GN Techonomy

Il valore aggiunto per la tua azienda dal 1995

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Abilitatori della transformazione digitale

Chi Siamo

- *Dal 1995 System Integrator*
- *Milano – Bergamo*
- *Più di 70 consulenti*
- *Più di 150 implementazioni JD Edwards*
- *Oracle JDE & IaaS Gold Partner*

- *Diverse tipologie di imprese Clienti:*
  - ✓ *Apparel Textile & Chemicals*
  - ✓ *Energy, Utilites & Professional Services*
  - ✓ *Food & Beverage*
  - ✓ *Industrial Manufacturing*
  - ✓ *Media, Real Estate & Retail*

Recenti risultati importanti

- *Oracle IaaS Partner of the Year 2018*
- *Oracle Innovation Partner of the Year 2019*
- *Oralce Cloud Implementer of the Year 2020*

ORACLE
Partner of the Year
'18
IaaS
GN Techonomy

ORACLE
Partner of the Year
'20
OCI
GN Techonomy

ORACLE
Partner of the Year
'19
Innovation
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Time Series Forecasting with R and Oracle Analytics

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Agenda

- *Oracle Business Intelligence, Data Visualization and OAC*
- *Machine Learning*
- *Implementation of sales forecast with Oracle Analytics and R*
- *Real examples*

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Oracle Analytics Cloud

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Customer/Partner Managed and Oracle Managed

Data Visualization	Big Data and Data Lake Analytics	OBIEE + Data Lake + Essbase
<u>Standard Edition</u> Data Visualization Self-service data prep.	<u>Essbase Edition</u> Standard plus: Big data sources Spark for processing at scale What if analysis via GUI Essbase to cloud	<u>Enterprise Edition</u> Essbase plus: Data modeling Enterprise Reporting Large scale & HA Use Oracle Database Cloud Live conn. to on-prem DWH

Includes Mobile Apps (BI HD, Day By Day, Synopsis) , Client tools & Desktop

Data Visualization Capabilities

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- Rich palette of chart types, combo charts of lines, areas, bubbles, and more
- Trellising for every visualization; customizable color palette
- Brushing – highlight correlations within data across visualizations, all auto-wired to work/update in unison, leveraging in-memory cache/execution layer
- One click access to common statistical functions – outliers, trend lines, forecasts for N periods, others

Data from all sources

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Easy access to a variety of data sources

- *Few clicks to setup and use*
- *Vast number of sources supported*
- *Expanding coverage to enable access to every industry-specific source via native connectors or developer community*

In-line and "extract and analyze"

- *IP built over two decades in function shipping (source-specific code generation) and internal execution now powers business user self-service*

SAAS/ PAAS

ORACLE MARKETING CLOUD; ORACLE FINANCIALS CLOUD; ORACLE SERVICE CLOUD; ORACLE SALES CLOUD; ORACLE HUMAN CAPITAL MANAGEMENT CLOUD; ORACLE ENTERPRISE RESOURCE PLANNING CLOUD; salesforce; OneDrive; Dropbox

DATABASES

ORACLE; TERADATA; Essbase; SAP Sybase IQ; MySQL; Microsoft Access; IBM DB2; SQL Server; PostgreSQL

BIG DATA NO SQL

HIVE; mongoDB; hadoop; Cassandra; splunk>; Google BigQuery; Spark; Pivotal; monetdb

OTHERS

CSV; JDBC Java Database Connectivity; ODBC open database connectivity

Prepare data with Data Flow

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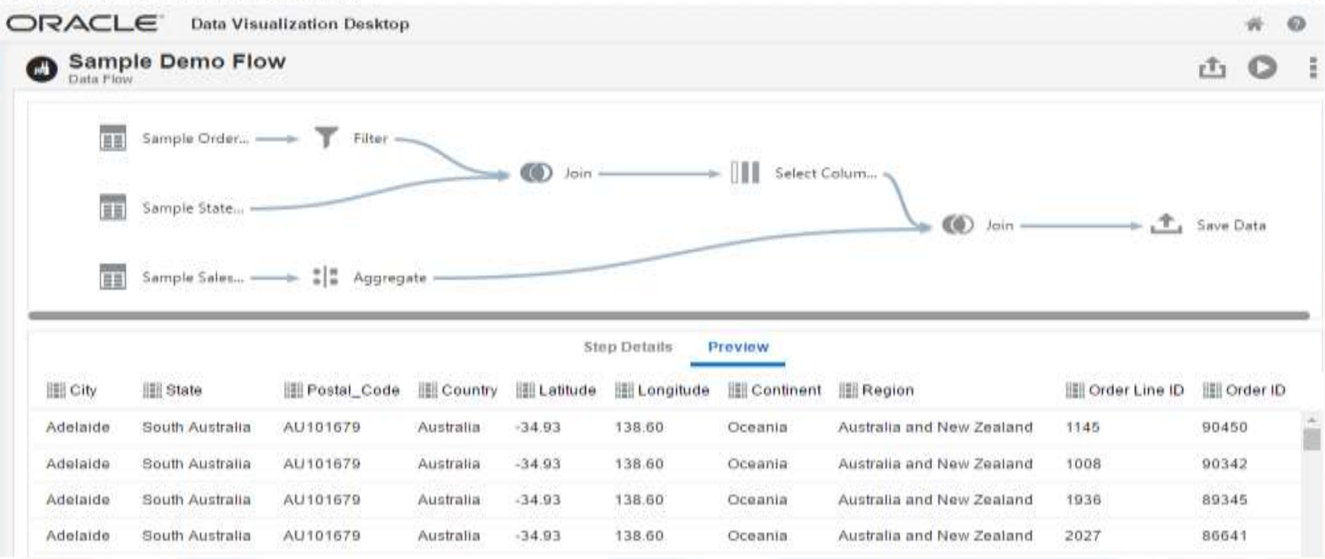
Power of SQL via intuitive interfaces

- *Group values, join data sets, sub-select rows/columns, aggregate, calculated fields, …*

Function extensibility via R and source execution

- *Full R grammar for statistical, Machine Learning, textual models*
- *Reach-in to data sources' specific routines*



