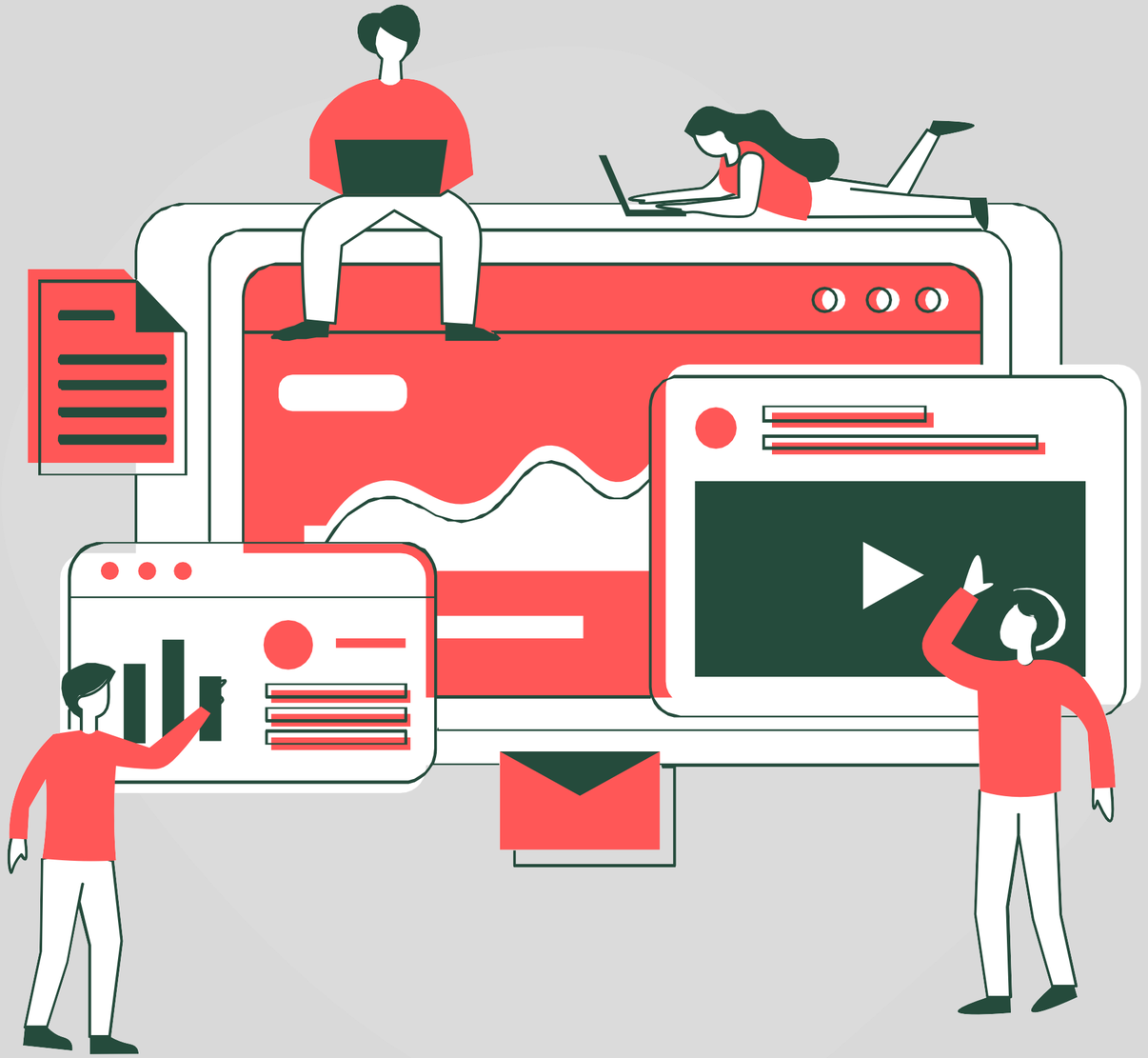
DMBI consultants

Get More Value Out of Your Data

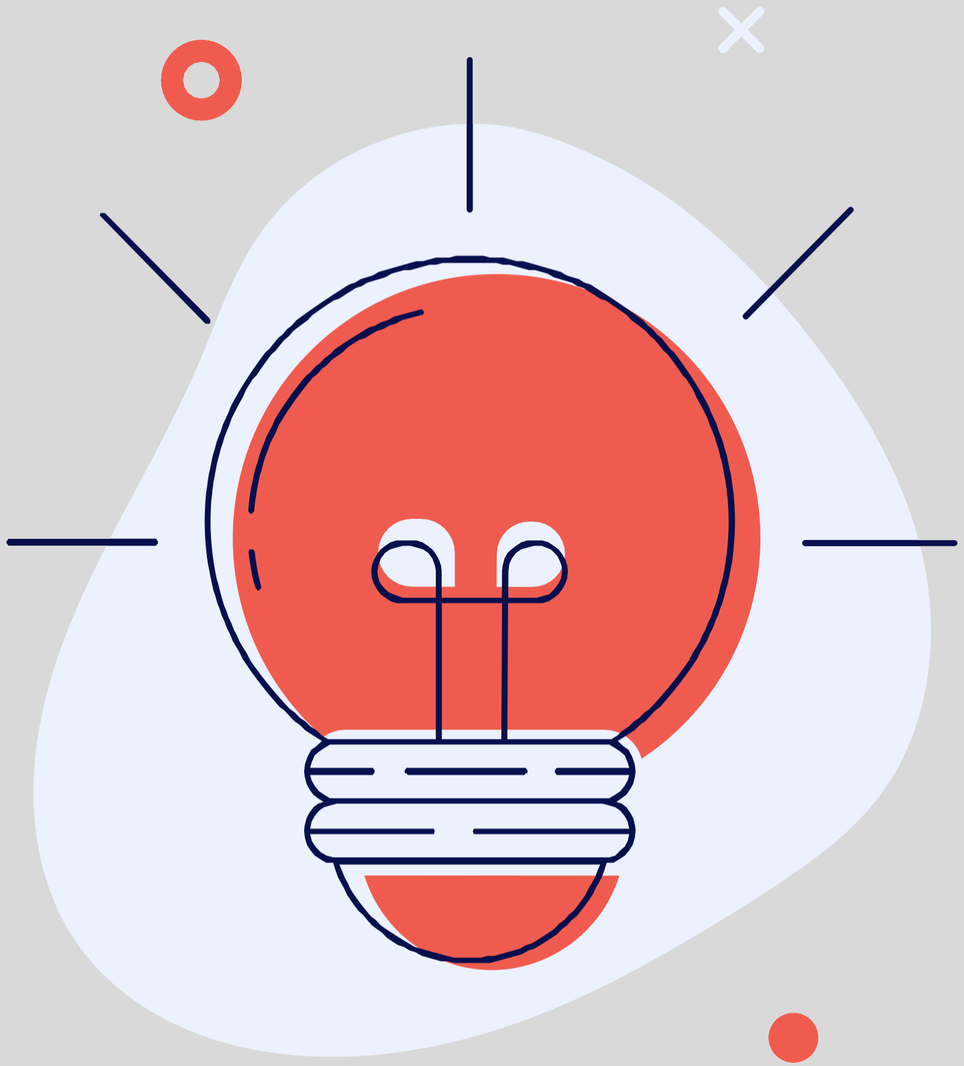


Who we are

Company Profile

DMBI Consultants is an innovative consulting company, founded in 2008 and active in the field of Data Science.
Our goal is to support customers in an innovation process and to increase their value through the expertise of our resources, specialized in techniques of:

- **ARTIFICIAL INTELLIGENCE**
- **DATA MINING**



Areas of application

Business Intelligence

Reporting activity aimed at the interactive and dynamic presentation of company data

Predictive Analytics

Development of tools capable of predicting the behaviour of the various corporate assets

Big Data

Management and analysis of large data flows that cannot be managed with traditional tools and techniques

Internet of Things

Development of links between machines for a hyper-connected reality

Skills in Big Data Architecture

- **Implementation** and **maintenance** of Big Data infrastructure that allows the **ingestion** and **integration** of large amounts of data, both in volume and production speed.

- **Exploitation** of computational engine frameworks for Big Data processing, aimed at both statistical analysis and the development of Artificial Intelligence models.

