

ACCOR TRAVEL PLANNER

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ABSTRACT

With recent developments in artificial intelligence and machine learning, numerous changes are occurring across various sectors worldwide. As a prominent actor in the travel and hospitality sector, ACCOR is also on the verge of adapting to these new technologies. The purpose of this report is to present the latest collaboration between ESSEC Business School-CentraleSupélec students and ACCOR team to create an application that uses Large Language Models (LLMs) and Streamlit to provide personalized recommendations and custom itinerary. This application is called Travel Planner (TP). In this report there will be sections describing the project's motivation, problem definition, related works, methodology, evaluation, business recommendations, and conclusion.

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1 INTRODUCTION

In today's fast-paced digital era, the travel and hospitality industry is constantly evolving to meet the dynamic needs of travelers. Accor, a global leader in hospitality, seeks to

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enhance its customer experience by leveraging cutting-edge technologies. In this report, there will be a presentation of the developed travel planner which was designed mainly using Streamlit framework of Python.

The primary objective throughout this journey was to obtain a final model that is capable of simplifying the trip planning of millions of ACCOR's clients. The idea was that by using the various inputs from the client, the travel planner would be able to customize an ideal itinerary that involves various accommodation options that ACCOR can offer.

LLMs have been playing a key role in various sectors at the moment to enhance client experience and increase efficiency within numerous sectors and corporations. There is a solid chance in hospitality sector as well to successfully implement this technology to enable more personalized experience for the clients. Travel Planner at ACCOR aims to have various inputs from the client including one's budget, duration of stay and destinations to create a customized itinerary.

This report details the motivation behind this project, the problem it aims to solve, related work in the field, the methodology adopted for development, evaluation of the application's performance, and business recommendations for its deployment within ACCOR. Particular emphasis is placed on the value created for ACCOR through this solution, highlighting its importance, potential benefits, and practical application within the company.

2 MOTIVATION

In this project the main motivation was to meet the client's demand by offering more personalized experience and customized recommendations. Currently, an ever increasing number of clients demand more streamlined processes and

services directly aiming at them in various sectors. By leveraging the latest, Artificial Intelligence (AI) technologies, ACCOR aims to differentiate itself from its competitors. Besides, it is highly important for the company to boost its customer satisfaction and operational efficiency to consolidate its market position.

Another advantage of TP is the expected overall increase in customer loyalty and engagement. The user-friendliness of travel planner is expected to increase the overall metrics regarding in these fields for ACCOR. Furthermore, TP can be a valuable asset in terms of providing more accurate pricing and availability information for the various clients. As a result both the revenue and resource allocation within ACCOR would augment significantly.

3 PROBLEM DEFINITION

The main problem for this project arises from the fact that in today's world, a client needs to manage various websites in order to finalize his/her travel planning process. This process is usually complex and inefficient as there are various parameters to handle at the same time. Clients struggle often with comparing numerous options and creating an optimized itinerary for their voyage. Through the usage of TP within ACCOR, we focused on simplifying this process and ameliorating the overall experience of the clients.

Another issue for the clients is lack of personalization offered by already existing solutions. The current alternatives are capable of only creating generic recommendations which do not always match the individual need of a client. Besides, the current process involves a lot of manual effort to fill various forms and to personally evaluate each possible option. Consequently, the mental energy required for all these steps, discourage a good portion of people to avoid planning their ideal itinerary.

4 RELATED WORK

When we examine the literature it is possible to see various works that have focused on the potential of using LLMs for improving the service quality in travel and hospitality industry. These works have cited numerous potential advantages of applying LLMs including enhancement in customer service, strategies for pricing and operational efficiency. However, there hasn't been a recent case where a major company within the industry has decided to launch such an application to the global its global clients.