Data Visualization Capabilities

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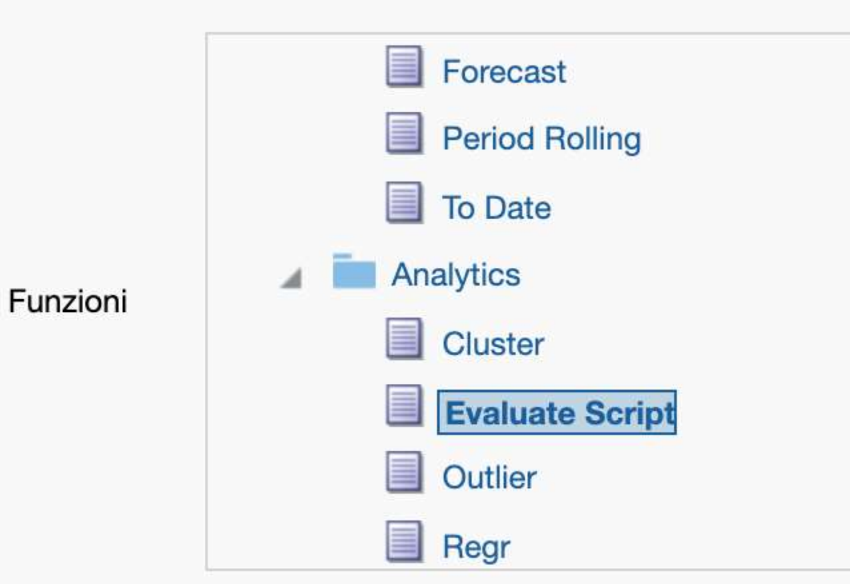
Enabling R in OBIEE 12c

- *The external Logical SQL functions such as EVALUATE_SCRIPT, FORECAST, and CLUSTER feed input data to the standalone R-process or to Oracle R Enterprise.*
- *Therefore, to create analyses that include these functions, you must install either the R or Oracle R Enterprise external engine in your environment.*



What is Machine Learning?

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Machine learning is an application of artificial intelligence (AI) that provides systems the ability to automatically learn and improve from experience without being explicitly programmed

A computer program is said to learn from experience E with respect to some class of tasks T and performance measure P, if its performance at tasks in T, as measured by P, improves with experience E

- *Tom Mitchell*

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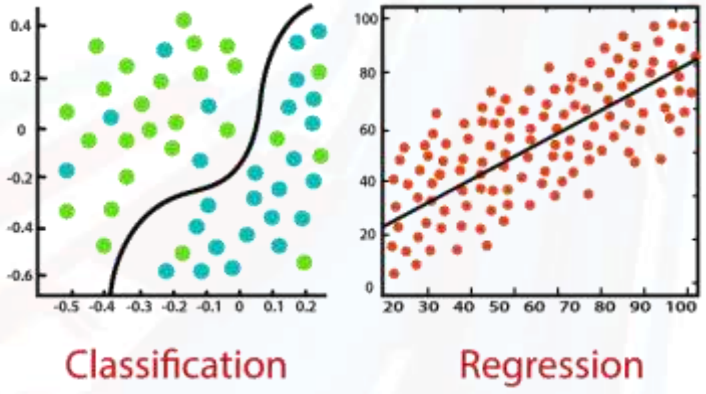
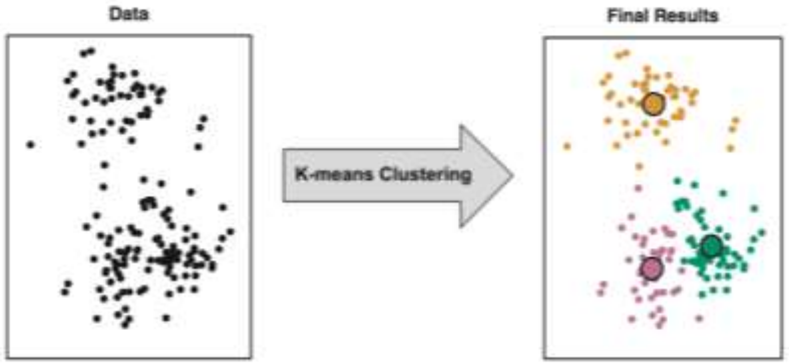
Machine Learning Algorithms

- ***Supervised**: learning systems that can provide predictions and analysis of **labeled data**, which means that each example is a pair consisting of an input object and an output value. Supervised learning usually deals with regression and classification problems (linear regression, logistic regression, decision tree, neural networks, …)*





- ***Unsupervised**: learning systems that can find hidden insights and behavioral patterns in data sets without focusing on predetermined attributes. This systems are called unsupervised since they do not aimed at a specific goal but exploratory in nature and finds hidden insights within the data. Examples of unsupervised learning are clustering and anomaly detection*

Machine Learning algorithms

With OAC and DVD

Native Functions implemented in BI Server (Binning, Trending)

- *Trending,*
- *Clustering (R)*
- *Outlier Detection (R)*
- *Forecasting (R)*

Extend BI Functionality with R

- *Custom analytic scripts with embedded R code*
- *Offline script execution to create enrichment dataset*

OAC ML Demo

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Quick demo using OAC ML functionallity. We will use OAC Data Flows to:

- *Prepare data*
- *Train the model*
- *Apply the model to the dataset*
- *Check the results*

Purpose of the Project

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Perform a calculation of Monthly Forecast based on Sales History in order to:

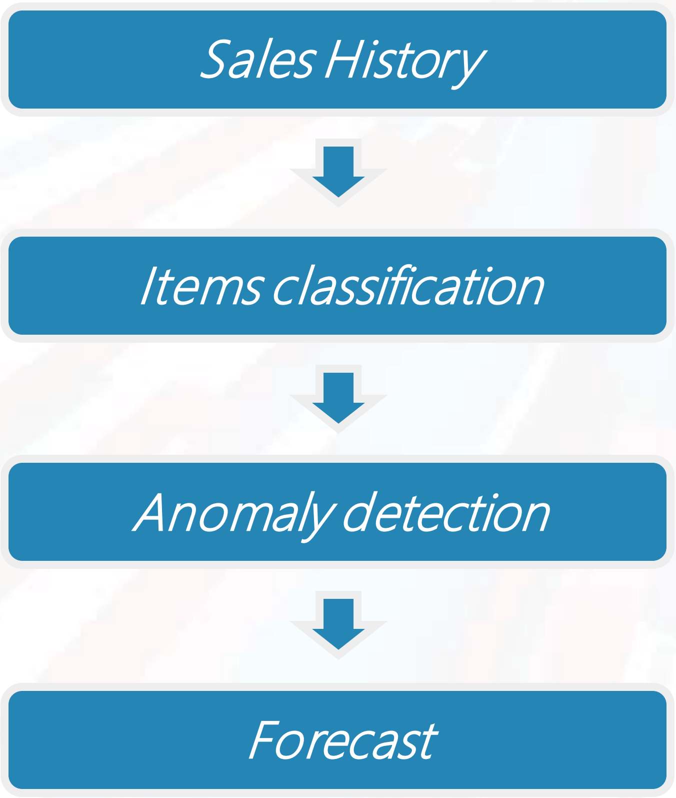
- *Plan orders in advance to satisfy the request*
- *Avoid having outstanding orders*
- *Limit warehouse costs*

Solution

- *Use of statistical and Machine Learning algorithms for sales forecasting and Oracle Analytics for visualizing and analyzing results*

