

House Price Prediction using Explainable AI Methods

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Research Background

- ▶ House price prediction is a crucial task in real estate development for both buyers and sellers and financial institutions
- ▶ Accurate house price prediction helps buyers, sellers, agents, banks, investors, and policymakers make informed decisions, assess risks, and set fair prices
- ▶ ML model have been used previously which showed high accuracy but was not transparent enough, they often used act as Black Boxes
- ▶ To maintain transparency in the predictions Explainable AI methods are used
- ▶ Explainable AI methods reduces the gap between prediction and interpretability which gives insights of the model's decisions

Research Problem

- ▶ ML models are used for the predictions which produce accurate predictions
- ▶ Traditional ML models for house price prediction lack interpretability, leading to issues in trust, fairness, and regulatory compliance
- ▶ Buyers, sellers, and agents struggle to understand the key factors that influence the prices
- ▶ Existing research mainly focuses on prediction accuracy rather than explainability
- ▶ Using Explainable AI ensures transparency and informed decision-making

Research Aim and Objectives

AIM:

- ▶ To develop an **Explainable AI (XAI) framework** for house price prediction that balances accuracy and interpretability

OBJECTIVES:

- ▶ To analyze the effectiveness of different ML models for house price prediction
- ▶ To improve the explainability of house price prediction models for better decision-making
- ▶ To implement XAI methods like SHAP, LIME and compare them

Brief Literature Review

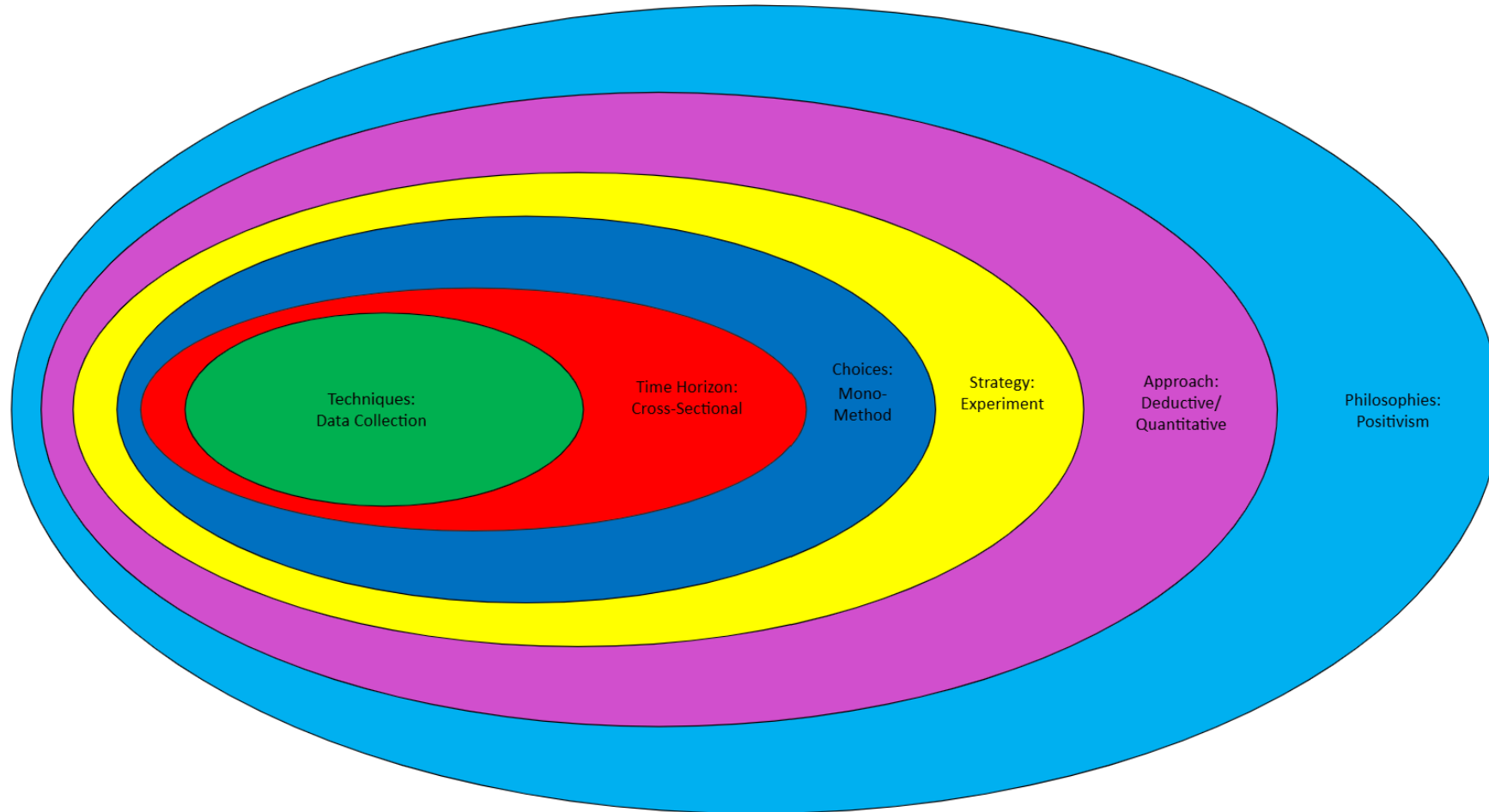
- ▶ Housing markets also positively affect a country's currency and economy. However, factors such as location and demand influence house prices, prompting buyers, developers, and real estate stakeholders to seek clarity on the attributes that affect pricing to inform investment decisions and pricing strategies.
- ▶ Rudresh Dwivedi et al (2023) states that Explainable artificial intelligence (XAI) focuses on developing machine learning methods that help users understand, trust, and create models that are more transparent
- ▶ To choose the right method for building an XAI-enabled application, it's essential to have a solid grasp of the fundamental concepts of XAI and the related programming frameworks
- ▶ Ahmad Chaddad et al (2023); For AI to be viable and acceptable tool it should be able mimic human decisions and interpretation skills, XAI aims to reveal the behind the black-box which has the information of how the decisions are made
- ▶ XAI can also be used in healthcare and medical imaging applications for the doctor to carefully examine the patient's sickness or symptoms