4.1 LLMs and their Planning Capabilities

Various researches have concentrated on the abilities of LLMs to plan certain tasks by themselves. There have been incidences that demonstrated the potential of them including AutoGPT, BabyAGI, and HuggingGPT. These are proven to be capable of decomposing complicated tasks into simpler ones and utilize necessary tools to gather important information (Su, 2023; Sumers et al., 2023; Xie et al., 2023). These works demonstrated the potential of using LLMs for creating a TP that aligns with the purpose of our project with ACCOR.

In the previous studies LLMs like GPT-4 has show certain success however, there were also certain limitations because of their lack-of ability to handle multi-constraint planning tasks. This situation has been crucial for our understanding and implementation for our application. (Wei et al., 2022; Yao et al., 2022; Lewkowycz et al., 2022).

4.2 Travel Planning Systems and their Personalization

The traditional travel recommendation systems (TRSSs) are good in terms of including popular destinations and routes in their suggestions. On the other hand they usually fail to create a more comprehensive plan that catches individual preferences of a user. Recent advancements in the field aim to enable more personalized recommendations. Ge, Y., et al. (2023) suggests a multi-contextual deep learning approach that can more effectively personalize recommendations for a travel and consider several user contexts at once to optimize the suggestions.

4.3 Integration of Tools and Data

It is highly crucial to successfully integrate certain datasets and tools, so that the TP can create an holistic itinerary for the client. Comprehensive information collection can be obtained by using several tools containing CitySearch, FlightSearch, and AccommodationSearch (Nakano et al., 2021; Lu et al., 2023; Ge et al., 2023). These tools provide the necessary information for planning. Similarly in our project we have used Google Maps API and ACCOR API to collect data related to transportation, hotel availability, and hotel prices. As a result the relevance and accuracy of TP was improved.

4.4 Usage of Memory and Tools with LLMs

A vital part of this project is to successfully create an harmony between the memory, used tools and the prompt by

the LLMs. Certain techniques including memory summarizing and retrieval enhances the management and utilisation of extensive information available (Chen et al., 2023; Zhou et al., 2023; Liang et al., 2023). Through the usage of similar methods in our TP, the LLM can comprehend better the client's inputs and preferences. In other words, a better refined itinerary and suggestions would be created.

4.5 The Difficulties in Complex Planning

There have been several observed common failure modes during the creation of AI integrated Travel Planners. These errors include argument errors in tool use, getting trapped in dead loops, and hallucinations (Yao et al., 2022; Shinn et al., 2023). We need a deep grasp of these possible errors to effectively employ LLM in to our TP. Otherwise, we can encounter a lot of complexities while implementing travel planning strategies in our application.

Understanding these works and gaining the insights was a vital part of our project as we aimed to leverage the capacity of LLMs to their fullest. As a result, we were able to create a TP that is capable of creating personalized itinerary recommendations for ACCOR clients. In other words we tried to minimize the adverse impact of limitations in the field and focused on a user friendly experience for the clients.

5 METHODOLOGY

For this project we aimed to successfully implement the LLMs with Streamlit framework so than we can obtain an application that best responds to what clients are looking for. There were several steps when developing the TP for ACCOR. These steps were collection of data and preprocessing, model integration, design of the interface, itinerary generation and integration of the system. In this section we are going to talk about each step along the way in further detail and present an overall summary of each phase.

5.1 Collection of Data and Preprocessing

The TP needed the necessary data so that it can serve for its main purpose. For this reason, we concentrated on finding the required sources for this project. The following were the primary sources that were utilized throughout the project:

- **Accor API:** The main reason for using this API was to access the hotel availability and price information within the ACCOR Group.

- **Google Maps API:** This API was integrated in order to obtain geolocation data, travel route calculation, as well as information regarding point of interests and attractions.
- **Hotel Data:** This dataset included vital information regarding ratings, reviews and descriptions of the hotels.

The data we obtained from these APIs and ACCOR team was already clean and ready to use. As a consequence, we mainly concentrated our efforts on better integrating them in TP. For example for the Hotel Data pandas library was utilized in order to manage data. The code snippet below show this usage:

```
hotel_data = pd.read_parquet('
    hotel_data_with_room_data.parquet', engine='
    pyarrow')
```

5.2 Model Integration

The itinerary creation was done using pre-trained LLMs through ChatBedrock. For this reason, we were able to have an access to powerful models including Claude 3. This model was used to handle travel-specific queries.

The initiation process for the Claude 3 is shared in the following:

```
1 import boto3
2 from langchain_aws import ChatBedrock
3
4 # Initialize a boto3 session with AWS
5 # credentials
6 session = boto3.Session(
7     aws_access_key_id='our_access_key',
8     aws_secret_access_key='our_secret_key',
9     region_name="us-east-1"
10 )
11
12 # Create a bedrock runtime client
13 bedrock_runtime = session.client(
14     service_name="bedrock-runtime"
15 )
16
17 # Initialize the ChatBedrock model
18 llm = ChatBedrock(
19     client=bedrock_runtime,
20     model_id="anthropic.claude-3-haiku-20240307-
21     v1:0",
22     model_kwargs={
23         "max_tokens": 2000,
24         "temperature": 0.1,
25         "top_k": 1,
26     },
27 )
```

5.3 Interface Design

For the interface design, we used mainly the Streamlit framework. Streamlit can offer an interactive and visually appealing experience to the clients. The interface included a 'User Form' for user inputs. Dynamic elements like a map and travel routes were included in the 'Itinerary' section of the TP.

The following code is an example usage of Streamlit to create the Interface of the TP:

```
1 import streamlit as st
2
3 st.title('Accor Travel Planner')
4 st.sidebar.image(logo_url, use_column_width=True)
5
6 # Form for user inputs
7 with st.form("user_form"):
8     start_date = st.date_input("Start Date")
9     end_date = st.date_input("End Date")
10    # Additional form inputs...
11    submitted = st.form_submit_button("Submit")
```

5.4 Itinerary Generation

Itinerary was generated using the inputs from the user. User fills out the 'User Form' and the ChatBedrock creates tailored recommendations for the user considering all the different criteria that the user shared. The recommendations of the TP include hotels, attractions, and travel routes for the user.

The following code show how the itinerary was obtained using Bedrock:

```
1 from langchain_core.messages import HumanMessage
2
3 def generate_itinerary_llm(form_data):
4     city_list = ", ".join([stop['city'] for stop
5         in form_data['stops']])
6     prompt = f"""Generate a detailed travel
7         itinerary for a trip visiting the
8         following cities: {city_list}.
9         Trip Details:
10        - Travel Dates: From {form_data['start_date']
11            to {form_data['end_date']}
12        - Number of Travelers: {form_data['
13            number_of_adults']} adults and {
14            form_data['number_of_children']}
15            children
16        - Budget: {form_data['min_budget']} to {
17            form_data['max_budget']} (Total
18            Budget)
19        - Interests: {' , '.join(form_data['interests']
20            )}
21        - Preferred Transportation Mode: {form_data
22            ['transportation_mode']}
```

```
13 Provide details for each city including
14     hotel recommendations, key attractions,
15     and travel details."""
16
17 messages = [HumanMessage(content=prompt)]
18 response = llm.invoke(messages)
19 return response.content, routes,
20     travel_times, travel_distances
```

5.5 System Integration

Various different systems were integrated for the Travel Planner. These efforts were mainly concentrated on the implementation of Google Maps and ACCOR APIs within the TP so that everything functions together effectively. In order to correctly handle errors, we added error-handling measures. In consequence API failures or invalid user inputs were foreseen.

