



USING AI TO DELIVER A DEVICE AS A SERVICE

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#Ent1SAIS



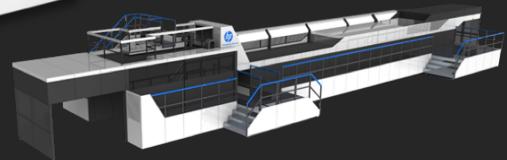
Agenda

- HP and AI
- Device Telemetry
- Case Study
- Next Steps

TWO leading franchises



Printing



Personal
Systems





DATA

Device Telemetry

What Comes With This Data?

Are your customers using the features you expect?
How are they engaging with your product?

How frequently are users engaging with your service,
and for what duration?

What settings options do users select most? Do they
prefer certain display types, input modalities, screen
orientation, or other device configurations?

What happens when crashes occur? Are crashes
happening more frequently when certain features are
used? What's the context surrounding a crash?

CONTEXT

INSIGHTS

Device Telemetry

Application Areas

**Improving Existing
Products and
Experiences**

**Services for
Individuals and
Fleets**

New Experiences

Device Telemetry

Challenges

- Gather information for hundreds, perhaps thousands of devices
- Megabytes, perhaps gigabytes of data per hour coming off a single device
- Massive amounts of data will drive data governance

QUALITY

IMBALANCE

Source: David Linthicum, The Data Challenges of Telemetry, 2014

Case Study

Health Management

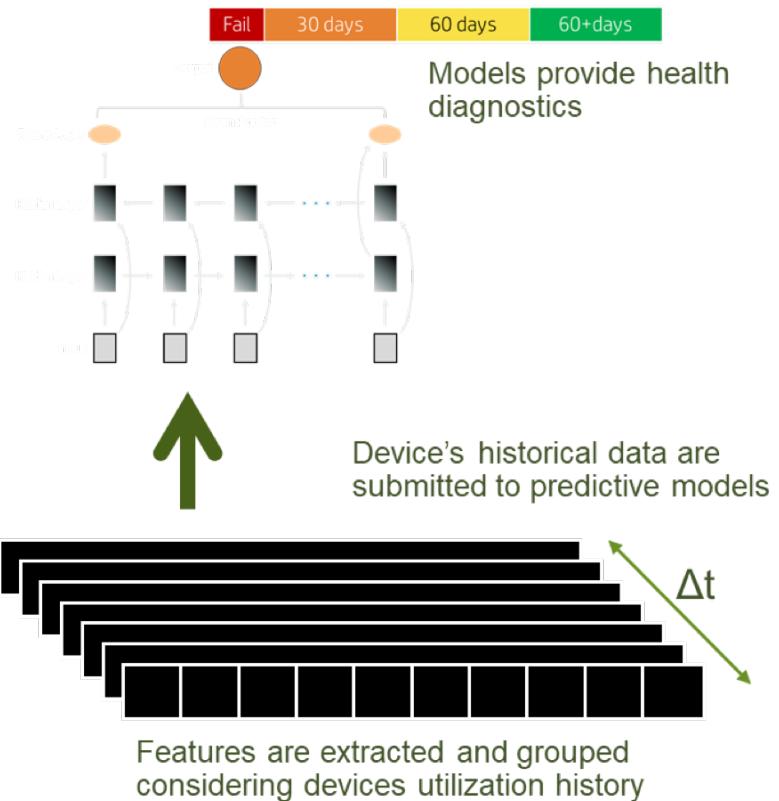


Devices have 'smart' components sensing their current state (e.g. disks, battery ...)

