Leveraging AI & ML in Automotive Industry
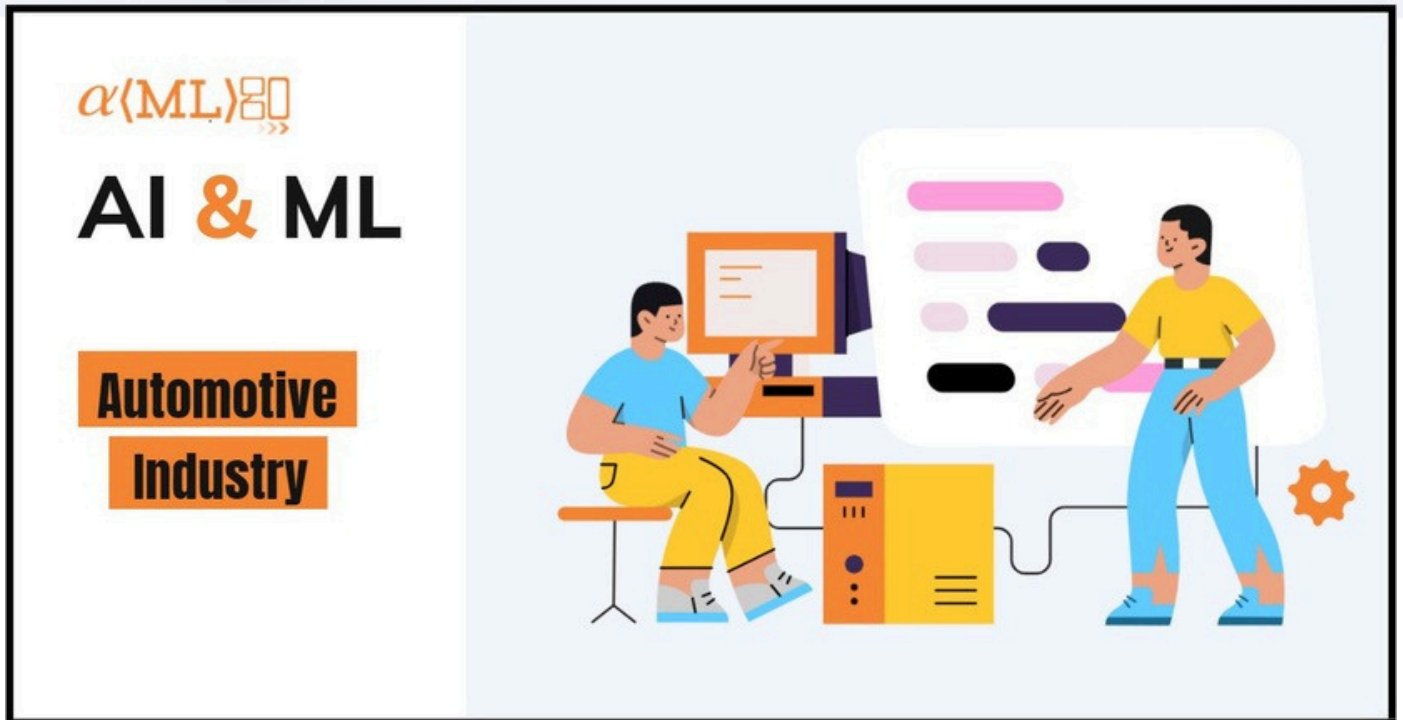

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Case-Study, Deep Learning, Language Processing

The automotive industry has become a $2.9 trillion global market in 2022 and is predicted to grow by more than 6% annually through 2028. The reason for this growth is simple: people are buying more and more cars. There are over 1.46 billion vehicles on the road in 2022, and that number will continue to grow.

From a technology perspective, this means that new software development is required to address the needs of an increasingly connected world and the need for more capable and reliable vehicles across the board.

At *Amlgo Labs*, we've focused on developing artificial intelligence and machine learning software to help automotive companies improve their performance and create better consumer products.

We've had great success in helping one of the biggest car manufacturers in India to automate and simplify their business processes so that they can make smarter decisions and develop better products than ever before. In one of our recent projects, we used NLP to create a real-time tracking system that could continuously monitor blogs and other social media platforms to identify customers and their issues.

The system has highlighted the critical areas of focus based on volume and ratings or comments from consumers to reduce the time and resources spent on various platforms.

The automatic tracking resulted in significant improvements in productivity by allowing the client to focus on tasks that require human intervention, which improved the client's efficiency and reduced operating costs. The client was able to identify and fix gaps in their service offering and product development much earlier than before.

