

ArtWorth AI: Intelligent Valuation Model for Sculptural Artifacts Based on Aesthetic, Historical, and Material Attribute

Prof. Shilpa Joshi ¹, Rahul²

¹Professor, Master of Computer Application, VTU's CPGS, Kalaburagi, Karnataka, India

²Student, Master of Computer Application, VTU's CPGS, Kalaburagi, Karnataka, India

Abstract- ArtWorth AI employs an intelligent multi-modal approach in order to provide accurate valuations of sculptural artefacts based on combining significant characteristics such as aesthetics, historical provenance, materials and use of ensemble machine learning technologies along with Natural Language Processing and Computer Vision to create accurate and transparent pricing predictions with statistically significant confidence intervals. ArtWorth AI creates opportunities for objective, reliable, and evidence-based sculpture valuation through providing insight and detection for Authenticity Risk for both galleries and collectors.

1.INTRODUCTION

ArtWorth AI is an Explainable Artificial Intelligence (AI) Framework that integrates visual, historical and material data to provide accurate, transparent and reliable sculpture valuations. Sculpture Valuation is a complex and highly subjective process determined by aesthetics, historical significance, material used, condition and market trends. The current methods of evaluating sculptures; including traditional expert-based and hedonic systems; lack the consistency, transparency and ability to leverage visual and three-dimensional characteristics of sculptures. Existing systems that utilize Artificial Intelligence (AI) have focused primarily on paintings; the challenges associated with sculptural artifacts remain unresolved.

2.PROBLEM STATEMENT

The opinions of experts vary widely regarding the value of sculptures, which makes sculpture valuations very subjective and inconsistent. Most current Ai and statistical valuation methods focus solely on paintings, and these methods have a number of shortcomings; namely they do not give valuations with estimates of uncertainty or offer authenticity verification, and they are not easily accessed by people looking for professional appraisal services.

To address these issues, there is an increased demand for a dedicated Ai-based Valuation System for Sculpture that is transparent, objective and focused on the values of sculptures.

3.OBJECTIVES

A key goal of this research is to create an intelligent Artificial Intelligence System that will allow for the accurate and transparent valuation of sculpture by leveraging Aesthetic, Historical, and Material Data. The system will provide the ability to extract visual and textual characteristics through Computer Vision and Natural Language Processing, consolidate the physical characteristics into a structured data set, apply an ensemble learning approach to predict the price of a sculpture with uncertainty estimation, and offer explainable services for reliable decision-making.

4.RESEARCH METHODOLOGY

Data from various auction houses, galleries and auction records were collected in multiple ways (images, provenance, materials, past sales etc.). Visual features were extracted from these by applying computer vision analysis; historical context was established through natural language processing, physical characteristics were captured as structured data; these three sets of features were combined and processed in an ensemble based/predictive model that provides uncertainty estimates. The data used to create the ensemble model were validated by splitting them by time; standard metrics were used to assess the performance of the predictive model (accuracy and reliability). In addition, explainable models and risk modelling provide practical uses for users.

5. REVIEW OF LITERATURE

Previously, hedonic and statistical methods were the dominant art valuation techniques. These methods are based on quantitative and qualitative characteristics, i.e., attributes of an artwork (e.g., medium, size, condition) but do not account for visual and contextual factors when pricing an artwork. In recent years, researchers have employed new technologies such as machine learning, computer vision, natural language processing, and material analysis to increase the accuracy of art valuation; however these new research efforts have primarily focused on paintings. Existing research on sculpture continues to be fragmented, lacking uncertainty assessment, authenticity evaluation, and a coherent

approach to sculpture valuation. Consequently, there is a necessity for a multimodal, explainable AI-based approach to art valuation that incorporates visual and contextual factors as well as quantitative and qualitative features.

6.SYSTEM DESIGN

The ArtWorth system is built on three levels, including the user interface, the application layer, and a data storage level. The sculpture images and metadata from users are submitted via the web interface. The backend of the application processes users' data using algorithms for computer vision, natural language processing, and structured data models to extract features and produce the price predictions (including uncertainty, liquidity scoring, and risk of an object's authenticity). The data generated and returned to the user will be stored in secure, encrypted databases provided by a cloud-based platform. Finally, the ArtWorth system is deployed on a containerized, scalable cloud infrastructure that ensures dependable access for users.

