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Applications of Advanced Analytics

Smarter insights. Stronger outcomes.

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What is Analytics – A Perspective

Often Analytics, AI/ML are thought of in a Technology domain. While the technologies themselves are a cool subject to talk about, the true power of Analytics comes from the business value that it creates through automation and insights

Stage 1

Assisted Intelligence:
Requires human assistance and interpretation

Stage 2

Augmented Intelligence:
Machine Learning augments human decisions

Stage 3

Autonomous Intelligence:
AI decides and executes autonomously

Explosion of data

Exponential computing power

Sophisticated algorithms

Intelligent human-machine interactions

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Applying Advanced Analytics

Technologies now support deployment of AI/ML models at the Enterprise and at the Edge meet temporal criticality of processes as well as locational decision making

Enterprise Analytics

Machine Learning and Cognitive models bring to life a multitude of use cases that can be activated using enterprise wide data to drive action at Enterprise and Operations level

- **AR/VR**
- **Spatial-Temporal Analytics**
- **Image Analytics**
- **Automated Workflow**
- **Large Scale Simulations & Digital Twins**
- **Cognitive / Machine Learning**
- **Telematics**

Operational Analytics

Analytics applied to operational data to extract business value, enhance operations and trigger actions in near real time

- Operational Data Storage
- Operator UI / Alarm
- ML Processing & Scoring
- Operational Analytics
- Protocol Conversion

Edge Analytics

Models are delivered **to Edge computing devices** that perform localized monitoring and controls

- First Principles
- AI/ML
- Adaptive Logic

Devices

Communicate and **aggregate time-series data from multiple devices** for real-time info and edge analytics

- Comms
- Controllers
- Sensor/ I/O
- Video/Audio

External

Enrich the enterprise data further through use of third-party or data **collected through UAS/Drones**

- Weather
- Social Media
- LiDAR/UV/IR

Things

Assets (“**Things**”) are subject to specific **processes** in order to create products

Open Loop	Discrete	Continuous
Closed Loop	Batch	Hybrid

Drives	Motors	Conveyors	Rollers	Vehicles
Compressors	Generators	Transformers	Switchgear	Network/Line

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Smart Grid Edge Analytics Workshop, June 4-5, 2019
Application of Advanced Analytics, Ajay Madwesh

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The Art of the Possible

A sample set of advanced analytics use cases that deliver high value

ASSET HEALTH ANALYTICS

The ability to develop **asset risk scores** based on probability of failure and asset health and **consequence of failure** using real-time asset condition data, inspection and maintenance data to develop risk based maintenance and replacement strategies. The algorithms use statistical, machine learning and first principles modeling the impact of weather and external environmental on the assets to arrive at **probability of failure** and **remaining life** metrics for transformers, breakers, batteries, relays, and cable assets

SYNCHROPHASOR SYSTEMS FOR GRID SITUATIONAL AWARENESS

The ability to perform post event analysis using both historical data and event time stamp to determine if the **causation of the event** traced to a system disturbance (i.e. generator tripping, bus lockouts, line faults, storm etc.). The results of the analysis displayed geospatially along with heat maps to enable determine both the normal operating characteristics and system dynamics (voltage, phase angle, frequency, system oscillations, etc.), as well as identify and generate alerts for abnormal conditions.

VEGETATION MANAGEMENT ANALYTICS

The ability to merge data related to vegetation and vegetation species along spatial and temporal dimensions along with factors that impact vegetation growth by species type. Value generated include prioritization vegetation management schedule to optimizing O&M spend as well as **assessing the incipient risk posed by vegetation to outages and downed conductors** in a utility network

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EV CHARGING STATION ANALYTICS

The ability to enable grid-aware charging of Electric Vehicles by publishing wait times and pricing for charging and charging schedules based on rates and state of the grid. Enable reinforced feedback to learn based on past performance and further refine charge**. Identify a optimal charge schedule based on load and demand**. Be able to aggregate actual and forecasted charging demand and total energy delivered to the transformer, feeder, or other points along the grid.

ENERGY STORAGE AND DER ANALYTICS

The ability to utilize real-time weather such as transient events, cloud cover, wind speed & direction and solar irradiance to calculate the load and voltage on the circuit from utility and customer-owned PV. Be able to conduct power flow analysis based on DER output and load on the applicable feeder and secondary to assess **Voltage Regulation, Reverse power flows and Protection system coordination** (i.e. steady-state voltage, over-voltage, voltage fluctuations, fault current, inverse power issues, overloads).

NETWORK CYBER SECURITY ANALYSIS

The ability to mine Security Information and Events (SIEM) data along with AMI network events and SCADA network events monitor performance on **specific network points and time-of-day, volume of traffic flow**, type of traffic (i.e. client to server, server to server, TCP, VOIP, etc.) for the purposes of setting baselines in performance. Be able to issue alert unusual activities and events across multiple communications networks that a utility uses. And also to create alerts when firewalls are experiencing activity that meets or exceeds user defined thresholds.

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We are entering a new world where human collaboration is stronger *with* machines.

And the power of *with* has never been greater:

Data *with* Precision

Analytics *with* Insight

Automation *with* Intelligence

Engagement *with* Purpose

Welcome to the ***Age of With***.

It is not about people versus machines. It's about human collaboration made greater *with* the machines we invent. People, services, industry acumen, platforms, data capabilities, and assets to help understand, embrace, and profit in this new age—to realize the true power of With.

Well-structured data *with* design thinking *with* analytics *with* machines

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Q&A

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