# DSC::Energy Analytics

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# DSC::Energy Analytics


**DSC Energy Analytics** is a consulting company of **advanced analytics** and predictive modeling with Machine Learning techniques, which provides services to companies that give importance to data for decision making.

**About 60 projects executed in more than 140 power plants (Wind and Solar) with about 3500 models of industrial equipment**

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Photovoltaic and Solar Thermal

Wind Energy

Biomass and Agroenergy


Carbon Emission Market

Smartgrid and Smartcities

Construction and OM

Drinking and Waste Water Treatment

## Foundational reasons:

DSC Energy was created **six years ago** based on the accumulated experience of the team, in the sectors it has worked for 25 years, with both multinational companies and SMEs, in more than 20 countries, and take advantage of it to use the **new technologies** that are presented with the digital transformation that companies are having, especially in the world of **artificial intelligence and big data**.

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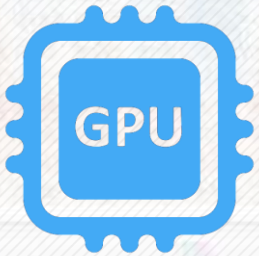
Cloud Computing
Azure, AWS, etc

Edge Computing




Own resources
> 170 Tflops

**Computing resources: :**

High computational capacity is necessary to address data-intensive projects. **DSC Energy** has five workstations (**768 Gb RAM**, **68 cores** processors, **9 GPUs** with **127 Gb** and **175 Tflops**), as well as the possibility of the public cloud or locating part of the intelligence at the client's facilities.

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# Use Cases

### Power Generation Modeling

for wind farm performance monitoring, both at farm level and at individual turbine level

### Improvement Evaluation

through modeling with Machine Learning techniques

### Anomaly Detection

Temperature and/or vibration modeling of equipment components for predictive maintenance (generators, turbines, pumps, transformers, …)

### GPS and Space Analytics

Analytics and reporting of geoposition data from cleaning trucks

### Image Analytics

Video processing, Image analytics and anomaly detection

### Energy monitoring

Automatic reporting, digital twin, optimization in RO desalination plant

### Others

Client Strategic Segmentation
Sales Prediction
Customer Churn Prediction

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# Use Case - Wind Turbine Upgrade Evaluation

## Problem Raised:

- Wind farm in operation
- Specific improvements with high economic cost
- Confirmation of such improvement
- Choice of next turbines to be upgraded

## Executed Solution:

- Analysis, modeling and prediction (high frequency data)
- Modified Turbine ML model based on the behavior of behavior of neighboring turbines
- Programming language: R and Python

## Improvement Achieved:

- Confirmation and quantification of improvement
- Reduction of evaluation time by using high-frequency high-frequency data
- Evaluation in all wind sectors

**Projects executed:** 3000 models in 120 Wind Farms

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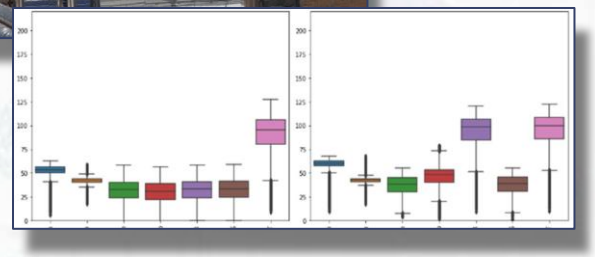
# Use Case - Detection of Anomalies in Generators, Turbines, Pumps, Transformers and Motor Components





## Problem Raised:

- Very costly and not predictable failures.
- Long repair times
- Production losses

## Executed Solution:

- Dual DL-ML model for input filtering and prediction of multi-component temperature of temperatures of multiple components
- Programming language: Python
- Deployment: Azure

## Improvement Achieved:

- Anomaly alert system
- Enable Predictive Maintenance
- Reduced maintenance costs

