Predictive AI for Socially-Aware and Legally-Compliant Research Policy in CRIS Systems

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Extended abstract

Current Research Information Systems (CRIS) constitute a central infrastructure for managing, analyzing, and strategically steering research activities in universities, non-university research institutions, and research policy organizations. They aggregate data on projects, publications, funding, collaborations, patents, research data, as well as legal and organizational frameworks. With the increasing importance of Open Science, Responsible Research and Innovation (RRI), diversity, and regulatory requirements, there is a growing need for tools that not only evaluate past policies retrospectively but also simulate the social, legal, and institutional impacts of research policies in a forward-looking manner.

This contribution investigates the use of predictive AI models to develop socially-aware and evidence-based research policy within CRIS systems. Predictive AI serves not only to forecast future research developments but also as a tool to simulate complex socio-technical interactions where policy decisions, scientific practices, legal frameworks, and societal expectations intersect. The aim is to enable decision-makers to compare different policy scenarios, anticipate potential impacts, and make strategic decisions based on solid evidence. As humorously noted, if a model prediction “fails,” it can still provide a learning opportunity—predictions have two sides, and their uncertainties offer insights for governance strategies (Gstrein et al., 2024).

Methodologically, the approach combines multiple AI techniques within the CRIS architecture. Machine learning analyzes historical trends and impact patterns; causal models identify key policy influence factors; agent-based simulations capture individual and institutional behavioral changes; and Natural Language Processing analyzes policy documents, regulatory requirements, and qualitative reports. By linking internal CRIS data with external sources — such as Open Access monitoring, funding statistics, compliance data, or social indicators — scenarios can be simulated to test hypothetical policy interventions, such as changes in evaluation criteria, Open Access mandates, funding logic, or governance structures. This integrated workflow is depicted in Figure 1, which illustrates the flow of data from input sources through predictive models to simulation outputs and decision support.

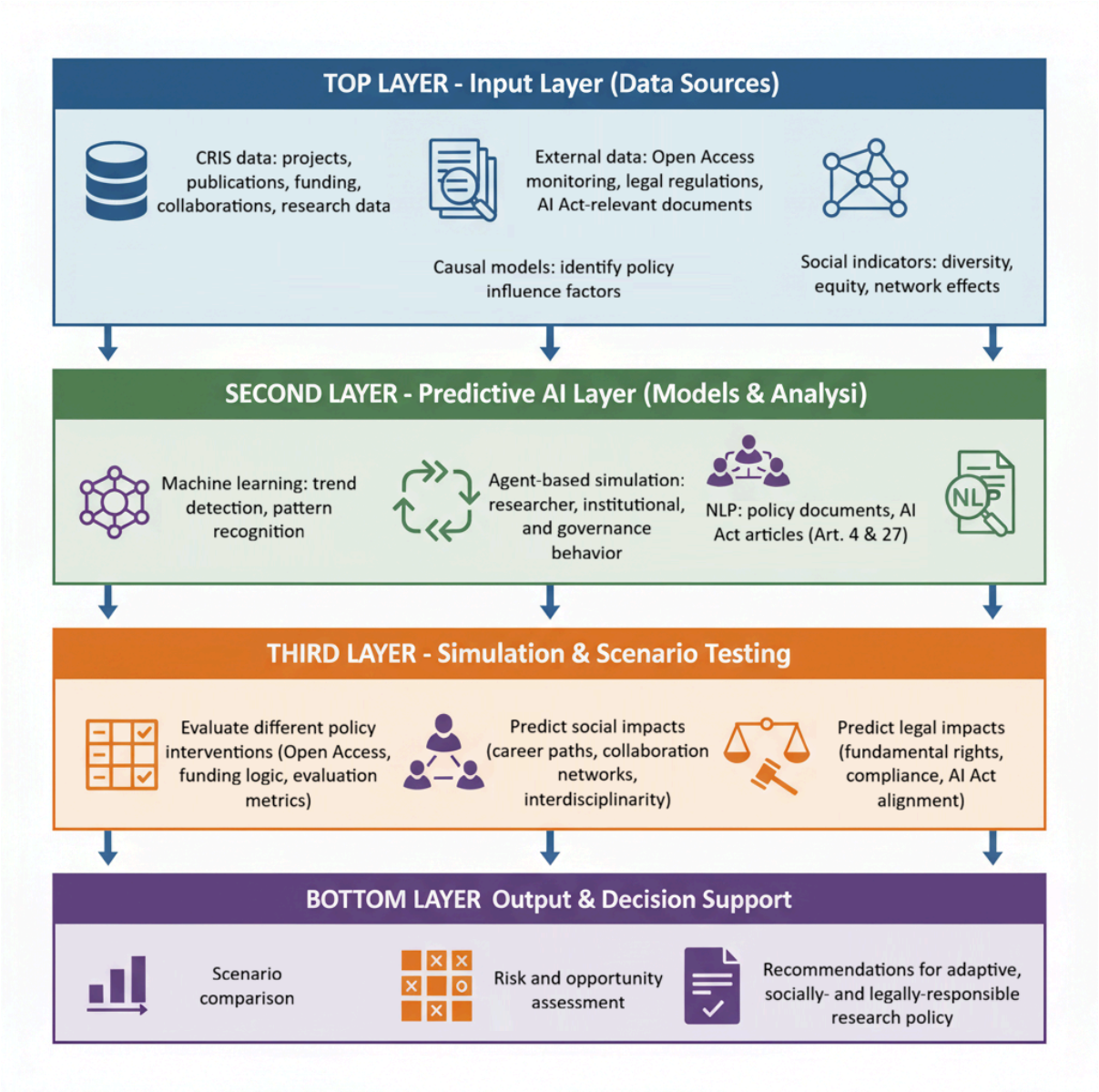

Figure 1. Predictive AI for Socially-Aware Research Policy in CRIS Systems.