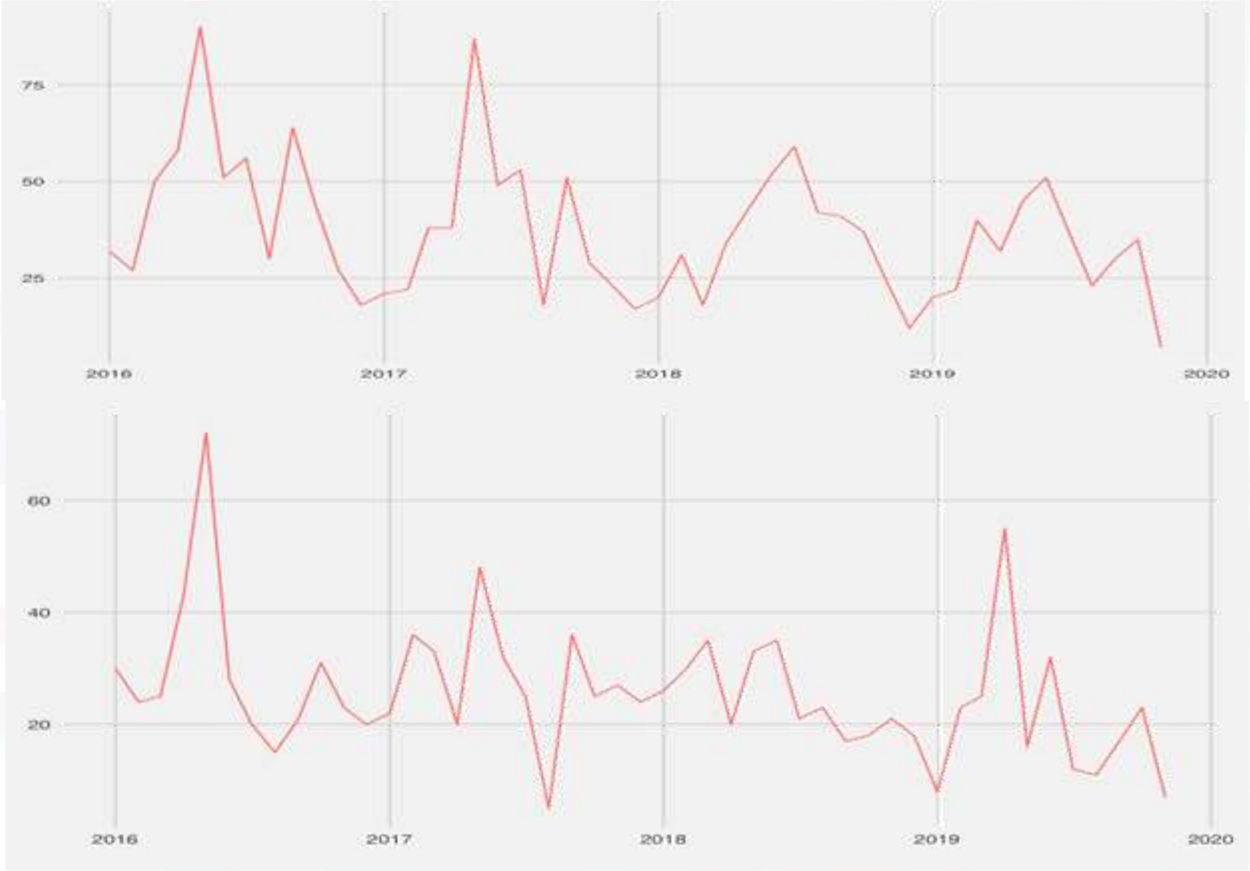
Process Schema

1. *Creation of a monthly sales data set (for each item)*
2. *Data pre-processing:*
   - *items classification (seasonal, continuous)*
   - *anomaly detection and normalization*
3. *Forecast*



Sales History

- For each item we get the time serie given by the sales aggregated by year/month.
- The source system can be both an ERP and a DataWarehouse



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Items Classification

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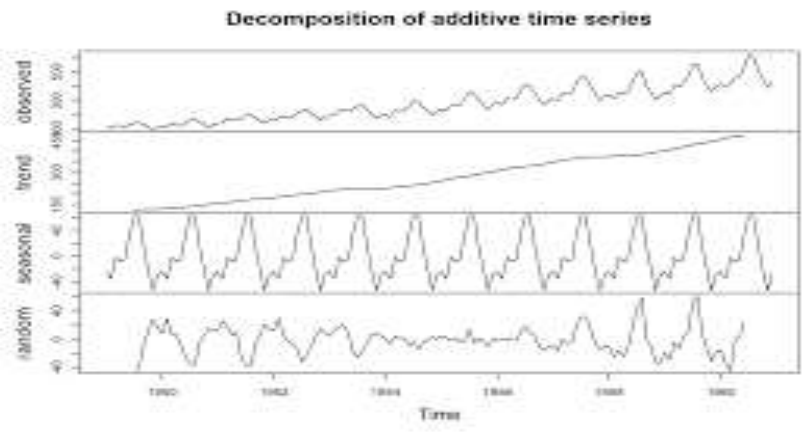
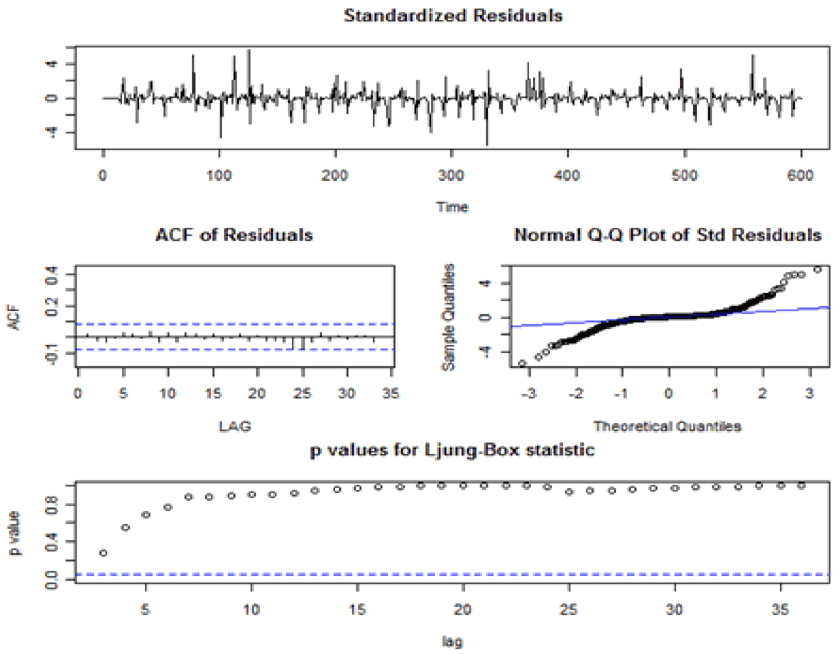
For each item we analyze past monthly sales in order to detect seasonality.