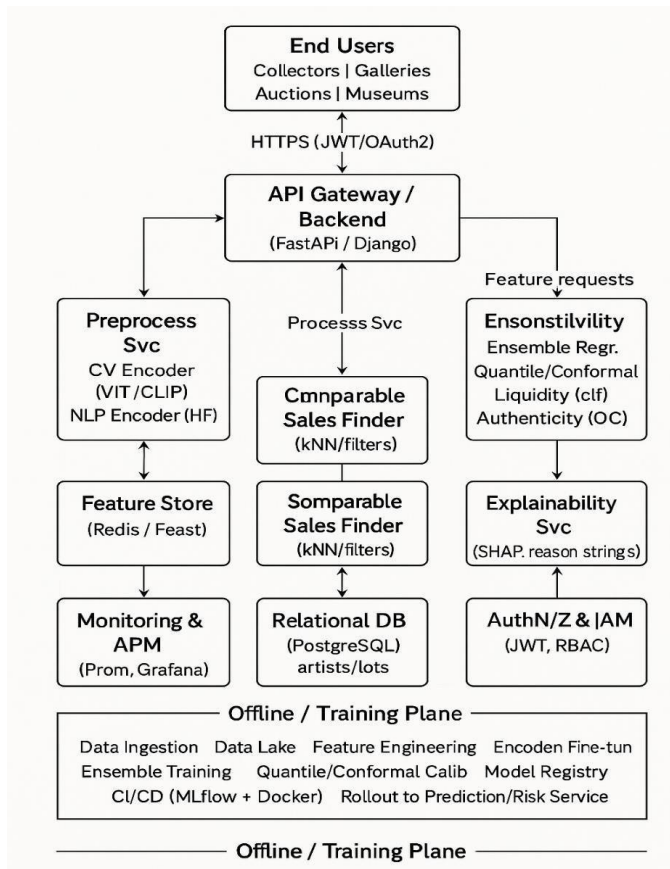


Figure 1 : Architecture overview

7.SCREENSHOT

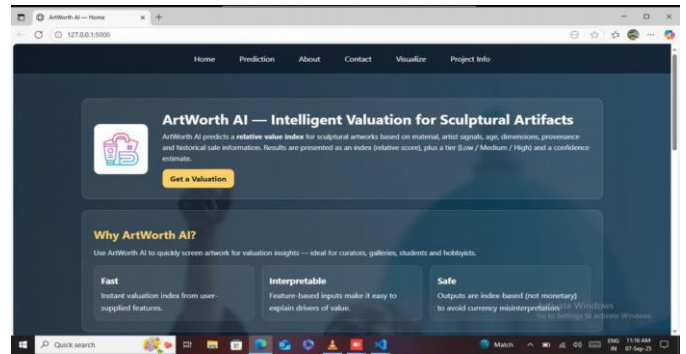


Figure 2: Home Page

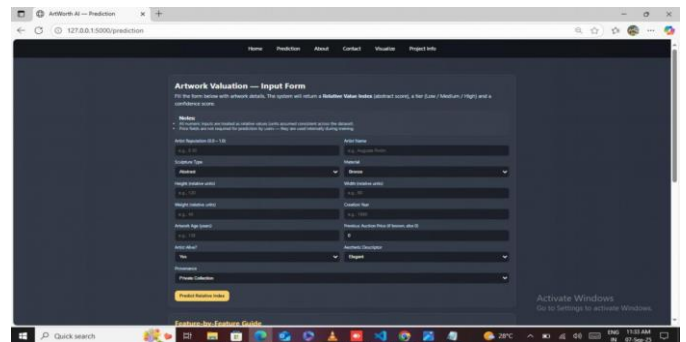


Figure 3: Prediction Page

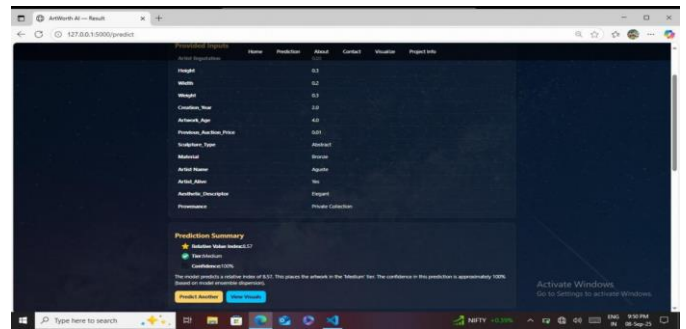


Figure 4: Prediction Result

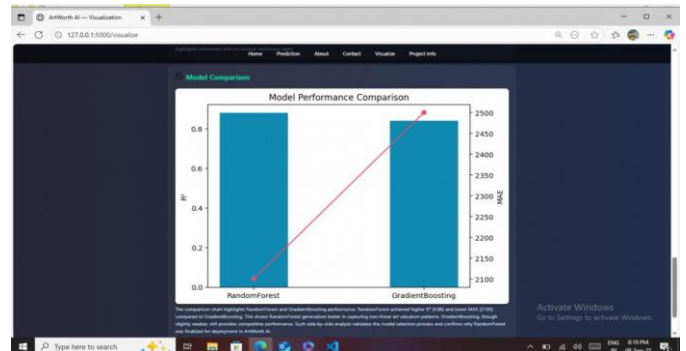


Figure 5: Model performance comparison



Figure 6: Mean Absolute Error Train Vs Test

8. Conclusion & Future Scope

ArtWorth AI enables the creation of reliable valuations of sculptures through a reliable, impartial and data-driven approach that takes into account the visual, historical and material attributes of the sculptures. By utilizing advanced techniques in artificial intelligence, the system increases the ability to reduce subjectivity in sculpture valuation; aids in estimating uncertainty in valuations; and allows for explainable decisions regarding sculpture valuation by stakeholders within the art marketplace. The framework could potentially be expanded to include other forms of art as additional technologies such as 3D detection, multispectral analysis and blockchain technology become available for the purposes of verifying art provenance, thus becoming a scalable, worldwide platform for the valuation of all art.

9. REFERENCES

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