**Projects executed:** 500 models in 23 Plants (Solar and Wind) with a total capacity of 1500 MW

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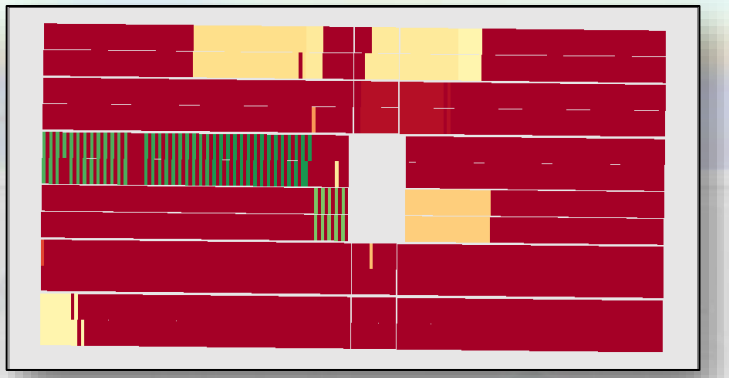
# Use Case – Monitor of Cleaning Trucks in Solar Thermal Power Plants



## Problem Raised:

- Standard GPS solutions not applicable
- GPS errors
- Processing of additional vehicle signals
- Particularisation for each plant

## Executed Solution:

- Development of a customised solution with spatial data analytics using Python language
- Tailoring to each individual plant
- Integration with SCADA data

## Improvement Achieved:

- Cleaning history of each collector
- Knowledge of the performance of each truck
- Current cleaning status of each plant

**Projects executed:** 14 Plants (CSP) in three countries with a total capacity of 1200 MW

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# Use Case - Customer Churn Prediction

## Problem Raised:

High customer churn rates

Knowing the likelihood of a client's loss in advance of policy renewal in advance of policy renewal.

## Executed Solution:

Modeled ML binary classification, with prediction of the of the probability of non-renewal

Programming language: R

Deployment: local server

## Improvement Achieved:

20% improvement in AUC and 60% improvement in Lift

Better profiling of customers likely to leave, improving with the potential to leave, improving the benefits of retention campaign benefits

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# Use Case - Sales Prediction

## Problem Raised:

To have an estimate of daily sales in each store and by product store and by product family in order to track sales for the current tracking sales for the current month

## Executed Solution:

Regression ML modeling with decision trees
Programming language: Python

## Improvement Achieved:

Reduction of customer method error by 50%.
Increased accuracy in sales tracking, so that action can be taken if there are significant deviations.