Examples of architectures:

- **Operating system**: Hadoop
- **Ingestion tool**: Apache Kafka
- **Framework**: Spark
- **Cloud Platforms-PaaS**: Azure, AWS

Technologies used for Big Data Architecture

Technologies used for Machine Learning

Case Histories:

Machine Learning - Sentiment Analysis

Project target:

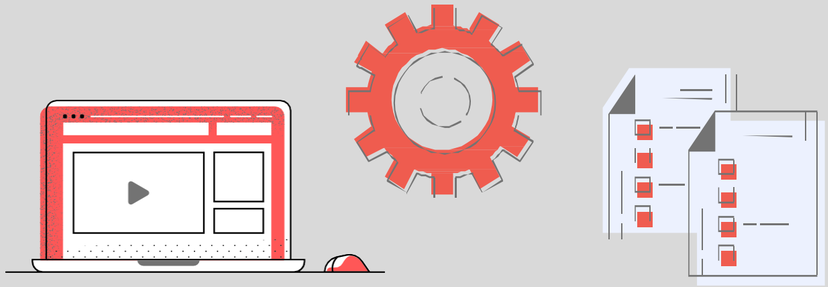
Automatic sentiment rating of tweets related to TV programs, through a Sentiment Analysis activity, carried out in the context of **Natural Language Processing (NLP).**

Performed activity:

Production of a collection of texts to train the NLP Pipeline to the reference linguistic context; implementation of a **deep learning** model for sentiment prediction.

Used technologies:

Project developed in Python (open source) using artificial intelligence frameworks (Keras, Scikit Learn, Tensorflow) which allowed a deep learning approach.

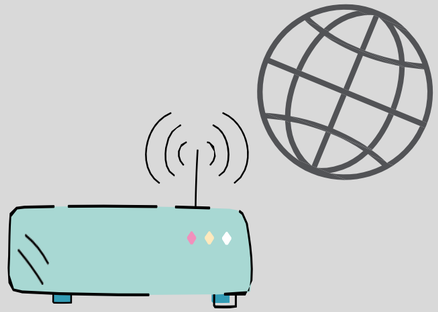


Case Histories:

Machine Learning - Predictive Maintenance

Project target:

Maintenance planning of a series of routers via a predictive model of **RUL** (Remaining Useful Life) for each unit, based on telemetry variables and sensory data.

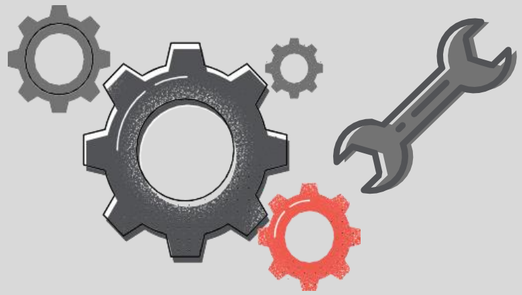


Performed activity:

Collection of the different data and structuring of the time series in a format suitable for the model; statistical analysis of measurements; implementation of a **Deep Learning** model for the prediction of the machine failures.

Technologies used:

Azure PaaS suite (Microsoft) dedicated to machine learning with customized models in R. Feasibility study for integration with **IoT** and **Edge Analytics** models from Azure



Case Histories:

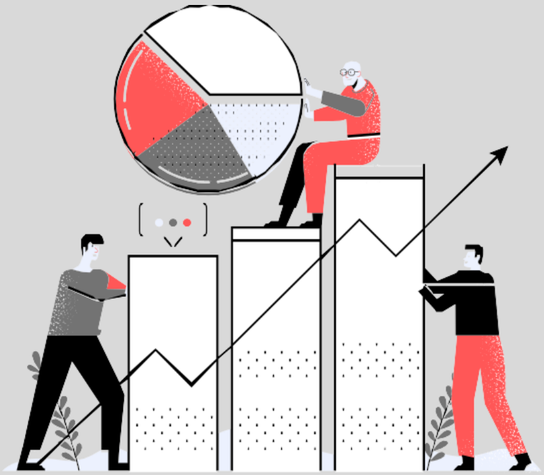
Machine Learning - Day Ahead Price Forecast

Project target:

Creation of a forecast model of the daily PUN price (**Unic National Price**); Creating an optimization and distribution model for resources to offer on the financial markets.

Methodologies used:

Simulation of **stochastic models** for price dynamics; use of Data Science techniques; use of **Business Intelligence** tools for evaluation of the effectiveness of the model in the financial trading market.



Case Histories:

BI for IoT – Infrastructure Monitoring

Project target:

Construction of an infrastructure performance monitoring platform distributed throughout the Italian territory.

Methodologies used:

Data collection project from unstructured sources in the field of Business Intelligence on the electricity transmission sector, created through a mix of open-source and enterprise-type software. The IoT data source to be accessed to retrieve sensor readings were distributed on the MongoDB platform. Through a pipeline developed in Python, the data were analyzed with statistical models for anomaly detection purposes, then ported to the SAS CAS Server. Subsequently, a monitoring platform for anomalous behaviors was built in SAS Visual Analytics. Finally, a solution for daily control of the behavior of transmission wires and exchange centers was implemented, to prevent possible damage due to physical phenomena such as freezing or damage to components.