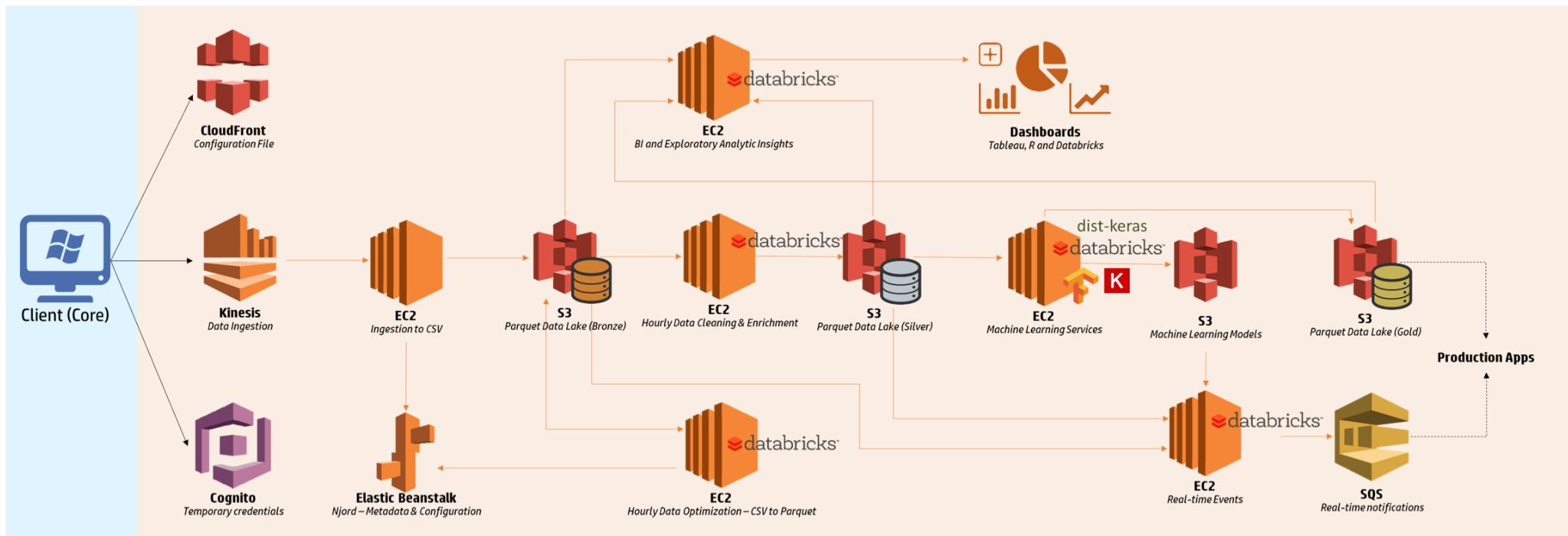
Ex.: Interface Errors Scan Errors Reallocated Sectors



Raw data is periodically uploaded, cleaned, transformed and filtered



A Unified Approach to Analytics



Machine Learning Pipeline

Training Pipeline



Selecting
Telemetry
Data



Data Transformation

- Filtering
- Normalization
- Rescaling
- Outliers removal



Dataset Preparation

- Windowing
- Labeling
- Preparing data structures for training



Training

- Feature Extraction
- Training models
 - LSTM
 - CNN+LSTM
 - ...

Millions of
Devices

Thousands of
Devices

Thousands of
Timeseries

Machine Learning Pipeline

Inferencing Pipeline



Selecting
Telemetry
Data



Data Transformation

- Normalizing
- Rescaling
- Windowing



Dataset Preparation

- Preparing data structures for inferencing



Inference

- Loading models
- Running inferences

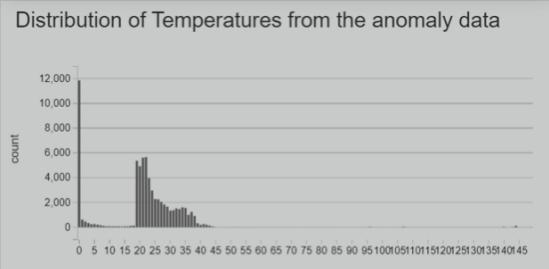
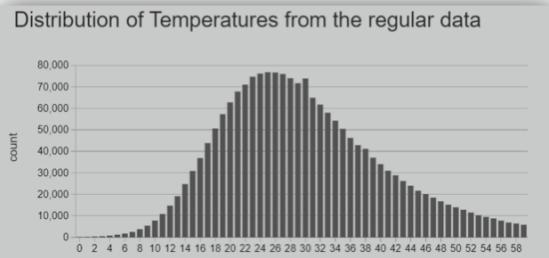
Millions of Devices