The calculation is performed by using the function ***Seasonality*** *of the R library* ***Greenbrown*** *which uses three different algorithms:*

1. *Periodgram*
2. *Auto-correlation*
3. *Linear model*

Anomaly Detection and Normalization

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Anomaly Detection → *for each item, we consider its sales history aggregated by year/month and we perform the following checks:*

1. *We check if there is a couple (year, month) which is anomalous (eccessively high), with respect to the history sales of that item*
2. *For every anomaly (item, year, month) detected at the previous step we split the sales between customers and we check if one or more of them made anomalous purchases with respect to others*
3. *For every anomaly (item, year, month, customer) detected at the previous step we explore the sales history of that customer and we check if that sale is effectively anomlaous*

Normalization → *for every anomaly detected, a new value is proposed.*
This value is calculated by statistical analysis

Anomaly Detection and Normalization

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Year-Month	Sales (Qty)
2019-01	70
2019-02	132
2019-03	83
2019-04	354
2019-05	128
2019-06	108
2019-07	95

Year-Month	Customer 1	Customer 2	Customer 3	Customer 4
2019-01	25		45	
2019-02	12	20	50	50
2019-03		13	20	50
2019-04	14	10	300	30
2019-05	10	33	30	45
2019-06	10	18	40	40
2019-07	22	10	20	43

Anomaly detected for customer 3 in 2019/04

Normalization by using the mean of the sales of the customer excluding the anomaly

New value: 34

Time Series Forecasting - Forecast:

Data Preparation

- *For each item we build a Time Series based on sales history aggregated by year/month*
- *We didivide the Time Series into two data sets:*
  1. *training set (80%)*
  2. *test set (20%)*

Training and Test

- *We use the training set to train the statistical model*
- *We use the test set to check the validity of the model by measuring the error between the predictions and the real values*
- *we reapeat the process for 5 different models and we will use the predictions of the winning one*

Time Series Forecasting - Algorithms

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- *Autoregressive Neural Networks*
- *ARIMA (Autoregressive Integrated Mooving Average)*
- *Extreme Learning Machine*
- *ETS (Exponential Smoothing)*
- *Multilyer Perceptron*

Real Examples

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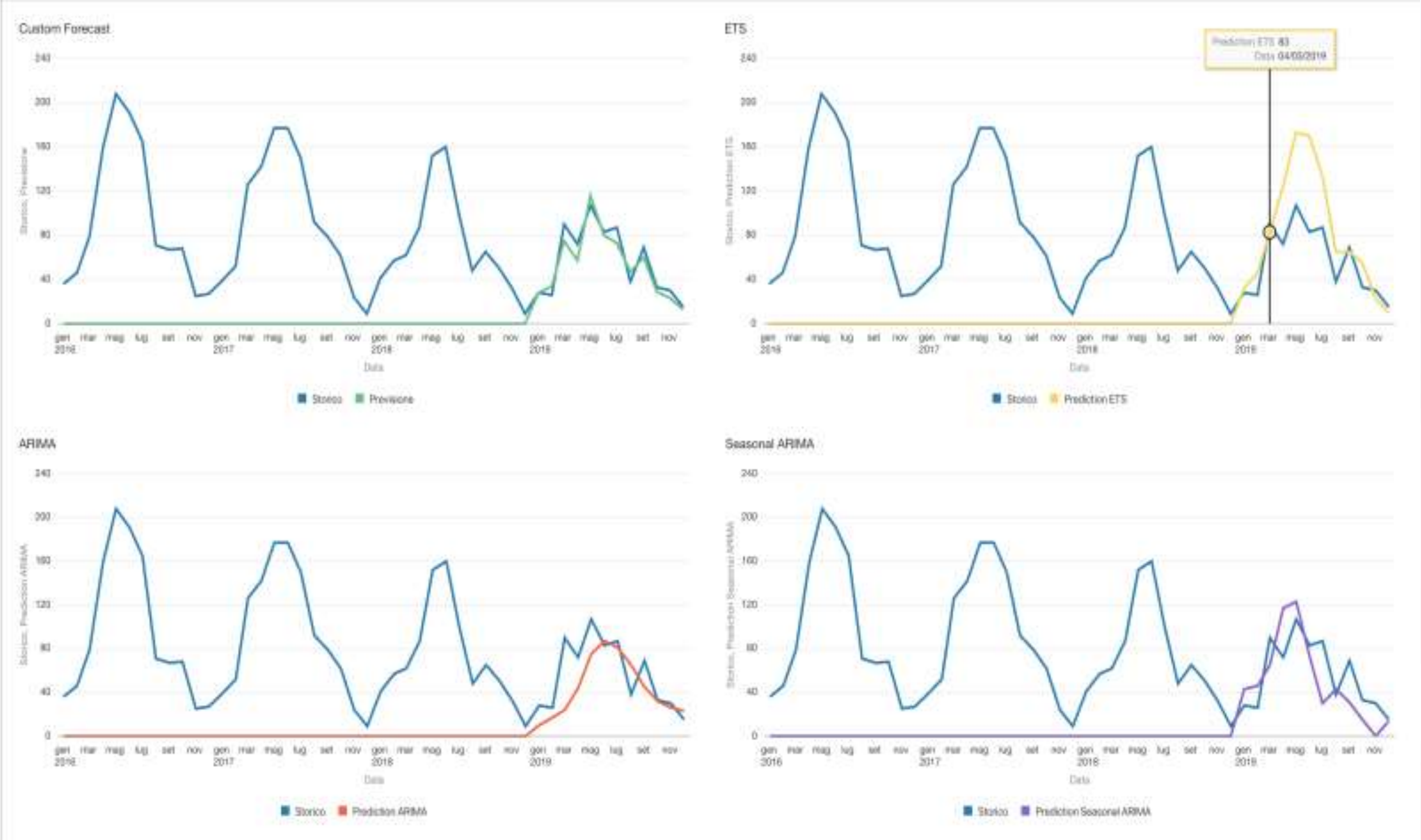
We are going to show the results obtained by our custom algorithm and compare them with three different algorithms embedded in Oracle Analytics:

