RestART: An AI-Driven Restoration System for High-Fidelity in Artwork Revival Across Multiple Surfaces, Damage Types, and Eras Through Metadata-Enriched, Style-Conscious, Explainable, and Interactive Artist Approaches

Baciu, Andrei (School: Informatics Liceum Grigore C. Moisil)

Artworks are one of the most important parts of cultural heritage. Unfortunately, they are often exposed to a lot of damage and are altered by threats like fire, water, fading, tearing, and many others. This project proposes an AI-based artwork restoration system that repairs multiple types of damage while maintaining the style and historical context of the artwork. Due to the lack of diverse damaged artwork datasets, several custom ones were created with simulated damage, which the model would use to learn how to realistically repair them. By leveraging style cues, color palettes, and metadata associated with the artwork's era, the AI system can isolate distorted areas and reconstruct them, and with the support of an interactive platform, conservators and human experts can assist the restoration process, thus making it possible to maintain artistry and accuracy. Moreover, explainable AI, which assists the model in showcasing how and why it reached a particular outcome, fosters trust through transparency. Preliminary tests on artificially created damage show the model's ability to accurately reconstruct fine details and broader areas. By combining computer science, art history, and human collaboration, this project showcases a flexible, scalable approach to restoring artworks across diverse surfaces and eras while also preserving cultural heritage by not sacrificing the essence of each piece.

Awards Won: