



HELPING COMPANIES GO GREEN WITH ADVANCED ANALYTICS

MOSAIC DATA SCIENCE | CASE STUDY

DATA SCIENCE CASE STUDY



Helping Companies Go Green with Advanced Analytics

Mosaic developed an innovative optimization app for a leading energy company, helping them recommend suites of renewable energy products to meet corporate carbon footprint reduction goals within budgetary constraints.

CLIMATE CHANGE & CORPORATE RESPONSIBILITY

As the world becomes increasingly exposed to climate change impacts, the corporations that produce and distribute just about everything the population buys, uses, and throws away are searching for ways to reduce their carbon footprints. [For example, according to this report, the top 15 U.S. food and beverage companies generate nearly 630 million metric tons of greenhouse gases every year](#), making them a larger emitter than Australia, the world's 15th largest annual source of greenhouse gases. A large share of these and other companies' carbon footprints comes from the emissions associated with generating the electricity that drives their manufacturing lines, powers their electronics and IT infrastructure, and heats and cools their office buildings. Companies must account for and address these emissions in order make a meaningful reduction in their contribution to climate change.

US utility players have stepped up their efforts to provide environmental, social, and governance reports (ESG) with clear emissions reduction goals and to actively support their corporate customers in achieving their own emission reduction goals. Recent initiatives by leaders across all industries have brought numerous new commitments to zero carbon emission goals and an accompanying surge in construction of wind and solar generation over the next few decades. Not surprisingly, machine learning & advanced analytics can play a large role in assisting utilities and their customers with insights and recommendations on meeting these targets.

INTRO

Mosaic's customer is a leading energy firm that provides energy products and related services to corporate customers to meet their comprehensive energy needs.

Companies that have made greenhouse gas (GHG) reduction or green energy commitments can work with the energy team to incorporate a range of energy efficiency initiatives, renewably sourced energy, carbon offset credits, and investment in renewable energy construction projects into their power portfolios in order to achieve these goals. The team works with prospective customers to compare various candidate portfolios of GHG reducing and offsetting products and to explore the costs and tradeoffs of potential offerings.

Mosaic, a premier data science consulting company, was tasked to develop an optimization model to act as the engine behind a new strategic portfolio planning tool. Mosaic leaned on our deep experience designing & deploying analytics-driven algorithms to critical operational and strategic decisions.

APPROACH

Mosaic laid out an iterative project plan to dynamically meet the energy firm's needs at every point of the analytics development lifecycle. Mosaic's data scientists collaborated with key stakeholders to lay out requirements for an interactive dashboard and the algorithms driving the portfolio recommendations. The operating concept was that with a click of a button, the solution would yield a cost-efficient portfolio of products that would meet the customer's GHG targets. Customer preferences could be adjusted within the application based on real-time feedback during the process and quickly get back a revised offering.



Mosaic decided to develop a custom mathematical optimization algorithm to select the products to eliminate or offset the emissions required to reach the GHG targets. The algorithm needed to be highly scalable. A planning scenario could be comprised over 50,000 customer locations, up to 15 possible GHG reduction/offset products for each location, and a planning horizon of 20+ years. These conditions translate to upwards of 15 million individual product selections. Adding to the complexity, energy usage, emissions estimates, and product and energy costs vary over the planning horizon, and the portfolio recommendations must account for these shifts. Numerous constraints also need to be satisfied by any recommended portfolio.

Mosaic needed to develop the algorithm to handle a very complex problem while also being fast enough to update recommendations in real time.

EXECUTION

Throughout the project's duration, Mosaic's data science team worked in close collaboration with client stakeholders to ensure that the algorithm developed fully solved the problem at hand. Additionally, Mosaic worked closely with the client's software development team, who was tasked with building the front-end interface, to make sure that the algorithm and front-end interactivity were tightly coupled. Working cohesively with these teams allowed Mosaic to deliver a custom algorithm under a tight delivery schedule.

The development process began as far away from the code as possible. Mosaic led several brainstorming sessions focused on fully defining the problem and understanding the many nuances that had to account for in a portfolio. Mosaic brought ideas to the table for new ways to think about portfolio tradeoffs and ways that users might interact with portfolio recommendations inspired by the Mosaic team's extensive experience designing similar decision support tools. In between these meetings, Mosaic deliberated internally on the best algorithmic approaches to use to solve the problem at hand. There are almost always multiple ways to solve the same problem. Taking adequate time to decide whether, for example, a formal mathematical optimization model that can be solved by a commercial or open-source optimization solver or manually implemented custom heuristics were going to be most appropriate, proved to save a significant amount of time off the back end of the project and resulted in the most effective possible solution.

The team ultimately decided on an approach that allowed the team to streamline pieces of the problem significantly and to develop an explainable algorithm that could run more quickly than a naïve mathematical optimization model might have otherwise. This also ensured that the final recommendations would meet the preferences and expectations of the energy company's customers.

