Busbud Upgrades Machine Learning Model to Overcome API Limitations

Busbud leveraged Pythian's machine learning expertise to upgrade their model, increasing prediction accuracy and enhancing the customer experience.

Busbud, a global online platform, is renowned for its specialization in intercity bus tickets. It covers various geographical locations—including North America, South America, Europe, Africa, and Southeast Asia—to connect customers to hundreds of suppliers for real-time schedule information.

The Challenge

Busbud's platform links hundreds of intercity transportation suppliers to provide real-time schedule information. This allows customers to search and book ground transportation tickets with ease. However, traffic increases led to a significant challenge: some suppliers' application programming interfaces (APIs) couldn't handle the volume of requests, while others had built-in rate limits or very slow APIs.

To resolve this, Busbud created a caching layer to reduce latency and enhance scalability with the tradeoff of shifting from real-time to near-real-time price and seat availability. Busbud compared sampled real-time information to the near-real-time information it had previously collected to determine an accuracy error rate. It sought to minimize the accuracy error rate using a rule-based scoring system and began testing a machine learning (ML) model in production against this system.

However, the early ML model predictor was limited and restricted to a single supplier. Busbud wanted to upgrade the existing ML model using more advanced techniques, but sought general ML techniques and best practices, neural network architecture expertise, and TensorFlow expertise.

Industry

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Location(s)

Montreal, Quebec, Canada

Technologies

- Google Cloud
- TensorFlow
- NodeJS

Overview

Busbud, an international online platform, specializes in providing intercity bus tickets across continents. Pythian, recognized for its exceptional expertise in neural networks and data science, was engaged as a partner to Busbud, a relationship initiated by Google Cloud.

Busbud created a caching layer to reduce latency and enhance scalability with the tradeoff of shifting from real-time to near-real-time price and seat availability.

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The Solution:

Early in the process, Pythian recognized Busbud's need for a more advanced ML model and data platform. After the workshop, it proposed and implemented an Enterprise Data Platform (EDP) QuickStart solution to build a more robust data architecture. Pythian's machine learning consulting followed the engagement, leveraging the insights from the initial machine learning workshop to understand Busbud's needs better. Our team of experts quickly transitioned into consulting mode, providing the expertise and support Busbud required.

The team began by kicking off the project alongside Busbud, using an agile approach to identify solutions to the following challenges:

- Identify gaps in the current model so that it can be upgraded to a more modernized TensorFlow ML model

- Implement ML model on the existing code to comply with performance constraints

- Exclude seasonal components from historical data (holiday season, pandemic)

- More effectively incorporate categorical data

- Provide near real-time data to the user

Our experts re-evaluated Busbud's machine learning model to refine their past work and implement improvements to the model's architecture. The team created a cohesive train/validate/test split on the data to use the same training set for all models while comparing two split methods (random and date-based).

After re-running the random forest and initial deep neural network (DNN) models, the Pythian team examined train performance vs. validation performance as a baseline. The iterative process involved changing neural network architecture and adding additional features, with performance comparisons made to the baseline.

Apart from technical implementation, the team also provided machine learning knowledge transfer as needed. This equipped Busbud's team with insights into our technical recommendations, further enabling Busbud in the performance optimization tasks.

Through this comprehensive process, Pythian helped Busbud upgrade their ML model predictor using more advanced techniques.
The improvements increased accuracy and performance, enhancing Busbud's service offering to their customers.

Business need:

With increasing traffic, Busbud faced the challenge of handling large volumes of requests through their supplier's APIs. This led to latency issues and risked impacting supplier API availability. Busbud needed to upgrade their initial machine learning (ML) model predictor to handle these challenges more efficiently.

Solution/What Pythian did:

Prior to this engagement, Pythian proposed a solution combining an ML workshop and Enterprise Data Platform (EDP) QuickStart implementation. Next, with a comprehensive understanding of Busbud's needs, our experts provided artificial intelligence (AI) and ML consulting services to reevaluate and improve the existing ML model, attend live coding sessions, and conduct knowledge transfer to empower Busbud's team.

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Key Results:

Our partnership with Busbud improved model performance and increased cache usage accuracy, directly translating to improved conversion rates and revenues. The teams collaborated on ML model development, training, and evaluation through an iterative agile process.

The enhancements to the model architecture led to increased accuracy in predicting changes in price and seat availability, thereby improving consistency in the service offering and enhancing customer experience by providing more reliable real-time schedule information.

Furthermore, equipping Busbud with knowledge of machine learning gave Busbud's technical team valuable insights and skills. This meant the teams could better optimize future tasks and enhance their internal capabilities for future projects. Our solution ultimately provided Busbud with an upgraded ML model predictor using more advanced techniques better suited to the company's business needs and objectives.

Business Outcomes

By leveraging Pythian's expertise, Busbud successfully upgraded their ML model predictor using more advanced techniques. The enhancements to the model architecture led to increased accuracy and performance, enriching Busbud's service offering to their customers. Moreover, Busbud's technical team members gained insights from Pythian's experts, enhancing their internal capabilities for future projects.

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Result/Key outcomes

The partnership with Pythian improved model performance and increased accuracy in predicting price and seat availability changes. This enhanced Busbud's service offering and customer experience. Moreover, the knowledge transfer empowered Busbud's technical team for future projects, ultimately providing its members with a more advanced ML model predictor that better met their business needs and objectives.

About Pythian

Founded in 1997, Pythian is a data and analytics services company that helps organizations transform how they compete and win by helping them turn data into valuable insights, predictions, and products. From cloud automation to machine learning, Pythian designs, implements, and supports customized solutions to the toughest data challenges.

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