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Smart Tourism: Executive Summary

Our team chose to work on our own project instead of collaborating with one of the companies presented to us. The goal was to create a minimal viable product (MVP) that relies on AI/ML techniques to provide a given service and that, at least in theory, has a Product/Market Fit with the potential to satisfy a demand by certain customer groups. Besides these business considerations, the output should include an end-to-end process covering the whole MLOps pipeline:

1) Data Sources/Ingestion; 2) Data Validation & Storage; 3) Data Processing & Model Training/Tuning; 4) Serving Results; 5) Model Evaluation & Feedback Loop.

Given this context, we faced multiple challenges that other groups with already established problems, set goals, and existing datasets did not have to deal with, which allowed us to deepen our understanding of the material covered in the MBD in a holistic way.

For our project we chose to work on a smart travel application that helps users to discover new places, find the best way around a city, quickly plan their itinerary and even automatically book reservations and secure discounts for the locations they want to visit, in a personalised way by leveraging recommendation algorithms. Having established this product vision, we set out to determine what the best way was to create an MVP that satisfied the above mentioned end-to-end MLOPs pipeline and that allowed us to overcome the challenges of starting without any data, which is detrimental to training our ML algorithms.[1]

Every new recommender system faces this cold-start problem: a situation where there is little to no data available to generate relevant recommendations. We deal with this by: 1) collecting data and feature engineering a dataset about available locations; 2) collecting user

[1] Please find our code-base under the following link: https://github.com/Hupperich-Manuel/Smart_Tourism

data and preferences; 3) using a baseline recommender in beta testing to receive direct user feedback; 4) use feedback to run more experiments, iterate and improve our product.

This means we need a robust data pipeline and an MVP that can provide us with these functionalities. We developed and deployed a fully-functioning Web Application to achieve this. We had following requirements: a user-friendly interface, a solid backend and a cost-efficient development and deployment. We set up our backend ensuring a smooth and continuous information flow with data being stored in a database (PostgreSQL). In terms of cost-efficiency, the whole development and deployment had zero cost using Heroku cloud provider. Moreover, promotion of this data gathering MVP was done through social media networks to maximise exposure.

For the recommendations algorithm, we used the preferences given by users and a dataset including features about the locations to predict the satisfaction score (target variable). By applying different algorithms, we narrowed it down to Gradient Boosting, SVM, KNN and Random Forest as the best models and combined them into an ensemble model. In order to further improve, we researched matrix factorization methods, given that the data we collected was sparse and lacking feedback on all available locations. Matrix factorization is known to work well when having a large sparsity in the dataset as well as being highly scalable and not requiring minimal storage. Results showed that this method yielded more diverse and better recommendations. We went further by applying an ALS matrix factorization approach based on collaborative filtering - with an average user happiness of 4.1 out of 5 this approach performed the best, 0.30 points over the baseline content-based recommender.

By expanding our user base and the number of locations available, we will further improve our models' performance and provide a better experience to customers. The goal: Become the Netflix of tourism - chasing the perfect day at your travel destination!