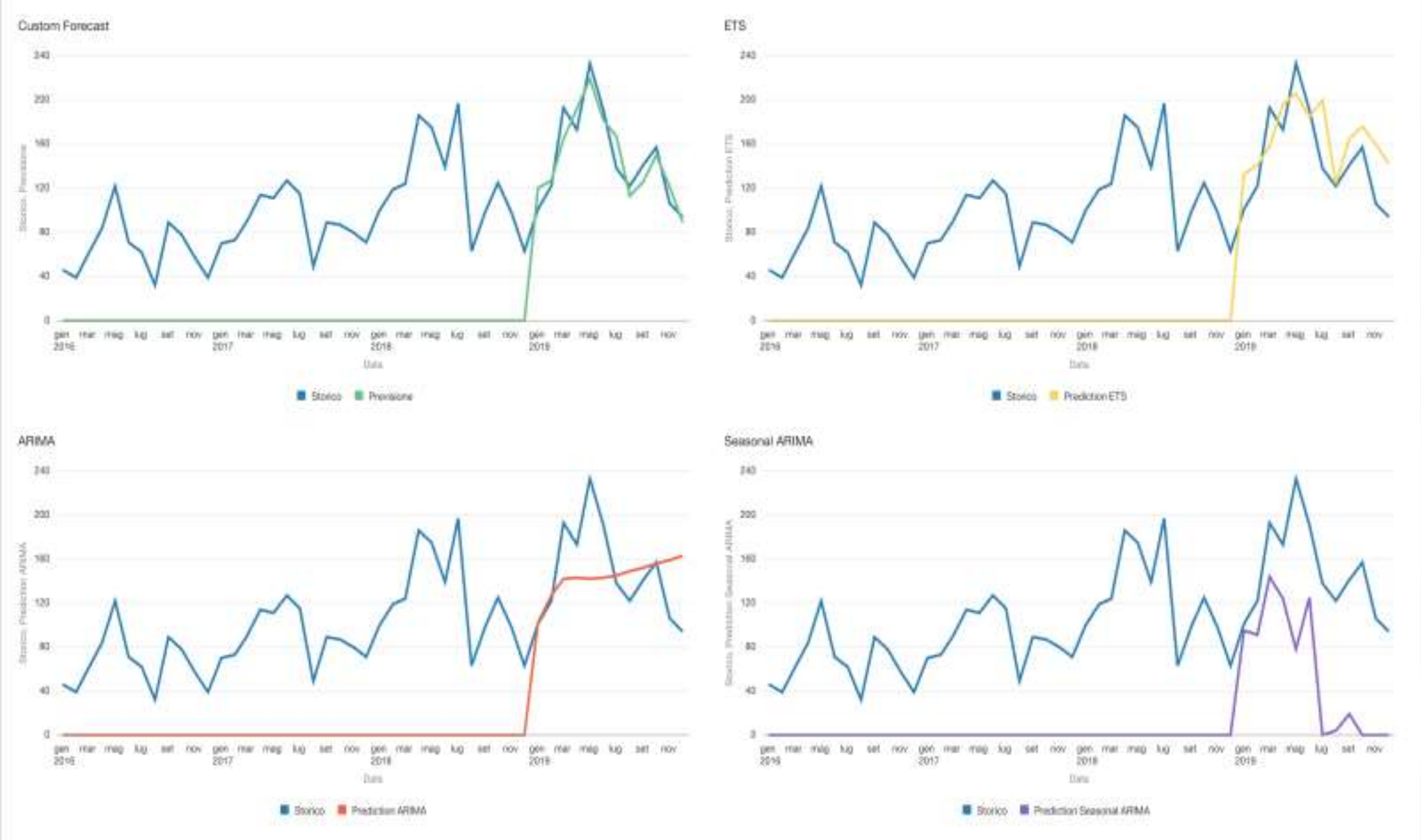
- *ETS*
- *ARIMA*
- *Seasonal ARIMA*

We will use four different items and for each of them we will analyze both absolute and effective error between predictions and real values.

Item 1


Custom Forecast
Storico
Previsione
ETS
Storico
Prediction ETS
ARIMA
Storico
Prediction ARIMA
Seasonal ARIMA
Storico
Prediction Seasonal ARIMA

Item 2

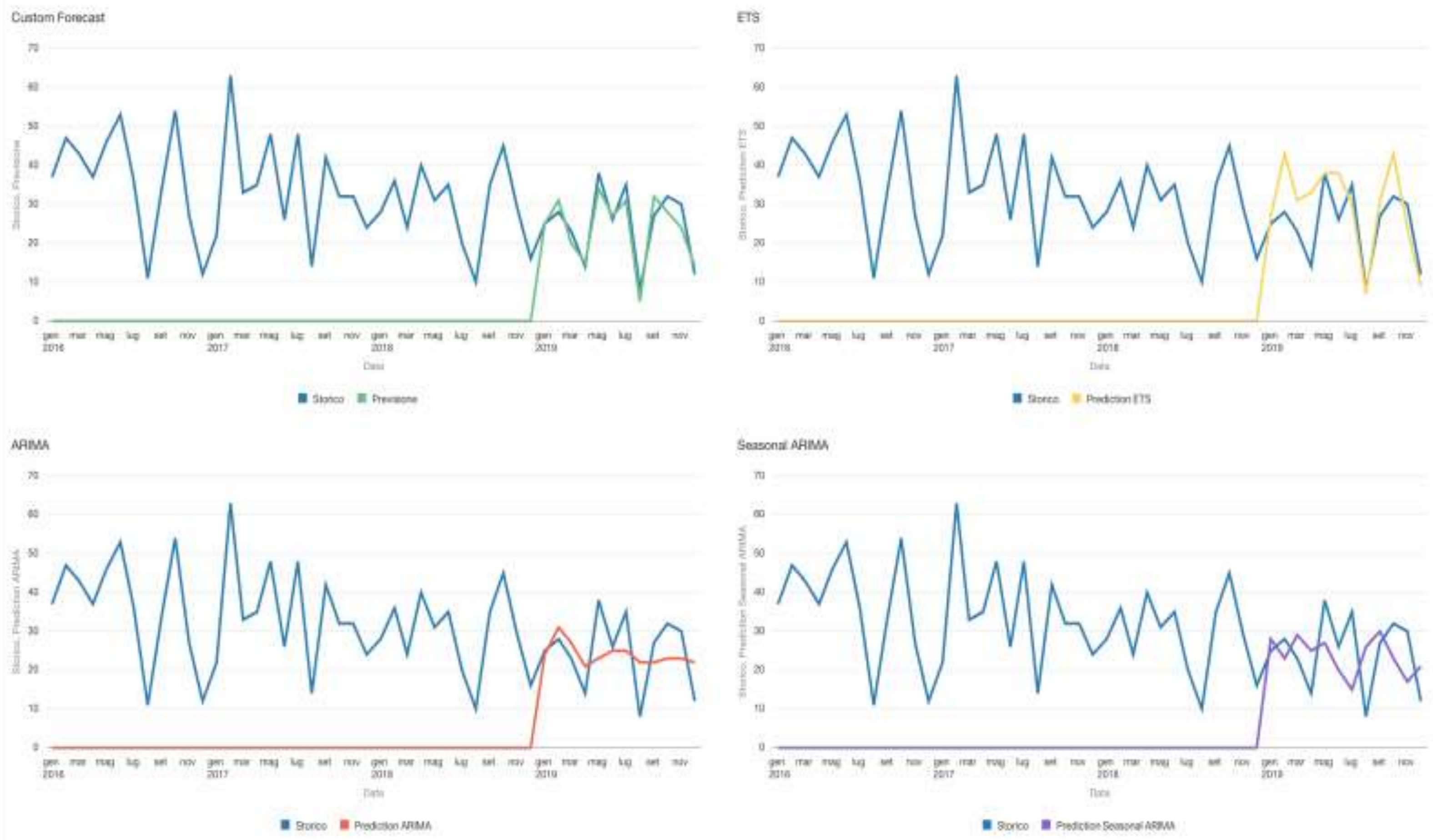


Custom Forecast
Storico
Previsione
ETS
Storico
Prediction ETS
ARIMA
Storico
Prediction ARIMA
Seasonal ARIMA
Storico
Prediction Seasonal ARIMA