The following code demonstrates how Google Maps was integrated to TP:

```
1 import googlemaps
2 from datetime import datetime
3
4 # Initialize Google Maps client
5 gmaps = googlemaps.Client(key='
6     our_google_api_key')
7
8 @st.cache_data
9 def get_route_details(start_location,
10     end_location, mode):
11     now = datetime.now()
12     directions_result = gmaps.directions(
13         start_location,
14         end_location,
15         mode=mode,
16         departure_time=now)
17     ...
18     return distance, duration, instructions,
19         polyline
```

5.6 Feedback Section

A feedback section was added to TP so that certain amount of feedback can be collected from clients. These section will allow the evaluation of the performance of the TP. Certain metrics will show the overall satisfaction among the clients. Lastly, it is important to see TP's shortcomings and improve these limitations after launch.

The following code is for gathering user feedback:

```
1 feedback = st.text_area("Please provide your
2     feedback here")
3 if st.button("Submit Feedback"):
4     st.session_state['feedback'] = feedback
5     st.success("Thank you for your feedback!")
```

6 EVALUATION

The main evaluation of the TP occurred from using the reviews and feedback from the ACCOR team. In this section we will focus on how the modifications were implemented on the TP based on criticism and suggestions from the ACCOR Team. Every wednesday between January 2024 and May 2024 there was a recurring meeting to discuss how to improve the functionality of TP. The majority of these meetings were conducted on Microsoft Teams.

6.1 Feedback from ACCOR Team

The Team members of ACCOR are highly experience professionals who had already been working in the travel and hospitality industry for years. They determined certain criteria to enhance the usability and functionality of TP. The following were the main criteria that the TP was evaluated on:

- **User Interface:** How easy it is to use and visual appeal
- **Functionality:** How accurate and relevant the generated itineraries are.
- **Performance:** The overall speed and constancy of TP.
- **Integration:** TP's ability to integrate effectively with already existing ACCOR systems.
- **Overall Satisfaction:** Overall contentment while using the application.

In order to demonstrate how the 'User Form' section of the TP evolved to its last form after considering all feedback, Figure 1 is placed below to illustrate :

The goal for the TP was to create an intuitive and user-friendly model. The following elements are included in the 'User Form'

- **Date Selection:** This section enables users to select start and end date of their trips.
- **Stop Management:** Users can determine the city, country and duration of each stop they envision for their holiday.
- **Traveler Information:** Users can share the total number of adults and children during the holiday.
- **Budget and Rating:** This section allows users to select their budget and the rating of the hotels that they search.

Figure 1: Screenshot of the User Form in Accor Travel Planner

- **Interest Selection:** Users can choose their interests from a dropdown menu, besides it is possible to add any not listed interests.
- **Transportation Preference:** This section allows users to choose a transportation method, including by car, train or plane.
- **Additional Notes:** Any other notes that the client has can be shared in this section.
- **Submit Button:** This button allows the user to finalize the process by sending a filled out form.

Similarly, the 'Itinerary' page was developed as a collaborated effort. It mainly focused on prompt engineering techniques and iterative feedback from the ACCOR team. As a

result, the application was ensured to meet the specific needs and expectations of the stakeholders.

The generated Itinerary in the end includes information regarding hotels, key attractions, and travel details. Each hotel recommendation includes a rating, URL, price per night, and a brief description. The details including travel routes, travel duration and distance are also included in this section of TP.

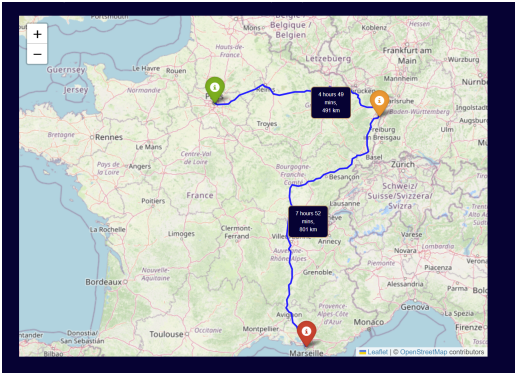


Figure 2: Travel Details and Map Integration in the Itinerary

The structure of the Itinerary page has evolved considering the critics in the weekly meetings.

