

Apply model

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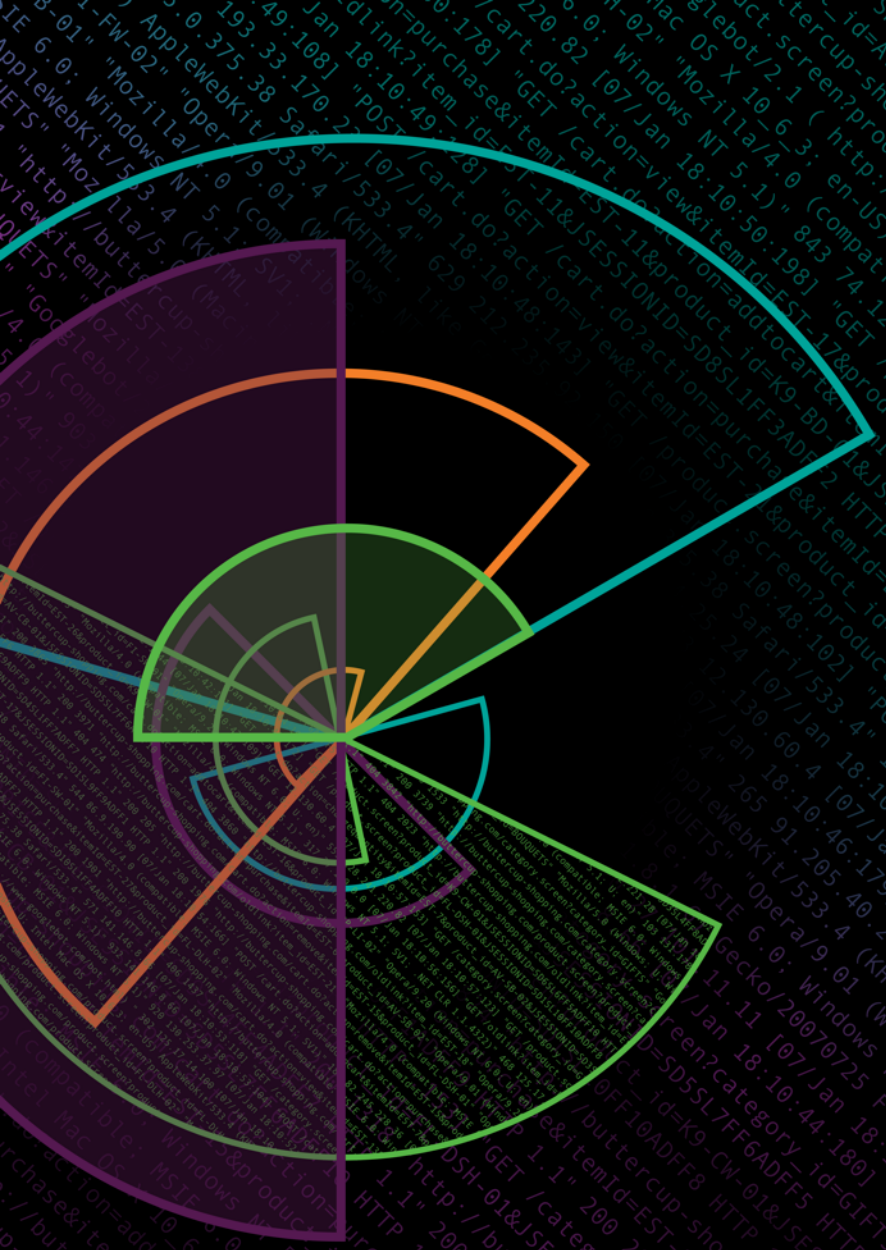

EEG DEMO

Key Takeaways

1. The MLTK is like a box of legos. What type of model do you want to build?

2. Predict categorical fields on time series data by bucketing into bins, performing stats on bucketed data and using the calculated values as model features

3. Enrich training data with KVStore Lookups, pre-process and store data in a summary index

Q&A

Brian Guilfoyle | Sr Sales Engineer

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Thank You

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