

Business Intelligence & Augmented Analytics

Smarten Integrates R Scripting for Gujarat Environment Management Institute (GEMI) for Predictive Analysis





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The Client

Gujarat Environment Management Institute (GEMI) is an ISO 9001:2008, ISO 14001:2004, OHSAS 18001:2007 certified Autonomous Institute under the auspices of the Gujarat Forest Department agency. The GEMI charter supports the "Think Global, Act Local" concept and is integrally involved in the pursuit of environmental protection for India. The Client team is engaged in assuring sustainable development, and provides research to measure and gauge the impact of various human, economic and industrial activities on the environment. GEMI is focused on developing standards for prevention of negative environmental impacts and performs lab testing on air, water, wastewater, microbiology and soil.

The Objective

The Client employed the services of the Smarten augmented analytics team to leverage its advanced analytics solution and enable predictive analytics and visualization to monitor and analyze river and soil attributes in Gujarat. The Client wished to build a linear regression model for river and soil attributes to analyze which parameters significantly affect the selected target variable and which are irrelevant, and to quantify the impact of significant attributes on selected target variables. In addition, the Client wished to use this solution to measure numerous other factors and aspects of water and soil pollution and to incorporate bio-monitoring, trending and correlations into the analytical model.

The Solution

The Smarten team incorporated its augmented analytics capabilities with the R scripting environment to design and build a flexible, comprehensive analytical environment. Using the new solution, the Client was able to perform advanced analytics, visualization and reporting and to monitor and manage factors including pH measurement, water and soil color, conductivity, turbidity, alkalinity, chloride levels, solids, dissolved and suspended solids, hardness, oxygen and biochemical oxygen demand, nitrogen and more. The solution allows the Client to apply filters to select data for linear regression model building, and to customize target and independent variable values while building a model, and generating data for dynamic output to the Smarten modern business intelligence and augmented analytics dashboards and reporting tools. This dynamic output enabled the Client team to measure the impact of any attribute on target variables, and to analyze the nature of relationships between, and among, independent variables versus the target variables; i.e., whether target variable Y increases or decreases with a unit change in independent variable(s) X, if yes then with how much magnitude it increases/decreases.



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The solution includes:

• ETL for Source Data:

• Loading data from source files via ETL, and creating meta data within the Smarten environment.

Development of Model Using R Scripting

- Linear Regression Model
 - Input:
 - Variables such as Temperature, Visual color, pH, TS, TDS, TSS, Turbidity, NH3N, Chloride, Alkalinity, Hardness etc.,
 - Output:
 - Predicted values of selected target variable
 - Residual values: Actual predicted
 - Standardized residuals
 - Standardized residual versus fit plot
 - Coefficients table
 - ANOVA table
 - Regression statistics table
- Benefits
 - With this new solution, the Client can now understand the relationship between significant variables and targeted variables

through scatter plots, e.g., whether there is a linear relationship between TDS and river pH etc.

- The Client team can check other assumptions for linear regression model such as normality in data, outliers in data etc.
- The new environment allows business users to identify the important variables impacting the targeted output
- The Client can now measure the magnitude of change in selected target variable Y with one unit change in independent variable X
- The Client team enjoys intuitive, self-serve dashboards, reports, and key performance indicators (KPIs) and can perform slice n' dice, drill down, drill through and visualization without the help of programmers.

The Technology

Smarten augmented analytics solution integrated with the R Scripting environment.



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Smarten Role

As part of this project, the Smarten team engaged in a requirements and data review, designed and developed and fine-tuned the appropriate model, validated the model for accuracy and designed dashboards, KPIs and reports within the Smarten augmented analytics solution. The team provided support, knowledge and skill in the following areas and activities:

- Requirements understanding, statistical modeling and related discussions with Client statisticians, analysts and the IT team
- Technical feasibility study
- ETL from source data
- Designing meta data layer
- Design, development and fine tuning of model using R
- Validation of model
- Integrate Smarten with R
- Develop dashboards, KPIs and Reports
- Testing
- Support and Training for statisticians, analysts and IT team

Conclusion

The Gujarat Environment Management Institute (GEMI) charter supports and encourages sustainable development, and provides research to gauge the impact of human, economic and industrial activities on the environment and the Client team develops standards for prevention of negative environmental impacts. Working with the Client team, the Smarten team conceived, designed and built a linear regression model to analyze, monitor and manage data related to river and soil attributes and to provide clear, analysis of the parameters that affect the selected target variables and identify which ones are not relevant, as well as to quantify the impact of each significant attribute on selected target variables. The solution combines the Smarten augmented analytics approach to modern business intelligence and advanced analytics and integrates the solution with the R scripting environment. This advanced analytical solution checks assumptions within the regression model, identifies important variables impacting the targeted output, identifies the relationship between significant variables and targeted variables, and measures the magnitude of change in selected target variables, and it provides ongoing benefits from self-serve dashboards, flexible reporting and KPIs so the Client can slice and dice, drill down, drill through and visualize data without the assistance of programmers. This new solution provides numerous benefits to help the Client team meet future challenges and plan for the future.



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