6.2 Limitations

Although the TP demonstrates what the travel planning experience will be like with the AI-driven solutions, it also has its set of constraints. One notable limitation is the current capability of LLMs to include very specific interests, such as nightclubs or niche activities. The model can perform well with broad categories of interests, but it may find challenges in very specific or less common preferences. Future work can focus on the pursuit of further granularity of interest-based recommendations so that a wide variety of heterogeneously unique user preferences find efficient support.

7 BUSINESS RECOMMENDATIONS

Based on the evaluation of the TP, the following business recommendations are agreed with the ACCOR Team. The main purpose of these recommendations is to maximize the effectiveness of TP and ensure that ACCOR reaches its business goals. The following Business and Product KPIs will be followed carefully in order to evaluate TP after its launch.

7.1 Business KPIs

7.1.1 Increase Total Conversion Rate.

- Number of Travelers: 1 adult and 0 children
- Budget: 100€ to 3000€ (Total Budget)
- Interests: Beaches, Adventure Sports, Historical Sites
- Preferred Transportation Mode: Car

City: PARIS (Stay for 1 day)

Hotel Recommendations:

1. HOTEL MERCURE PARIS 15 PORTE DE VERSAILLES
 - Rating: 4.0
 - URL: <https://all.accor.com/hotel/0903/index.en.shtml>
 - Price per night: 14.70€
 - Brief description: This modern hotel is located near the Porte de Versailles exhibition center and offers easy access to the city's attractions.
2. SOFITEL LE SCRIBE PARIS OPÉRA
 - Rating: 4.5
 - URL: <https://all.accor.com/hotel/0663/index.en.shtml>
 - Price per night: 324.00€
 - Brief description: This luxurious hotel is situated in a historic building near the Opéra Garnier and offers elegant accommodations and amenities.
3. PULLMAN PARIS EIFFEL TOWER
 - Rating: 4.0
 - URL: <https://all.accor.com/hotel/7229/index.en.shtml>
 - Price per night: 142.89€
 - Brief description: This modern hotel offers stunning views of the Eiffel Tower and is located within walking distance of many of Paris's iconic landmarks.

Key Attractions:

1. Eiffel Tower: One of the most iconic landmarks in the world, the Eiffel Tower offers breathtaking views of the city.
2. Louvre Museum: Home to some of the world's most famous works of art, including the Mona Lisa and the Venus de Milo.
3. Notre-Dame Cathedral: A stunning example of Gothic architecture, this cathedral is a must-see for any visitor to Paris.

Figure 3: Generated Itinerary for Paris with Hotel Recommendations and Key Attractions

- **Objective:** Have an overall increase in the conversion rate by a certain percentage(e.g., +X%) compared to the one without TP.
- **Strategy:** The objective of TP is to convince clients who would otherwise use various websites to finalize their reservations through ACCOR; The coprehensive and seamless nature of TP is a major reason for people to choose it rather than the alternatives.
- **Expected Outcome:** Boosted conversion rates as more people are determined to take advantage of TP.

7.1.2 Increase Number of Conversions Per Guest.

- **Objective:** To increase the average number of bookings per guest by a certain percentage (e.g., +X%) compared to the baseline.
- **Strategy:** By offering a well-planned itinerary that includes multiple stops and accommodation options, the TP encourages guests to book several hotels at once. This comprehensive approach simplifies the

booking process and increases the likelihood of multiple bookings.

- **Expected Outcome:** A higher average basket value per guest, as they book multiple accommodations through the TP.

7.1.3 Long-term Goal: Increase Cross-sell.

- **Objective:** To increase cross-selling opportunities by a certain percentage (e.g., +X%) for restaurant and activity bookings via the all.com website and partners.
- **Strategy:** By recommending activities and dining options in the itinerary, the TP promotes additional bookings beyond accommodation. This integrated approach enhances the overall guest experience and drives cross-sell opportunities.
- **Expected Outcome:** Increased revenue from non-accommodation bookings, such as restaurants and activities.