Item 3


Custom Forecast
Storico
Previsione
ETS
Storico
Prediction ETS
ARIMA
Storico
Prediction ARIMA
Seasonal ARIMA
Storico
Prediction Seasonal ARIMA

Item 4



Custom Forecast
Storico
Previsione
ETS
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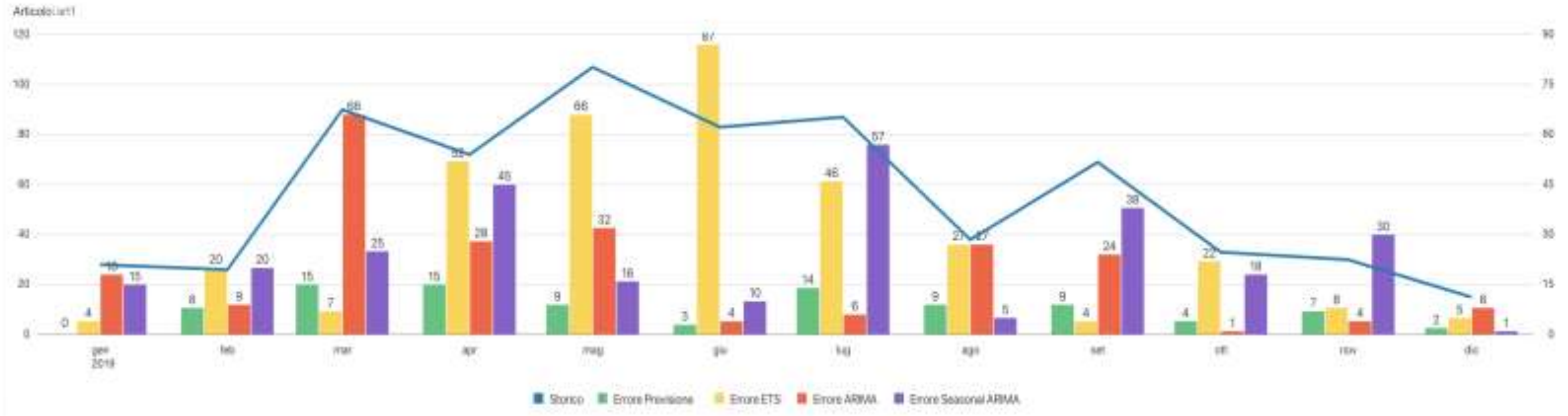
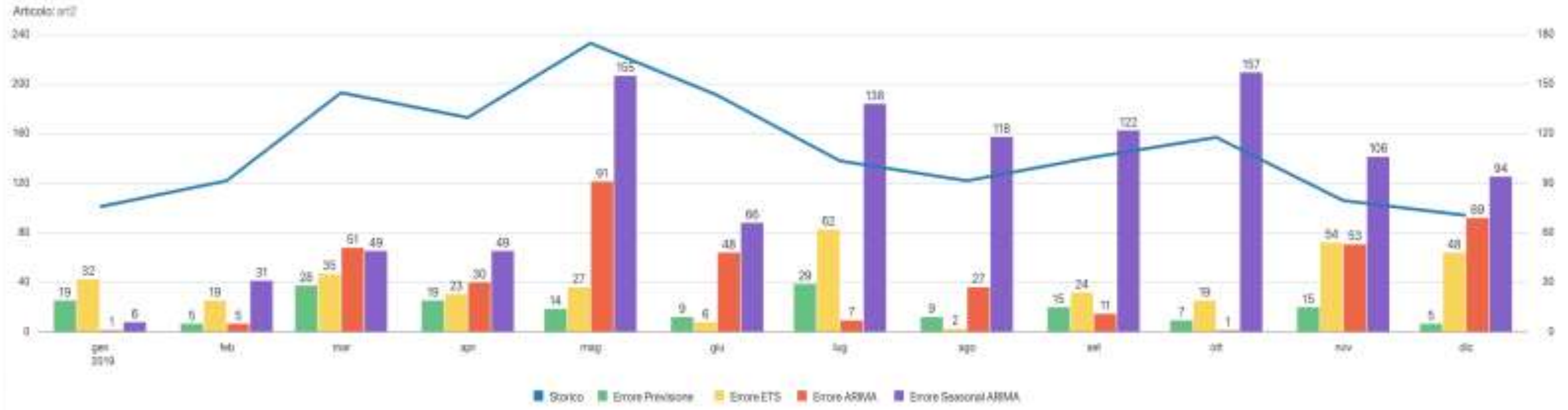
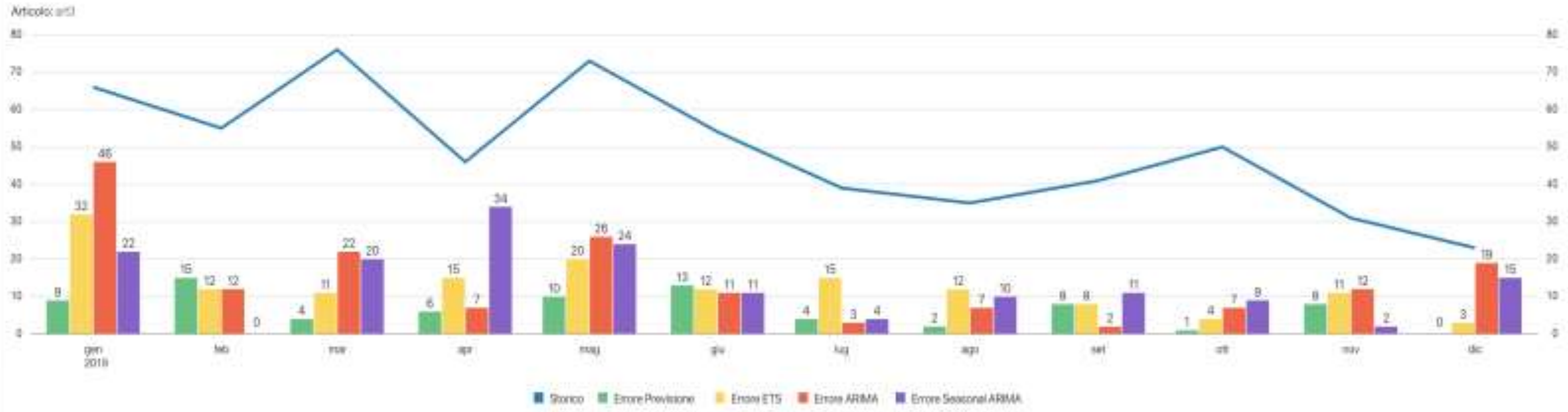
ARIMA
Storico
Prediction ARIMA
Seasonal ARIMA
Storico
Prediction Seasonal ARIMA