Our end-to-end approach also helped the client to identify unforeseen areas that required further improvement to ensure optimized consumer satisfaction on all levels of the business.

"Every Voice Counts" Natural Language Processing Made It Possible

In the past, gauging customer satisfaction was a big challenge for car manufacturers as they couldn't gauge the magnitude of sentiment from the data collected across various social media platforms such as Facebook, Twitter, and Instagram. This data didn't provide the entire picture as it was too general and didn't account for the sentiments communicated through platforms, Leading to an inability of car manufacturers to identify the different problems experienced by their customers, which delayed the development of an effective solution.

With the implementation of NLP, these issues can now be resolved in real-time as the system keeps a close eye on all customers' communications and categorizes them into relevant categories so that the manufacturer can take action quickly.

> *When it comes to Solutions, Expertise Matters!*

Here Comes Amlgo Labs

Natural Language Processing (NLP) is a field of computer science that deals with recognizing, understanding, and processing natural language. Implementing NLP enables a better understanding between the manufacturers and the customers by converting human input into a format easily understood and processed by a machine.

This is done by breaking down the language into its components, which can then be analyzed and processed. For instance, say a customer complains about the temperature of a car's air conditioner, with a normal customer service approach, the car company would question the customer further regarding the type of issue to determine the problem and develop a solution accordingly.

The manual collection of feedback is challenging and demands significant time to get meaningful insights. However, with NLP, manufacturers can instantly identify the problem without talking to the customer and develop suitable, fast & efficient solutions. This requires a large amount of data to be analyzed within a short period to ensure the solutions & reach the customers promptly.

Real-time analysis is a requirement of NLP implementation in the automotive industry because of its ability to detect even the slightest changes in customer attitudes. This ability to analyze and resolve issues in comparatively less time Also gives manufacturers a competitive edge against their customers who are not using such technologies.

Challenges

- **Collection of Data** – There is a lot of data available on social media where customers talk about an automotive company and their products and services. Data should be collected from various sources and compiled into structured files before being interpreted and analyzed.
- **Interpretation of Data** – due to the ambiguous nature of data, the same information can be interpreted and analyzed in multiple ways depending on the context & meaning. For example, a user writing "the car engine won't start" does not mean the vehicle is having problems with it, but rather, It could have trouble with another component like the ignition system. Linguistic cues like – emotions and sentiments became mandatory for proper text interpretation.

- **Unstructured and Noisy Data –** Often, Information on social media is present in unstructured formats (the data is not labeled). Thus, making the task of classifying customer concerns into relevant categories is very challenging.

In some instances, the data is too noisy and contains irrelevant information whereas, in most cases, the data is free-form text with no proper semantic meaning and lots of spelling mistakes. Some users even use emojis in their posts, which makes them hard to categorize and understand.

What Have We Done?

AmIgo Labs with its world-class expertise has used a mixture of heuristic methods and deep learning to solve the above problem. When a customer writes something on social media about a product, we first analyze it to see if the social media text matches any pre-defined patterns in our database.

For example, if a customer has complained about his car's AC, then we will check if the customer has used the words "cool" or "cold" in their post. If the system detects these words in a customer post, it will mark the post as a problem and automatically add it to the workflow.

Next, the system will run linguistic algorithms on the content of the post to figure out what exactly the problem is and categorize them accordingly (as per some pre-defined classes in the database).

Assume we have a social media text 'A', And we want to predict its semantic similarity score w.r.t to some known entities (target classes). For this, we required a proper understanding of concepts like word2vec, embeddings, cosine distance, etc.

We used a combination of models to obtain sentence embeddings and computed the most similar class entity for the text using **cosine** similarity. The most similar class is the predicted class. As the problem we are solving is unsupervised and there is no straightforward way to measure the accuracy of the results, the quality of the sentence embeddings becomes very important to obtain a reliable result. Most of the research time was spent figuring out how to find dependable sentence embeddings.

Technologies We Rely On

Amazon Web Services (AWS) is one of the leading providers of cloud services, and we use it to power our analytics, machine learning (ML), and artificial intelligence (AI) solutions.

We leverage AWS Sage maker to build, train, test, and deploy machine learning models in our cloud environment. AWS Glue helps to run our ETL jobs & AWS Redshift enables data warehousing without worry about scalability, setting up, and maintenance costs.

At Amlgo Labs , we thrive on innovative concepts and solutions by utilizing cutting-edge technologies, to give an extra edge to business outcomes and help to visualize and execute effective decision strategies.