7.2 Product KPIs

7.2.1 Usage of Planner / Exposed Guests.

- **Objective:** To measure the share of guests who use the TP compared to the total number of guests exposed to the offer.
- **Strategy:** Track the number of guests who access and use the TP out of those who are presented with the planning tool. This KPI helps assess the reach and engagement of the TP among potential users.
- **Expected Outcome:** A higher percentage of guests using the TP indicates effective engagement and interest in the product.

7.2.2 Share of Conversion from Planner.

- **Objective:** To measure the share of users who finalize their hotel reservations through the TP.
- **Strategy:** Track the number of guests who complete their bookings via the TP out of the total number of users who start the planning process. This KPI helps assess the effectiveness of the TP in driving conversions.
- **Expected Outcome:** A higher share of conversions from the TP indicates its efficiency and success in facilitating bookings.

7.3 Future Steps

- **Continuous Improvement:** Regularly keep the updating of LLMs with iterations in the prompts based on continuous user feedback to ensure both the correctness and relevancy of the recommendations.
- **Expand Features:** Add more features like real-time update functionalities, multi-language support, and integration of more third-party services to make the TP a functionality powerhouse..
- **Monitor and Analyze:** Continuously track the usage and performance of the TP against set KPIs and, through data-driven insights, increase its effectiveness.
- **Marketing and Outreach:** Focused marketing campaigns to make the penetration levels and adoption of the TP higher among Accor guests by communicating the distinctive benefits and ease of use.

8 CONCLUSION

In the current report, we developed and analyzed an innovative solution, Accor Travel Planner, to offer Accor customers a comfortable travel planning experience when using its services. We employed advanced modern technologies, namely: LLMs and Streamlit. With those, we developed a tool able to give out personalized travel recommendations, along with detailed itineraries accounting for the diversified needs and preferences of the contemporary traveler.

It testifies, in the final analysis, that with AI-driven solutions such that Accor's Travel Planner, there is a transformation of the travel planning experience. Continual improvement in product development and strategic implementation would unlock tremendous value for both Accor and guests.

REFERENCES

- [1] Bohao Li. EverywhereGPT: An AI Travel Planning Assistant Based on ChatGPT. In *The 4th International Conference on Artificial Intelligence and Computer Engineering (ICAICE 2023)*, November 17–19, 2023, Dalian, China. ACM, New York, NY, USA, 9 pages. <https://doi.org/10.1145/3652628.3652793>.
- [2] Jian Xie, Kai Zhang, Jiangjie Chen, Tinghui Zhu, Renze Lou, Yuan-dong Tian, Yanghua Xiao, and Yu Su. TravelPlanner: A Benchmark for Real-World Planning with Language Agents. Fudan University, The Ohio State University, The Pennsylvania State University, Meta AI. <https://osu-nlp-group.github.io/TravelPlanner>. *arXiv preprint arXiv:2402.01622*, 2023.
- [3] LangChain Documentation. LangChain: Model I/O. https://python.langchain.com/v0.1/docs/modules/model_io/.
- [4] LangChain Documentation. LangChain: Buffer Window Memory. https://python.langchain.com/docs/modules/memory/types/buffer_window.

- [5] LangChain Documentation. LangChain: Conversational Customization. https://python.langchain.com/docs/modules/memory/conversational_customization.
- [6] LangChain Documentation. LangChain: Tools. <https://python.langchain.com/docs/modules/agents/tools/>.
- [7] Kumar, S. python-dotenv: Read .env files into os.environ. <https://github.com/theskumar/python-dotenv>.
- [8] Tripadvisor. Tripadvisor says its AI itinerary users generate 3x revenues of average users. Skift. <https://skift.com/blog/tripadvisor-says-its-ai-itinerary-users-generate-3x-revenues-of-average-users/>.