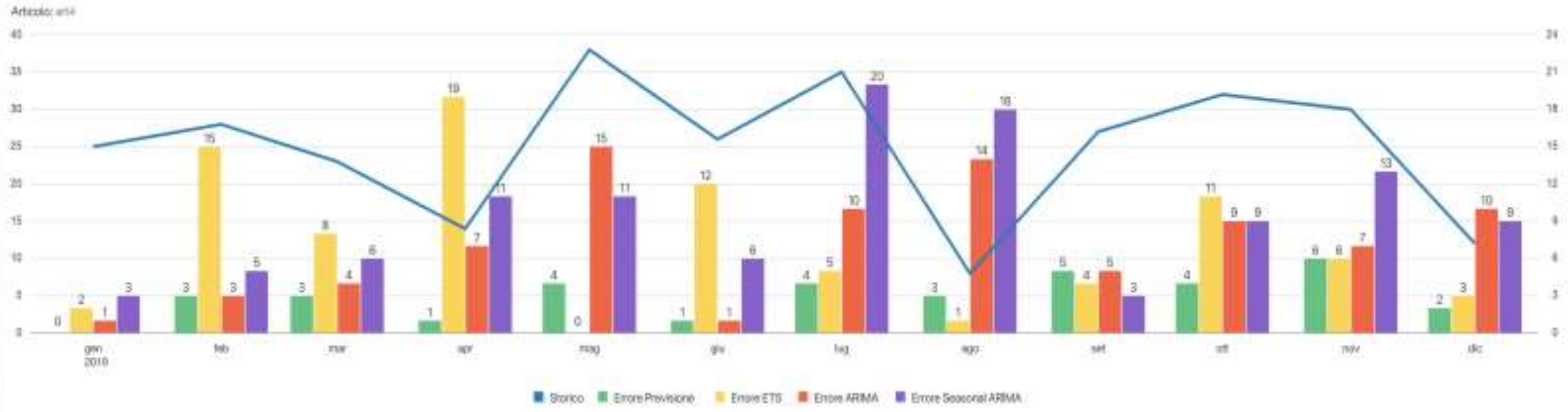
Absolute Error (1/2)



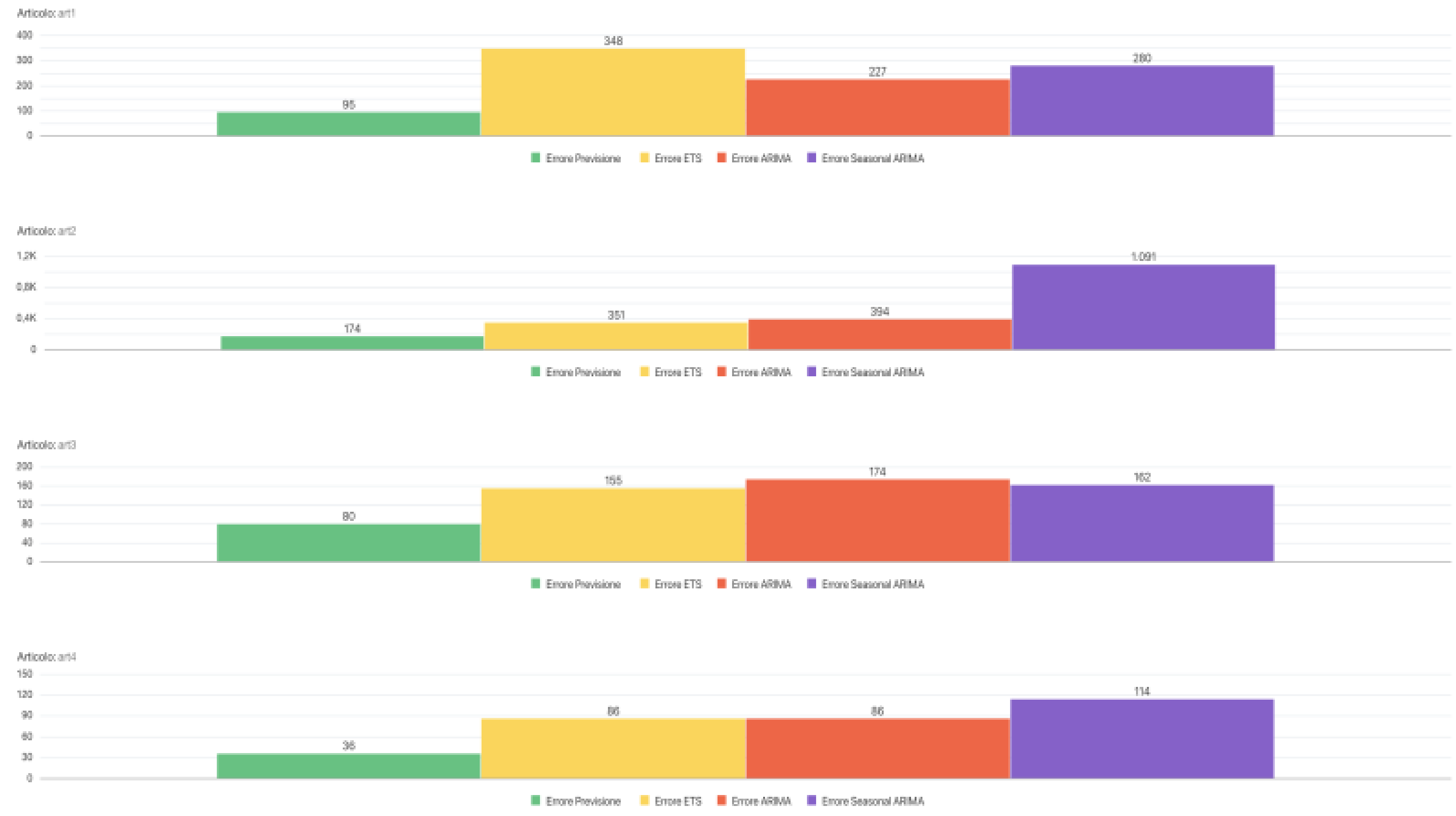


Absolute Error (2/2)