Millions of Devices

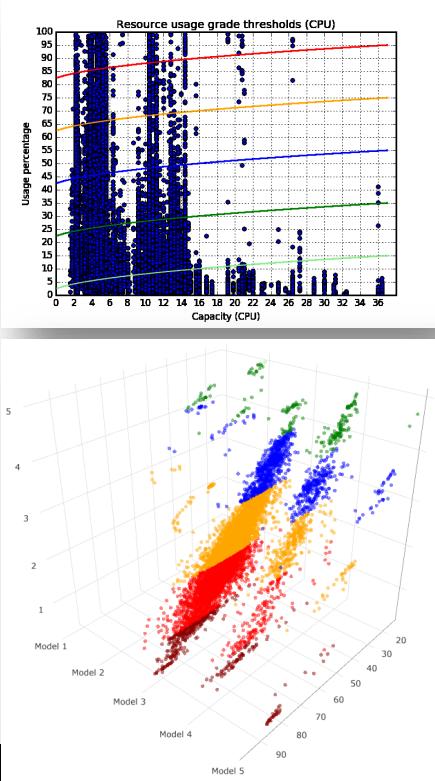
Millions of Predictions

Typical Results

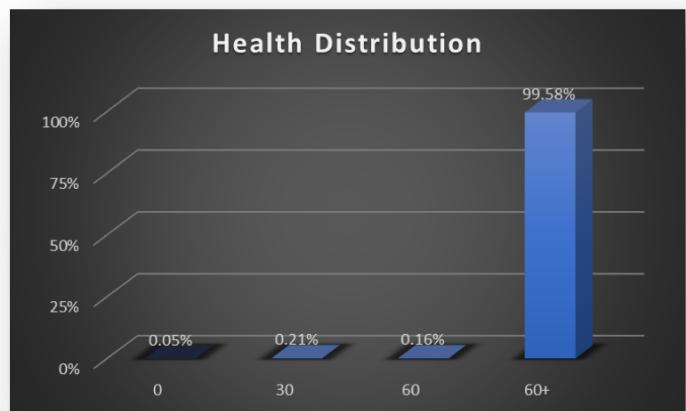
Unsupervised Anomaly Detection



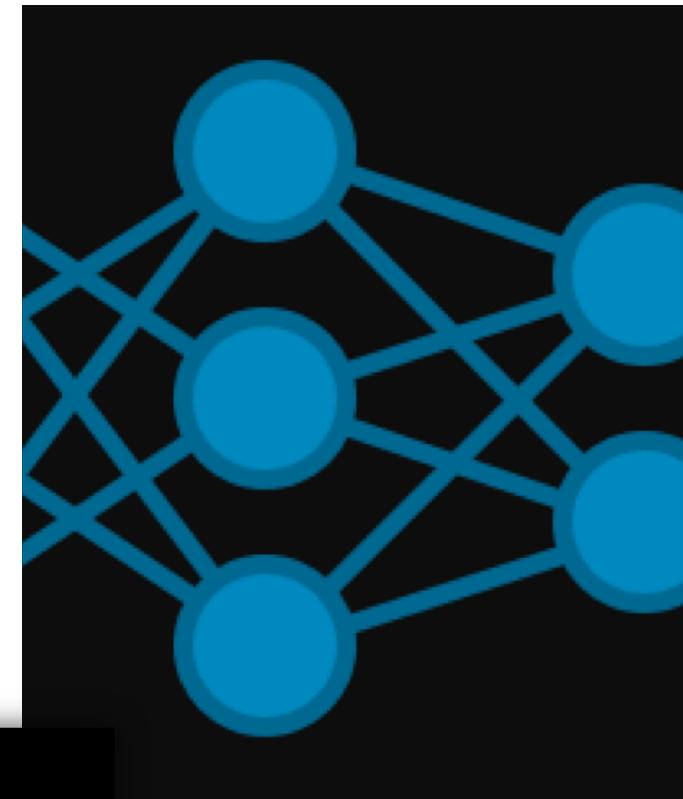
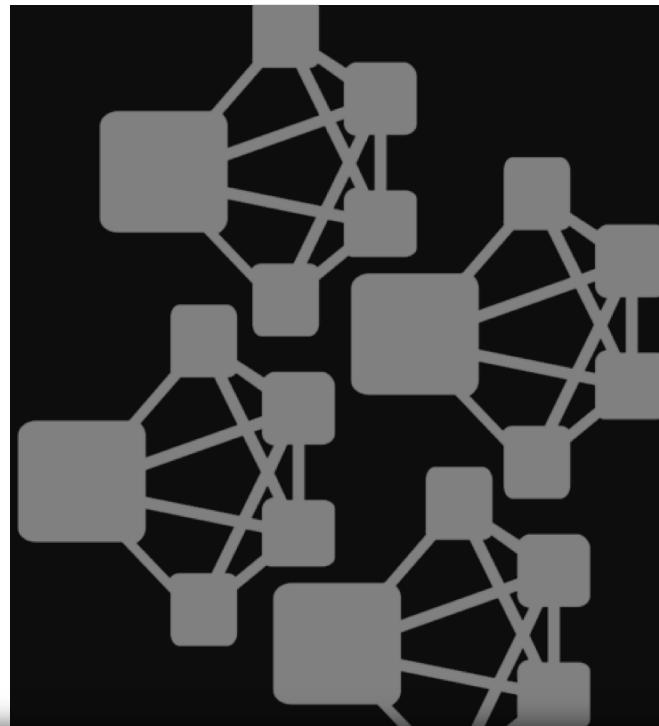
Unsupervised Grade Analysis



Multiclass Classification



Closing The Loop



Next Steps

- Technical
 - Advanced Automated Learning Pipeline
 - Improve Repeatability
 - Massive Parallel Processing
- Business
 - Increase the number of AI services
 - Improve user experience





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