HOUSING MARKET FORECASTS

ACCURATE FORECASTS COMBINING MACHINE LEARNING WITH EXPERT MODELS

CASE STUDY

Elder Research worked with a housing manufacturer to build fast and accurate forecasts of housing-related economic indicators. These forecasts combined machine-learning methods with expert models to produce high-quality predictions that outperformed benchmark methods under rigorous testing. The models were also designed for interpretability, empowering business users to understand what data are used and how to make specific predictions.

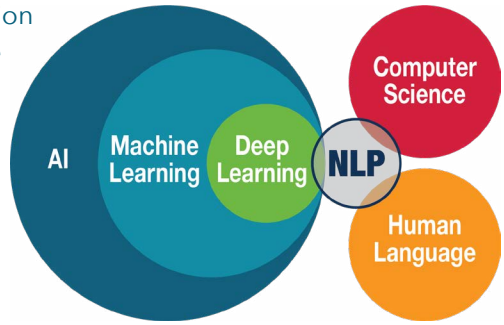
THE CHALLENGE

Because this client operates in the housing industry, their business is closely tied to the housing market. Their planning and projections depend on accurate housing-activity forecasts reaching years into the future. Historically, these projections have been compiled from several sources including paid market analysis, simple market models, and a strong understanding of the market and the client's position within it.

Recognizing the potential in bringing machine learning (ML) to bear on this problem, the client tasked Elder Research with building a new collection of market forecasts.

The goal: profitably using the wide range of data available to the client, both public and private, to produce more accurate predictions than have been possible historically.

The client also asked Elder Research to explore applications of natural language processing (NLP) to their collection of document-based data sources. This would programmatically extract relevant information otherwise locked inside these documents and relieve the client's team of tedious manual efforts.



INDUSTRY

Housing Industry

BUSINESS NEED

Accurate and understandable forecasts of key housing-related economic indicators over several time horizons, ranging from the near term to more than a year in the future

Natural-language-powered processing and extraction from collections of complex documents

SOLUTION

Developed a collection of housing market forecasts that match or outperform existing forecasts by combining machine learning methods with expert-driven models

Extracted key statistics from client-provided documents via programmatic and NLP methods

BENEFIT

Fast and accurate forecasting models that meet or exceed the accuracy of paid subscription models

Model designs that will allow business users to understand and work with the models, incorporating them into their workflow and analysis

OFFICE LOCATIONS
Charlottesville, VA | Baltimore, MD
Raleigh, NC | Washington, DC

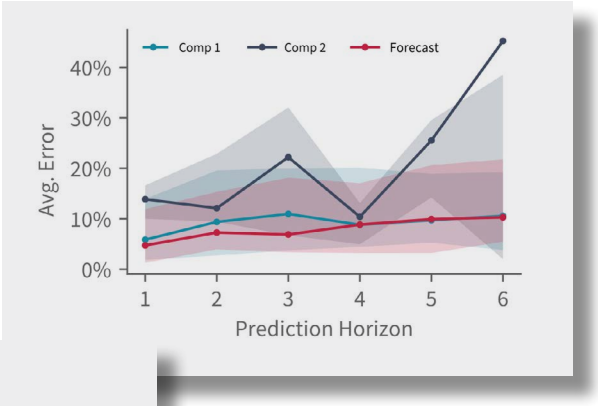
elderresearch.com
contact@elderresearch.com
434.973.7673

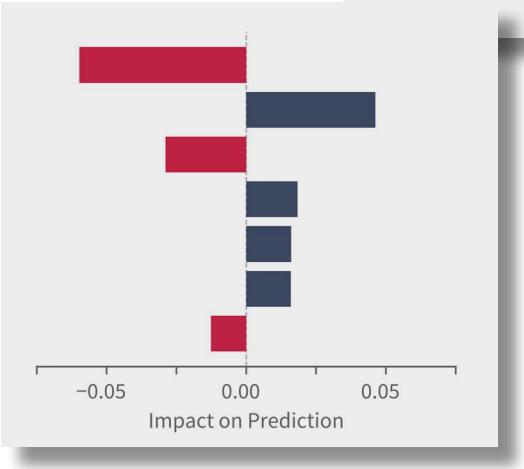
ELDER RESEARCH
DATA SCIENCE · AI · MACHINE LEARNING

THE SOLUTION

Elder Research developed a suite of housing-related forecast models, applying our expertise to optimize accuracy, minimize variability, and rigorously test our methodology. To optimize accuracy, we combined tried-and-true subject-matter expertise—simple models based on economically sound understanding—with wide-ranging and flexible ML models capable of synthesizing thousands of inputs to make decisions.

To reduced variability, we combined multiple high-performing models into model ensembles, allowing our forecasts to combine different perspectives for a given task. And, as always, we deployed a rigorous model-testing strategy to measure how our modeling framework would have performed had it been developed in previous years. This work was then collected in a Python package, making it possible to deploy the framework and attach a user interface.





Top chart: Elder Research Forecast matches or outperforms competitive forecasts at all prediction horizons.

Bottom Chart: Explainable results show which features had the greatest impact on prediction

Elder Research also leveraged NLP and programmatic text processing to identify and extract key information from several of the client's document-based sources. This extraction pipeline made it possible to compare our model predictions—and past performance under our testing strategy—to actual expert performance. This pipeline can also serve as a baseline for future NLP efforts.

RESULTS

Elder Research's ensemble market models matched or outperformed the forecasts contained in the client's paid subscriptions over more than a decade of testing. This demonstrated the effectiveness of combining machine learning and expert approaches.

Our forecasting models were also designed with interpretability in mind, providing insight into how their various inputs are used and empowering business users to understand why models make specific future predictions. This transparency allows users, for example, to understand how our models' views into the market change as they are asked to predict further into the future.

ABOUT ELDER RESEARCH

Elder Research is a recognized leader in the science, practice, and technology of advanced analytics. We have helped government agencies and Fortune Global 500® companies solve real-world problems across diverse industries. Our areas of expertise include data science, text mining, data visualization, scientific software engineering, and technical teaching. With experience in diverse projects and algorithms, advanced validation techniques, and innovative model combination methods (ensembles), Elder Research can maximize project success to ensure a continued return on analytics investment.

OFFICE LOCATIONS
Charlottesville, VA | Baltimore, MD
Raleigh, NC | Washington, DC

elderresearch.com
contact@elderresearch.com
434.973.7673

ELDER RESEARCH
DATA SCIENCE · AI · MACHINE LEARNING