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(57) Abstract :

The present invention relates to a comprehensive framework for developing Explainable Artificial Intelligence (XAI) models aimed at enhancing trust, transparency, and accountability in AI-driven decision-making processes. The invention embeds interpretability throughout the AI lifecycle—from data preprocessing to model training, inference, and deployment—using a combination of inherently explainable algorithms, post-hoc techniques, and model-agnostic interfaces. It generates multi-modal, user-centric explanations tailored to different stakeholders, while incorporating real-time feedback to adapt explanation strategies dynamically. The framework includes audit trails, ethical assessment modules, and compliance-ready explanation formats to meet regulatory demands. Designed to function across various domains and platforms, it supports scalable deployment through microservices and federated learning protocols. The invention enables AI systems to articulate reasoning behind decisions, detect biases, maintain explanation consistency over time, and promote responsible usage in sensitive sectors such as healthcare, finance, and governance. It offers a human-centric foundation for building trustworthy, transparent, and legally defensible AI systems.

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