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**Assessment Cover Page**

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| *Module Title* | Strategic Thinking (HDip in Data Analytics) |
| *Assessment Title* | CA 1 – Capstone Project Proposal |
| *Assessment Due Date* | 29th March 2024 |
| *Date of Submission* |  |

**Declaration**

By submitting this assessment, I confirm that I have read the CCT policy on academic misconduct and understand the implications of submitting work that is not my own or does not appropriately reference material take from a third party or other source.

I declare it to be my own work and that all material from third parties has been appropriately referenced.

I further confirm that this work has not previously been submitted for assessment by myself or someone else in CCT College Dublin or any other higher education institution.

**Introduction**

The House Price Prediction project aims to develop a machine learning model for predicting house prices. It intends to enhance the real estate industry by providing significant insights to both the public sector and individuals interested in property transactions. The overarching goal is to address current issues and contribute to larger long-term objectives, including the development of policies to combat rising costs, reduce homelessness, and contribute to legislation promoting equal opportunities for buyers.

The project's primary objective is to deliver current market insights by combining present data and historical trends to generate accurate projections for the future. These projections are designed to improve transparency and efficiency in the real estate market, empowering parties in negotiations and aiding governmental decision-making processes.

In response to the challenges posed by rising housing costs in the current market, the project aims to provide meaningful insights that meet the demands of both public and private stakeholders. The primary objective is to chart a clear path towards achieving the project's goals while also enriching our collective knowledge of the constantly shifting real estate industry

1. **Objectives**
2. **Develop Accurate Price Prediction Model**: Create a machine learning model to predict house prices based on key features like location, room count, and construction year.
3. **Enhance Market Transparency**: Utilize the model to provide clear insights into house prices, empowering both buyers and sellers to make well-informed decisions.
4. **Optimize Price Negotiations**: Improve efficiency and fairness in negotiations by using the model's predictions to establish a clearer understanding of property values.
5. **Inform Governmental Decisions on Social Housing**: Explore using predictive insights to assist government decisions, particularly in identifying areas for social housing construction to address housing challenges.
6. **Contribute to Strategic Policies**: Explore the model's potential role in shaping strategic initiatives and governmental policy formulation, tackling issues like rising house prices, homelessness, and ensuring fair opportunities for buyers!

These objectives align with the broader goal of developing a house price prediction model, showcasing its practical applications and impacts in the real estate industry and beyond.

1. **Problem Definition:**

The House Price Prediction project intend to address a critical challenge in the Irish real estate market—the significant growth of the house price-to-income ratio. According to Statista (published on Jan 8, 2024), between 2015 and 2023, the ratio in Ireland increased by nearly 17 index points. This substantial increase is a barrier to homeownership as property values rose in ratio to earnings, limiting affordability. This imbalance not only affects individuals but also disrupts community stability and impedes fair real estate transactions. The consequent affordability drop presents a complex issue for governmental sectors in developing effective solutions.

In response, the project aims to develop a machine learning model for house price predictions. Through analyses and transparent market dynamics, it strives to address challenges linked to escalating housing prices, fostering a more accessible and equitable real estate landscape.

1. **Scope**

The two-semester House Price Prediction capstone project encompasses a comprehensive exploration of machine learning methodologies to accurately forecast house prices, with a focus on the Irish real estate market. The project aims to include:

* 1. **Data Collection and Preprocessing:** In-depth gathering of relevant real estate data, including property details, location information, and historical pricing. Cleaning and preprocessing of the data to ensure its quality and suitability for machine learning model training.
  2. **Model Development:** Creation and fine-tuning of a robust machine learning model, incorporating features such as location, number of rooms, and year built. Implementation of advanced techniques to enhance the model's predictive accuracy.
  3. **Transparency and Efficiency Enhancement:** Utilization of the developed model to provide transparent insights into house prices, empowering buyers, and sellers with valuable information. Integration of the model into the real estate market to optimize efficiency in price negotiations.
  4. **Government Decision Support:** Exploration of the potential application of predictive insights to aid public government decisions, particularly in identifying areas for strategic social housing construction.
  5. **Strategic Initiatives and Policies Contribution:** Investigation of the model's predictions' applicability in contributing to strategic initiatives and policy formulation, addressing challenges like rising house prices and homelessness.
  6. **Exclusions:** The project will not delve into: Predictive analysis beyond the scope of house prices in the Irish real estate market.

Implementation of policies; the focus is on providing insights for policy considerations.

* 1. **Boundaries:** The project is limited to the capabilities of machine learning algorithms and the quality of available data. Ethical considerations and data privacy will be strictly adhered to.
  2. **Planned Methods, Techniques, and Approaches:** Utilization of supervised learning algorithms for model development. Feature engineering to enhance model performance. Evaluation of various regression techniques for predicting house prices. Ethical handling of data, ensuring privacy and compliance.

1. **Timeline:**
   1. **Semester One:**

Weeks 1-4: Data Collection and Preprocessing.

Weeks 5-8: Model Development and Fine-tuning.

Weeks 9-12: Initial Transparency and Efficiency Enhancement.

4.**2. Semester Two:**

Weeks 1-4: Government Decision Support Exploration.

Weeks 5-8: Contribution to Strategic Initiatives and Policies.

Weeks 9-12: Final Model Optimization, Documentation, and Presentation Preparation.

* 1. **Expected Deliverables by End of Semester Two:** A well-trained machine learning model capable of predicting house prices accurately. Transparent insights into real estate market dynamics for informed decision-making. Integration of the model into a user-friendly interface for market participants. Comprehensive documentation of methodologies, results, and recommendations.

1. **Ethical Considerations:** The House Price Prediction capstone project is committed to upholding the highest ethical standards throughout its lifecycle. Key ethical considerations include:
   1. **Data Privacy and Confidentiality:** Ensuring that all collected data adheres to privacy regulations and is anonymized to prevent the identification of individuals. Implementing robust security measures to safeguard sensitive information from unauthorized access.
   2. **Informed Consent:** Obtaining explicit consent from data sources, acknowledging the intended use of their information, and ensuring transparency about data handling practices.
   3. **Bias and Fairness:** Regularly assessing and mitigating bias within the machine learning model to prevent unfair treatment of specific demographic groups. Implementing fairness-aware algorithms and techniques to ensure equitable outcomes.
   4. **Transparency:** Providing clear and understandable explanations of the model's predictions to users, avoiding black-box scenarios. Disclosing the limitations and potential biases of the model to users and stakeholders.
   5. **Data Permissions:** Acquiring explicit permissions for data usage from relevant authorities or organizations that own or manage the datasets. Adhering to any restrictions or guidelines stipulated by data sources to ensure ethical data utilization.
   6. **Societal Impact:** Evaluating potential societal impacts of the project, including its influence on property pricing, market dynamics, and housing accessibility. Ensuring that the project's outcomes contribute positively to the welfare of individuals and communities.
   7. **No Medical Capstone Projects**: Abiding by ethical guidelines and avoiding the inclusion of any medical-related data or analyses in the capstone project. Ensuring that the project's focus remains on addressing challenges within the real estate domain without inadvertently impacting medical privacy or ethics.

The project team is committed to continuous monitoring of ethical considerations, making adjustments as needed, and seeking expert advice when necessary to uphold the highest standards of integrity and responsibility in all project activities.

# References

Statista Research Department. (2024, January 8). Annual house price change in Ireland. Retrieved from [ [https://www.statista.com/statistics/1155332/annual-house-price-change-in-ireland/]