## **Introduction.**

Revenue management involves employing information systems and pricing strategies to effectively assign appropriate capacity to customers, ensuring it aligns with the optimal price and timing. In the hospitality sector, particularly within the rooms division, revenue management focuses on providing the suitable room to the appropriate guest, at the right price, and through the most fitting distribution channel. [cit]

Hotel revenue management stands out as a critical factor in maintaining profitability. Among the various factors contributing to effective hotel revenue management, some correlated factors stand out prominently:

* Forecasting of hotel room demand.
* Prediction of booking cancellations.
* Online hotel reputation.

### Forecasting of hotel room demand.

Forecasting hotel room demand involves predicting the anticipated demand for rooms on any given day throughout the year. Accurate forecasts enable hotels and revenue managers to adjust prices dynamically, thus maximizing revenue potential. However, forecasting hotel room demand is a complex task, influenced by a multitude of factors that vary widely across different regions and contexts. Variables such as location, cultural events, weather, seasonal patterns, and more significantly impact optimal hotel revenue management strategies. For example, a rock concert or a global exposition can increase the booking demand or a storm in the area can trigger an increment of cancellations.

### Prediction of booking cancellations.

Booking cancellations [1] are an issue for the hotel revenue manager because they make harder to predict the number of rooms. To cope with this problem cancellation polices and strategies has been developed over the years [2]. A common pattern is reaching the overbooking status by lowering the price to be sure that the revenue is not impacted by cancellation, but the overbooking when it is real, it is a problem because it hurts hotel reputation and revenue. As states a study in Japan[1] reputation is very important.

### Online hotel reputation.

Using the framework developed in [3], we define online hotel reputation. Online reputation is *“the result of what clients, former clients, future clients, employees, etc. say, write and communicate to another anywhere in the internet social media based on their perceptions and experience in any moment of their relationship, direct or indirect, with the brand”*. The same study performed in the four main Spanish cities (Barcelona, Madrid, Valencia, Sevilla) states that room price increases whenever the Hotel is positioned in the top position in TripAdvisor Index. Negative online reviews also can have a strong impact in room booking rate that might take time to recover. A study over ten five starts Chinese hotels [2] (Impact of reputation on hospitality profitability: impact of service failure online exposure on revenue performance) - https://www.emerald.com/insight/content/doi/10.1108/TR-09-2022-0465/full/html – evidence from the hotel industry in China) describes the effects of negative online reputation. One of its main contributions is that Hotels that they’ve received online negative feedback took up till nine months to recover.

During the years many machines learning [1] and deep learning techniques [2] has been deployed to minimize the negative impact of the above-described factors and maximize revenue.

Our focus will be to create a hotel ranking algorithm called **HotelRank** that considers all three factors (demand forecasting, cancellations and online reputation) in a weighted manner using machine learning and deep learning techniques.

This research project will be done in strict collaboration with **Blastness Corp**. Blastness Corp. is the #1 provider in Italy for luxury hotels with a portfolio of over nine hundred hotels.

The project will deliver a set of data science models and a data engineering platform in Azure that it is able to ingest, analyse and train models online, providing real-market value to the project itself.

We're employing a CRISP-DM approach for the model tuning and creation, while adopting Scrumban (https://www.agilealliance.org/scrumban/) for the deployment part to ensure agility and adaptability, including Blastness Corp at each iteration/sprint.

**Objectives:** Outline the specific goals of your capstone project. What do you intend to achieve through this capstone project? Ensure your objectives are clear, concise, and aligned with the project's goals. You should have between three and five objectives. There should be a business objective or hypothesis (not a statistical test hypothesis) that looks to be explored.

**Problem Definition:** Clearly state the problem or challenge the capstone project seeks to solve. Discuss the context of the problem, its impact, and why it's essential to address it.

**Scope:** There should be plenty of scope for the two-semester capstone project. Define the scope of the capstone project. What will be included and excluded from the capstone project? List the boundaries of the capstone project to avoid any ambiguity. Since this is a two-semester project, ample scope should be provided for in-depth analysis and exploration. Describe the planned methods, techniques, and approaches you plan to accomplish in the capstone project. What do you expect to deliver by the end of semester two? Provide a high-level timeline for the capstone project. Break down the project into phases or milestones and estimate the time required for each.

**Data Sources:** Where will you get your data, and how much do you need? Specify the data sources you plan to use in the capstone project. Show evidence of any permissions to access and use the data.

**Ethical Considerations:** Discuss any ethical considerations associated with the capstone project, especially if it involves sensitive data, user privacy, or potential societal impacts. This will include dataset permissions and use of data permissions. There can be no medical capstone projects.