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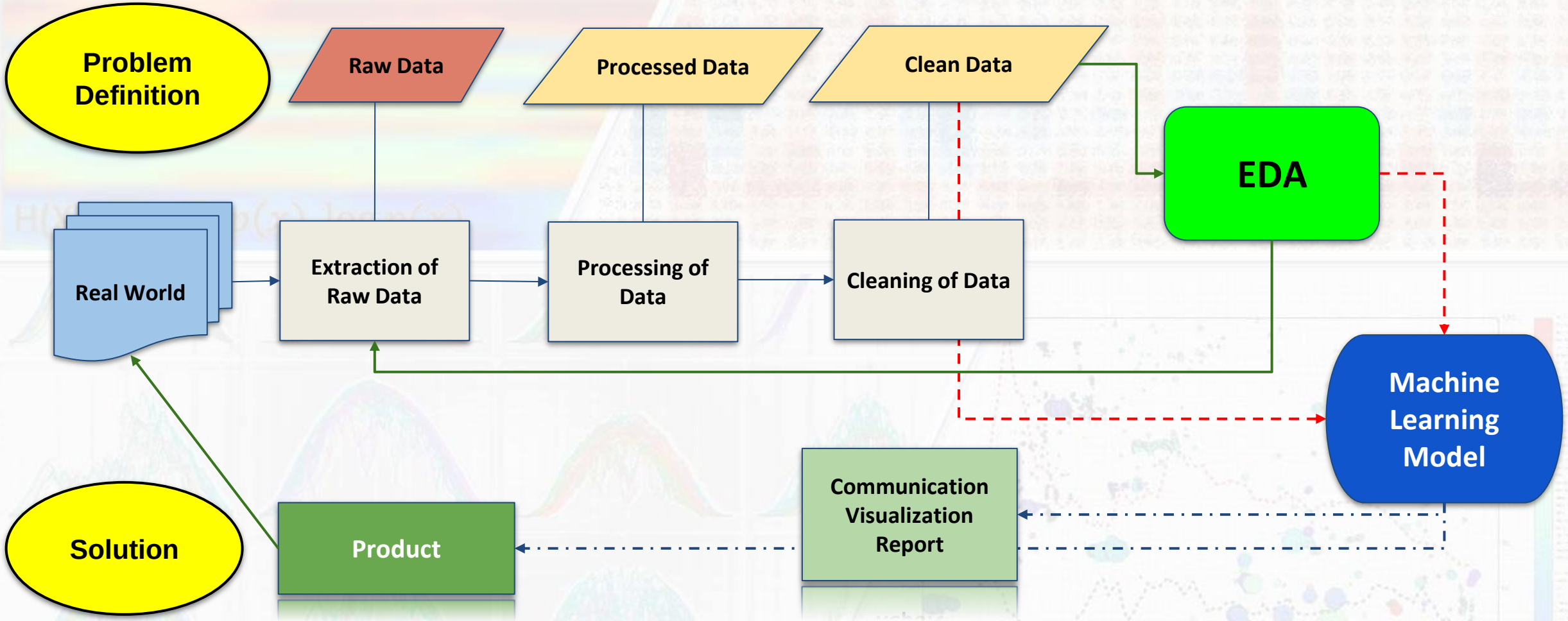
# Machine Learning Project Process. Scheme



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# Why now?

## Democratization of AI - open software

- Open specialized languages: Python, R
- Advanced open algorithms: LightGBM (Microsoft), XGBoost, Catboost (Yandex)
- Neural networks: Tensorflow (Google), Torch (used by Facebook AI Research Group, IBM, Yandex)
- Big data infrastructures: Hadoop, Spark
- Cloud and its tools: Microsoft Azure, Amazon Web Services, Google Cloud

## Computer revolution

- More and more advanced CPUs (even option to rent in the cloud). In the last 25 years computing has increased its speed by 1 million times ! And it continues to grow
- Spectacular evolution of GPUs for neural networks, driven by the video game industry and bitcoin mining. Today for just over 1000 euros you can have a GPU with 30 TFlops, something unthinkable a few years ago (1997: 30000 USD/GFlops -> 2019: 0.03 USD/GFlops).

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# Where to start?

1. Do we have digitally recorded **data**?
2. What **problems** do we think we could solve?
3. How is my **organization** approaching digital transformation and advanced data use?
4. Make a **list** of possible projects, always defining the problem to be solved and the benefits it could have.
5. Start with an **initial pilot project**, which can be representative of more that can be tackled.
6. Measure the **economic impact** of the project and promote it.
7. Move forward with more projects from the list, increasing the deployment and scope.

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# To be taken into account

1. **Productivity improvement tool**
2. Evolution of **computing**: in 25 years it has multiplied by 1 million !!! And of prices: 30k USD/GFlop in 1997 to 0.03 USD/GFlop in 2019.
3. **Resources** are needed: local/cloud. But they are getting cheaper and cheaper
4. Without **data**, there is nothing to do
5. **Top Management** involvement is very important if you want to drive at scale
6. **Business/Operations** knows the problems, but IT must be involved. It is good to have a transversal driving force: "Digital Transformation".
7. And all this makes sense if in the end we see that it contributes to **company results** in one way or another (it should always be valued)