Brief Literature Review (Cont.)

- ▶ William Villegas-CH et al (2025); SHAP and LIME explainability methods offer insights into individual predictions by highlighting important contributing features. This helps analysts gain a clearer understanding of why certain sequences are identified as anomalous
- ▶ The limited interpretability of AI can make its use challenging in various environments where transparency and trust are just as important as accuracy. This disconnect between precision and explainability has driven the creation of methods incorporating explainable artificial intelligence (XAI) techniques. These approaches enable detection systems to identify threats while providing clear justifications for their decisions
- ▶ There are two methods for integrating XAI techniques: an intrinsic (model-specific) approach and a post-hoc (model-agnostic) approach
- ▶ In an intrinsic approach, the integration of explainability occurs within the architecture of the machine learning model itself during the training phase, making it non-transferable to other architectures
- ▶ In a post-hoc approach, the XAI method is independent of any architecture and can be applied to any trained ML model

Research Methodology

Research Onion Framework



Research Methodology (Cont.)

► Philosophies: Positivism

Since the study is based on quantitative data, machine learning models, and explainability techniques (SHAP, LIME), the positivist approach fits well. Positivism focuses on objective reality, measurable observations, and empirical analysis

► Approach: Deductive/Quantitative

The project follows a hypothesis-driven approach, where machine learning models are trained, evaluated, and explained using XAI techniques. Deductive reasoning is used to test whether XAI techniques improve interpretability

Quantitative Research Approach uses structured numerical data, machine learning models, and statistical evaluation

Since historical real estate data is used for prediction, this is a cross-sectional study analyzing past data.

Research Methodology (Cont.)

- ▶ Strategy: Experiment

Involves training XGBoost and Random Forest models. Experimenting with SHAP and LIME to compare explainability and evaluating the impact of different features on house prices