Internal Research Department

After years of experience gained in the areas of Banking, Insurance, Telco and Energy, we have been able to experience the transversality of our technical skills and their applicability to even the most disparate sectors. Driven by the desire to face distinctive new challenges, we have decided to dedicate part of our time and resources to research projects aimed at developing expertise in all the areas that can benefit from the world of **Data Science**.

Case Studies:

Research Department- Satellite Imagery: Object detection

The purpose of the Object Detection Project in which DMBI participated, was to develop a **machine learning** model able to identify, through the analysis of satellite images, geographical areas where landfills may be present (**Landfill Detection**).

The development of the model initially took place with a binary approach: which means that two different methodologies were used simultaneously.

In the first case, a **pixel-based** model was taken as a reference, which observed the images pixel by pixel, both in the case of model training and in the evaluation; in the second case, the The model approach was **tile-based**. After observing the results of the two approaches, it was decided to continue exclusively with the tile-based on, because the other methodology was considered less effective.

Case Studies:

Research Department – Myectomy Project

In collaboration with La Sapienza University of Rome, we have analyzed a dataset formed by a population of patients undergoing myectomy, a type of heart surgery, using **descriptive and inferential statistical techniques**.

For each patient in the population, the dataset reported some parameters detected both before and after the operation. Again for descriptive purposes, the information available was used for the calibration of some hierarchical clustering models, to identify various groupings by the similarity between the elements of the sample.

The analysis carried out represented the basis to build a predictive model, through a **logistic regression** that used, as input, the values of the pre-intervention parameters and returned the probability of improvement of the same parameters, following the operation.

In this way, the model provides the surgeon with an additional information element to evaluate the appropriateness of the intervention.

The project was developed with **SAS technology**, using the statistical and modeling procedures included in the product.

Case Studies:

Research Department – REP Project

In collaboration with the orthodontics department of the Umberto I University Hospital, we have analyzed the questionnaires filled out by children undergoing orthodontic treatment with a **Rapid Palatal Expander (REP)**. Patients, between the ages of 7 and 14, have been asked periodically to fill-out questionnaires, aimed at describing the pain perceived in the various areas of the palate during the different moments of therapy.

The variability of the sample allowed a study on the Correlation between variables characterizing the individuals of the population, measuring the invasiveness of the treatment with **inferential statistical** techniques.

The analysis was carried out with **SAS** software and produced tabular reports, graphs, and statistical indicators aimed at formally justifying the results reported in a paper to be published in a medical scientific journal.

Case Studies:

Research Department – Satellite Imagery: Weather risk forecasting

In collaboration with the University of Salerno, the theme of the **meteorological risk** in **Agritech** was addressed. In particular, the study focused on the factors influencing the development of an insurance policy that covers the risk of crop damage caused by extreme heat, cold or excessive rainfall. Due to climate change, events previously considered rare have now shown a significant impact, due to the increase in the frequency with which they occur. For this reason, it becomes of crucial to know how to estimate how many days a year will present a high meteorological risk. The reanalysis dataset of the **NASA MERRA** mission, of satellite origin, represents a rich source of timely meteorological information with a significant temporal depth: this data source has fed a database on which to calibrate forecasting Machine Learning models capable of estimating future days at risk. Through open-source packages and R software, **Tree-Based** (Random Forest, XGBoost) and **Deep Learning** (LSTM) models have been tested exploiting, where possible, the computing power of the **GPU (Graphical Processing Unit)**.

Case Studies:

Research Department – Auricular Acupuncture Project for Facial Pain

In collaboration with researchers from the Umberto I University Hospital, clinical and molecular data were processed for the analysis of an auricular acupuncture technique. The clinical data contained in the database records the pain levels identified by patients during the treatment, while the molecular data identifies the presence of some salivary biomarkers. The experiment was set up by determining 4 groups, one of the healthy volunteers and one of the patients, who were treated with the auricular acupuncture technique of interest; a placebo group of healthy volunteers received sham acupuncture; finally, a control group of healthy volunteers did not receive any therapy. Using descriptive statistical techniques, the trends in the pain level recorded by the patients were monitored, looking for correlations with personal attributes such as sex and age. On the other hand, the data recorded at the beginning and the end of therapy regarding salivary biomarkers were analyzed with inferential statistical techniques using tests and regression models.

Contact Us

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