Implementation of the algorithm was an iterative process. Mosaic regularly demonstrated intermediate portfolio recommendations to solicit feedback that was incorporated back into the next version. The result of this process was a more effective algorithm and a deeper trust from the team in the recommendations. Similarly, the development of the algorithm and user interface was a collaborative and iterative process, allowing ideas for improved functionality to flow back and forth.

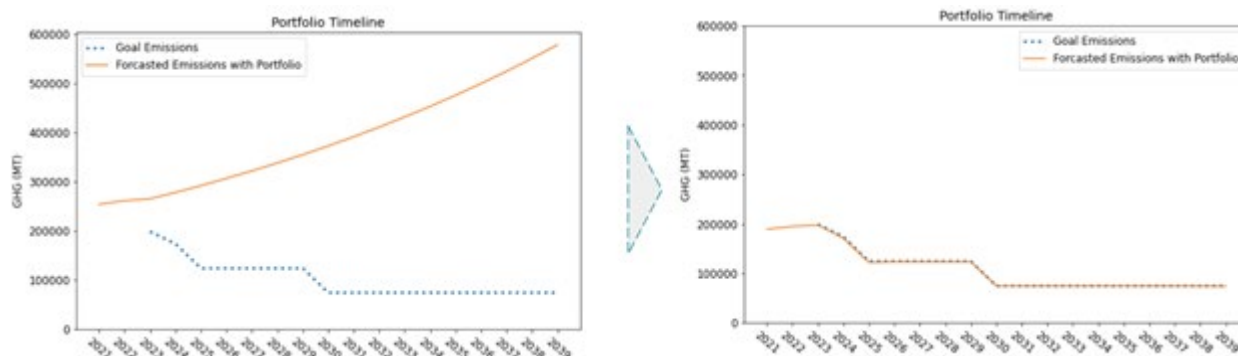
RESULTS

The visual below shows a before and after depiction of a customer's annual forecasted GHG emissions (orange line) and yearly GHG targets. The optimization builds a cost-efficient portfolio that collapses the predicted emissions onto the target emissions by moving backward in time. It provided a break down over

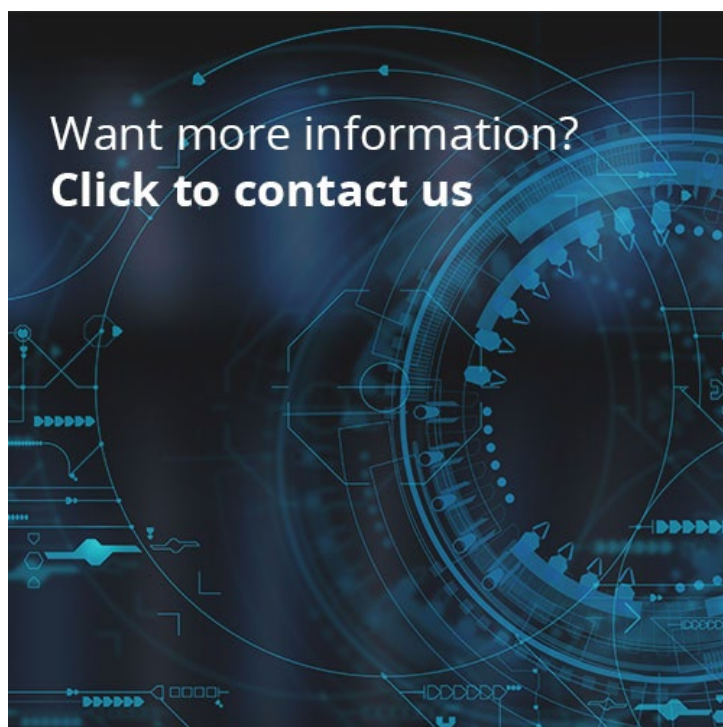


time with different products in the recommended portfolio and the share of emissions that are accounted for by each product category.

This custom optimization tool helps Mosaic's energy customer to enable the exploration of a wider variety of portfolio options and helping more customers reduce their carbon footprints. It improves the accuracy of calculations and boosts the firm's commitment to helping its customers do their part to combat climate change. Custom analytics solutions like the one developed in this case study can not only assist utility operators in being upstanding corporate citizens but can also boost their customers' brand equity while driving to meet lofty reduction goals.



The visual shows a before and after depiction of a customer's annual forecasted GHG emissions (orange line) and yearly GHG targets.





ABOUT MOSAIC DATA SCIENCE

We provide innovative machine learning, AI and analytics consulting across organizations.

Mosaic is a leading data science consulting company focused on helping organizations build and deploy actionable analytics solutions. Our customers are as varied as the techniques we use — some just starting their first predictive analytics project; others with deep in-house machine learning expertise.

HOW WE WORK WITH YOU

We work in a highly collaborative partnership with our customers to ensure you get only the best results to consistently drive business value.



MACHINE LEARNING

We design and deploy predictive algorithms to solve the most challenging problems facing businesses today



ARTIFICIAL INTELLIGENCE

We bring a wealth of knowledge on how to tune AI models to deliver the maximum business value



BUSINESS ANALYTICS

We leverage technical expertise and experience across a swath of industries, bringing fresh approaches to challenging problems



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