- ▶ Choices: Mono-Method

The study is purely data-driven, without qualitative interviews or case studies

- ▶ Time Horizon: Cross-sectional

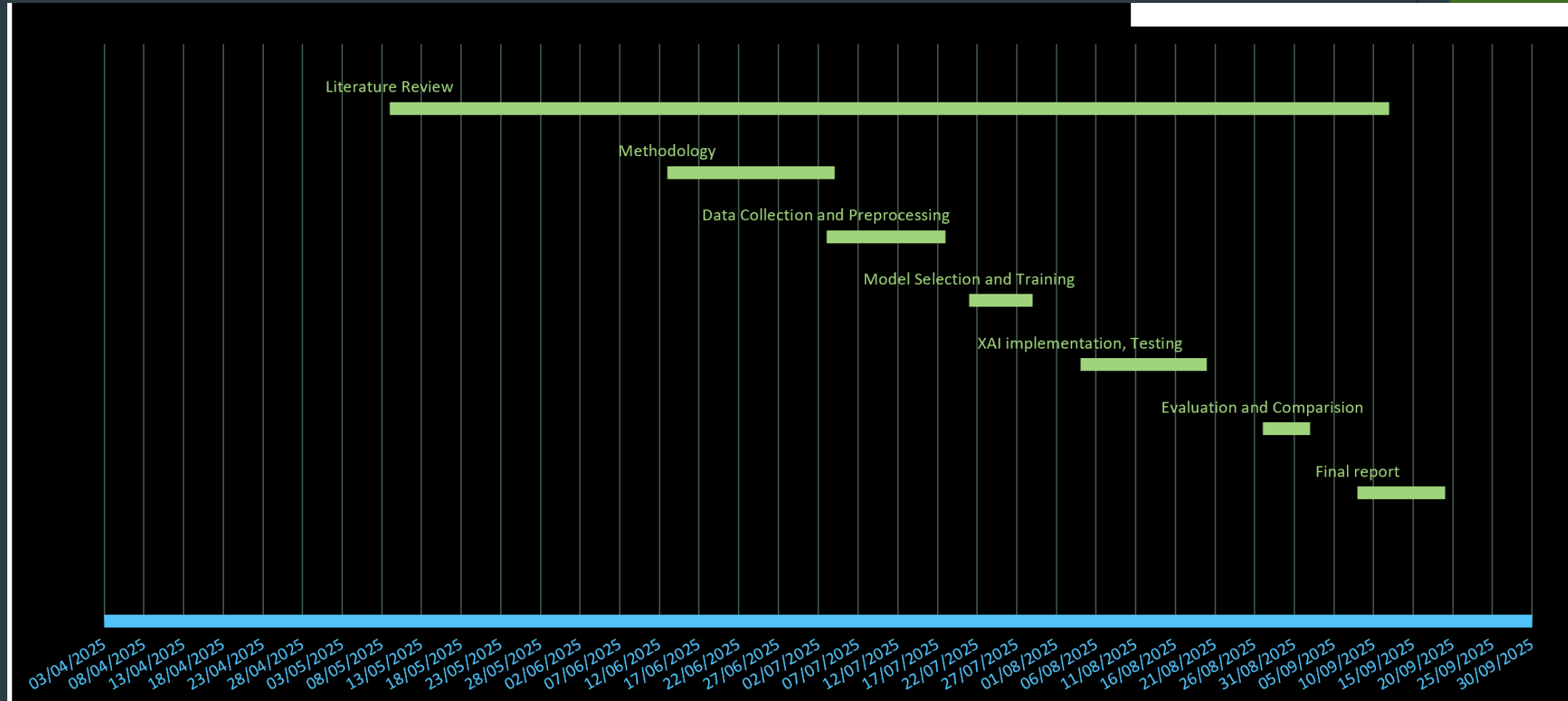
The study uses historical datasets (e.g., Kaggle) at a fixed point in time and no longitudinal analysis is performed

- ▶ Techniques: Data Collection

Collecting UK real estate dataset from online platforms like Kaggle

Project Planning and Resources

► Gantt Chart



This is the proposed Gantt Chart for this project.

Resource

- ▶ UK house prices dataset from Kaggle.com will be used for this project
- ▶ The dataset consists of a variety of variables the provides good understanding related to UK house prices

Project Impact and Limitations

Impact:

- ▶ This study enhances the model transparency By integrating SHAP and LIME
- ▶ AI-driven pricing models are more interpretable for real estate professionals, buyers, and sellers
- ▶ Buyers and investors can understand key price-influencing factors, leading to better purchasing decisions
- ▶ Real estate firms can refine pricing strategies using insights from explainable AI
- ▶ The study aligns with ethical AI principles by making predictions more interpretable
- ▶ Helps regulatory bodies ensure that AI models do not rely on biased or unfair criteria
- ▶ This can lead to better feature engineering, resulting in more accurate models

Project Impact and Limitations (Cont.)

Limitations:

- ▶ House price predictions heavily rely on the quality of real estate datasets. So, Missing data, incorrect pricing records, or biased samples might impact model performance
- ▶ The study focuses on static datasets, meaning models are not updated dynamically. In practical applications, a real-time updating mechanism (e.g., online learning models) would be required for live price predictions
- ▶ The trained models may not generalize well to new real estate markets if the dataset is specific to one region (e.g., UK housing data only)

References

- ▶ [1] R. Dwivedi, et al., "Explainable AI (XAI): Core Ideas, Techniques, and Solutions," ACM Comput. Surv., vol. 55, no. 9, pp.1, -01-16 2023. doi: 10.1145/3561048.
- ▶ [2] R. Machlev, et al., "Explainable Artificial Intelligence (XAI) techniques for energy and power systems: Review, challenges and opportunities," Energy and AI, vol. 9, -05-25 2022. doi: 10.1016/j.egyai.2022.100169.
- ▶ [3] R. Dwivedi, et al., "Explainable AI (XAI): Core Ideas, Techniques, and Solutions," ACM Comput. Surv., vol. 55, no. 9, pp.1, -01-16 2023. doi: 10.1145/3561048.
- ▶ [4] R. Machlev, et al., "Explainable Artificial Intelligence (XAI) techniques for energy and power systems: Review, challenges and opportunities," Energy and AI, vol. 9, -05-25 2022. doi: 10.1016/j.egyai.2022.100169.
- ▶ [5] N. Hamizah Zulkifley, et al., "House Price Prediction using a Machine Learning Model: A Survey of Literature," IJMECS, vol. 12, no. 6, pp.46, -12-08 2020. doi: 10.5815/ijmeecs.2020.06.04.



Thank You!

Any Questions ?

