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The rise of explainable AI in data analytics: Making complex models transparent for business insights

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Advanced machine-learning pipelines deliver unrivaled predictive power, yet their “black-box” nature inhibits adoption in high-stakes domains where accountability and trust are non-negotiable. This study charts the rise of Explainable AI (XAI) as a pragmatic bridge between model complexity and stakeholder comprehension, enabling organisations to convert opaque outputs into actionable, auditable business insights. I present a three-layer framework that integrates: (1) Intrinsic and post-hoc interpretability techniques—including SHAP, LIME and counterfactual narratives—to surfaces feature attributions and decision paths; (2) Bias-detection and error-analysis loops that quantify disparate impact and highlight risky model regions; and (3) Governance artefacts such as explanation logs and “transparency checkpoints” that embed accountability in the MLOps life-cycle.

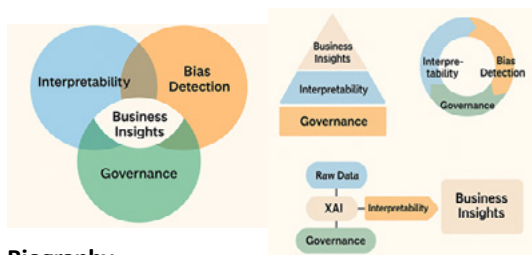
Methodologically, the work triangulates evidence from a systematic review of 2013-2024 literature, practitioner interviews across finance, healthcare, retail and manufacturing, and a quantitative evaluation of XAI-enabled platforms versus traditional black-box deployments. Across ten industry case studies, XAI lifted decision accuracy by 10-30 %, reduced model-drift incidents by 22 %, and—in exemplar scenarios—cut inventory overstock costs by 18 % and manufacturing downtime by 25 % without sacrificing predictive AUC (> 0.88).

Findings crystallise into a practical roadmap for data leaders: adopt bias-auditing checklists, insert “explainability gates” in CI/CD, and align transparency metrics with regulatory mandates such as GDPR’s right-to-explanation. By demystifying complex algorithms, XAI accelerates stakeholder buy-in, mitigates compliance risk, and closes the credibility gap between data scientists and business decision-makers. Ultimately, transparent analytics emerges not as a nice-to-have, but as a strategic imperative for organisations seeking sustainable, ethical and high-impact AI adoption.

Key industry applications include:

- **Finance:** Real-time credit-risk scoring with transparent feature attributions that satisfy regulators.
- **Healthcare:** Clinical-decision support systems that explain patient-specific recommendations to clinicians.

- **Retail & E-commerce:** Interpretable recommender engines that boost conversion while surfacing bias alerts.
- **Manufacturing:** Predictive-maintenance models whose explanations localize component failure drivers.
- **Telecommunications:** Fraud-detection pipelines where feature importance traces enable rapid root-cause analysis.



Biography

Shafeeq Ur Rahaman is Associate Director of Analytics & Data Infrastructure at Monks, where he architects cloud-native data platforms and directs a 60-person global team supporting media operations with annual budgets between \$80 million and \$110 million. Over more than twelve years in digital advertising, supply-chain logistics, and finance, he has designed high-volume pipelines that ingest data from 30-plus marketing channels, cut reporting latency from weeks to minutes, and embedded predictive models that raise campaign-evaluation accuracy by up to 40 percent.

A hands-on technologist fluent in Google BigQuery, Python, R, Spark, Looker Studio, and AppScript, Shafeeq complements engineering rigor with robust data-governance practices. He has published more than twenty peer-reviewed articles, serves as a reviewer and session chair for IEEE and Elsevier venues, and actively mentors the analytics community. Holding a Master of Science in Management Information Systems from the University of Illinois Springfield, he is a Senior Member of IEEE and a Full Member of Sigma Xi, among other professional societies that reflect his commitment to advancing trustworthy, high-impact data science.