As this paper highlights, a particular focus lies on the social impacts of research policy which could be enhanced and supported with emerging technologies. Predictive AI can help identify potential effects on research practices, career

trajectories, collaboration networks, interdisciplinarity, and equity. Unintended consequences of performance-based evaluation systems and demographic biases — well documented in algorithmic fairness research — highlight the need for explainable and equity-sensitive models (e.g., discussions at ACM FAccT on fairness and bias in predictive systems) (Lalor et al., 2024). Legal scholars have also discussed these biases and the execution of decisions based on these biased outputs, which lead to more bias and discrimination. (Wachter et al., 2021;).

Predictive AI in CRIS systems enables a new form of strategic decision support that goes beyond classical metrics and descriptive analyses. By simulating future scenarios, decision-makers can test the robustness of research policies under varying assumptions and develop informed, adaptive strategies. This supports evidence-based, socially-aware, and legally compliant research policy that delivers societal value — a central concern, as research governance must address not only efficiency but also inclusion, sustainability, and ethical responsibility. The growing AI governance literature underscores the importance of such interdisciplinary approaches that combine technical capability with legal and ethical foresight (Kim et al., 2025).

However, implementing predictive AI also raises methodological, ethical, and legal challenges. Models heavily depend on the quality, representativeness, and completeness of underlying data. Bias in historical CRIS records can reproduce or amplify existing inequalities if not explicitly addressed through fairness-oriented modeling practices. Furthermore, explainability and transparency are crucial: black-box models are of limited use for policy decision-making without transparent reasoning paths. Thus, transparent and interpretable AI approaches must be developed to support traceable policy recommendations. Legal and governance requirements, such as those embedded in the AI Act and related EU regulatory frameworks (e.g. General Data Protection Regulation), also demand rigorous safeguards to protect fundamental rights and ensure accountability (Ebers et al., 2021).

Simultaneously, legal effects — especially those relevant under the AI Act and despite the legal shortcomings addressing the specific risks clearly (Laux and Ruschemeier, 2025) - can be systematically considered. In order to assess the risks and mitigate these risks before a high-risk AI system is placed in the market and used, the AI Act introduces several tools which can serve such a purpose.

Obligations like Fundamental Rights Impact Assessments (FRIA), which require deployers of high-risk AI to assess potential impacts on fundamental rights before use, including risk categories and affected groups (Malgieri & Santos, 2025) and equally, provisions to promote AI literacy (AI-L) emphasize the need for stakeholders to understand AI systems, which is foundational for democratic oversight and responsible adoption (Karaboga et al., 2023).

FRIA is a regulatory risk-governance mechanism established under Article 27 of the EU AI Act. It requires deployers of high-risk AI systems to identify, assess, and mitigate potential harms to individuals and groups prior to deployment. FRIA extends beyond technical performance evaluation to include analysis of system purpose, affected categories of persons, transparency obligations, and the design of human oversight measures. Emerging scholarship conceptualises FRIA as a structured,

context-aware methodology combining legal, ethical, and socio-technical assessment (de Bruijn et al., 2022; Bertaina et al., 2025).

AI-L refers to the constellation of conceptual, technical, and socio-ethical competencies enabling individuals to understand AI system functioning, interpret outputs, recognise limitations and data biases, and exercise informed oversight (Long & Magerko, 2020; Ng et al., 2021; Yi, 2022), reflecting the capacity-building objectives of Article 4 AI Act. Both FRIA and AI-L are legal instruments that could be further developed in practice to structure rights-compliant system design, enabling administrators to interpret predictive outputs responsibly, ensuring socially aware and legally compliant governance.

Finally, a conceptual framework for integrating predictive AI into CRIS systems is proposed, taking into account technological, social, legal, and ethical dimensions. Predictive AI is positioned as a governance tool — rather than an automated decision-maker — enabling institutions to iteratively refine policies, assess societal impacts, and communicate risks transparently. The approach emphasizes problem-solving and value creation by addressing concrete gaps in research policy and empowering decision-makers to develop socially and legally responsible interventions. Uncertainty in predictions is not viewed as failure but as an opportunity for adaptive learning and governance refinement.

Overall, this study demonstrates that predictive AI in CRIS provides not only analytical instruments but also serves as a bridge between evidence-based research policy, societal responsibility, and legal compliance. By combining simulation, social awareness, and regulatory alignment, predictive AI can facilitate forward-looking, adaptive, and responsible research policy that delivers measurable value at both institutional and societal levels (see Figure 1).

Keywords

Predictive AI, Current Research Information Systems (CRIS), Research Policy, Social Impact Assessment, Legal Compliance / AI Act, Evidence-Based Decision-Making.

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