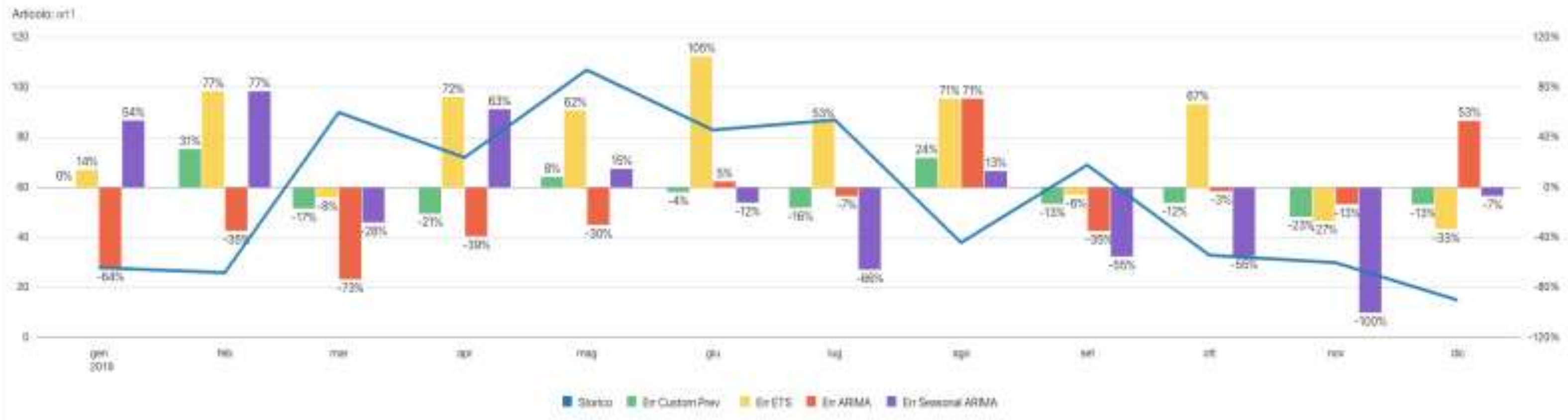




Total Absolute Error



Error % (1/2)


Articolo: art1
Storico
Err Custom Prev
Err ETS
Err ARIMA
Err Seasonal ARIMA


Articolo: art2
Storico
Err Custom Prev
Err ETS
Err ARIMA
Err Seasonal ARIMA

Error % (2/2)

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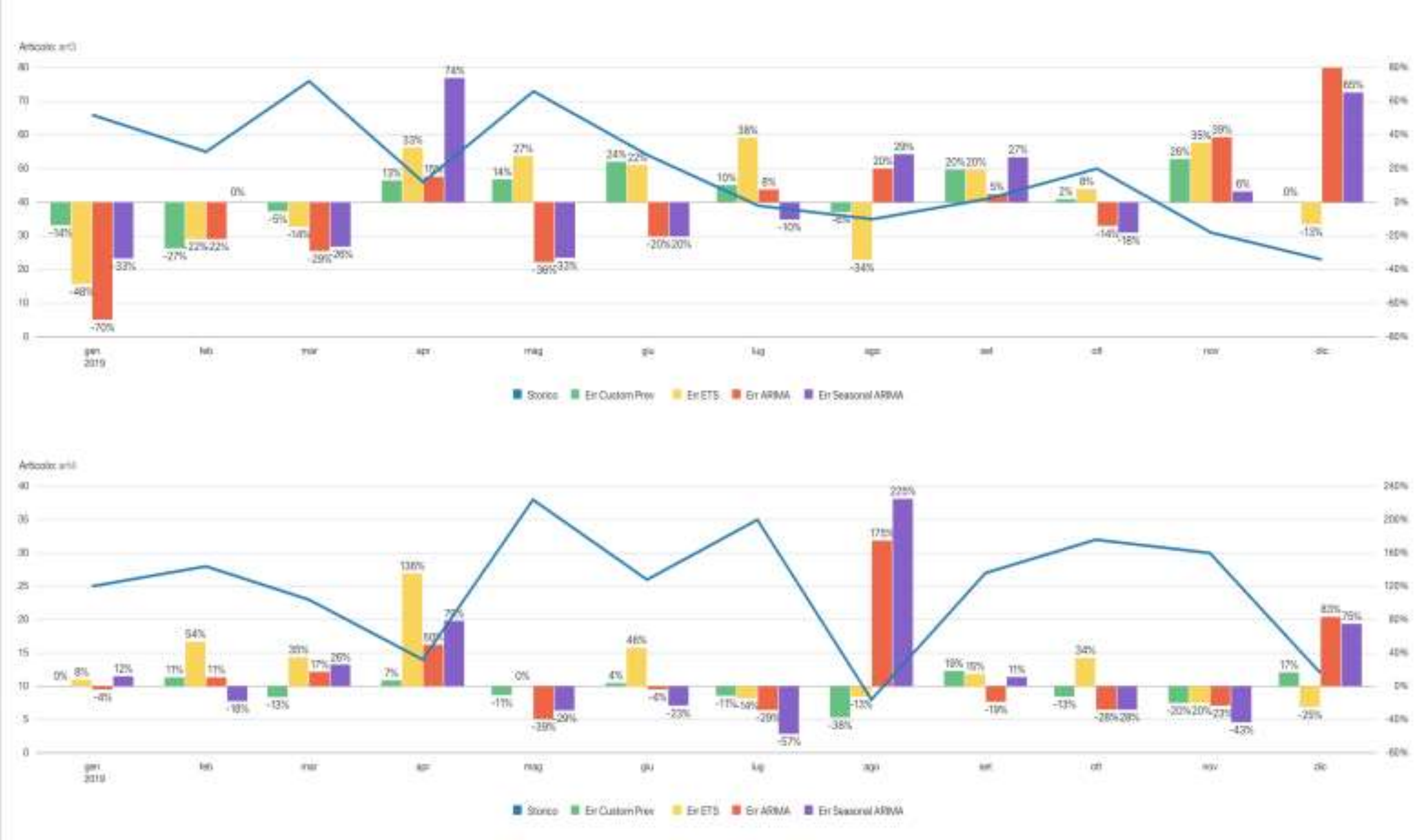

Total Error %

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By analyzing the effective error (with sign), between the four algorithms and the real values we can see how our custom algorithm best fits the problem ang gets the best predictions

Item	Custom	ETS	ARIMA	Seasonal ARIMA
item 1	-6%	44%	-22%	-12%
Item 2	0%	12%	-3%	-62%
Item 3	3%	3%	-13%	-3%
Item 4	-4%	19%	-3%	-5%
Total	-1%	18%	-8%	-36%

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Grazie per l'attenzione

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