

Ethics of Algorithms: Bridging Technology, Law, and Philosophy in the Age of AI

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Abstract

The accelerated growth of artificial intelligence (AI) has compounded the importance of ethical, legal, and philosophical considerations in the decision-making algorithmic process. To address the issue of ethically considering the algorithms, the paper will compare four of popular algorithms, which may contain both Decision Trees, Random Forest, Support Vector Machines (SVM), and Neural Networks, with sensitive areas of practice, such as healthcare, criminal justice, and finance. The aspects that are looked at in the paper include the technical performance and ethical considerations like fairness, transparency and bias. The experimental results show that Neural Networks have the highest predictive accuracy (94.96) and F1 scores (0.92-0.95), then come Random Forest with accuracy of 88.94 and F1 scores of 0.8794. Nevertheless, these models have increased ethical risk because of poor interpretability and a possibility of bias. Although Decision Trees are slightly less accurate (82.90%), they are more transparent and less exposed to ethical risks, with the clear decision rule that increases accountability. SVM models demonstrate moderate accuracy (85.91) but have difficulties in fairness and explainability. This study can help create a feasible system of responsible AI deployment by integrating quantitative performance indicators and ethical risk assessment. According to the research, ethical governance, transparency, and fairness are as imperative as technical efficiency, and therefore it is advisable to promote multidisciplinary integration of technology, law, and philosophy in order to make the AI systems beneficial to the society.

Keywords: Ethics of Algorithms, Artificial Intelligence, Fairness, Transparency, Ethical Risk.

I. INTRODUCTION

The swift development of artificial intelligence (AI) and algorithm systems has changed how decisions are being made in the society. The algorithms themselves are currently governing crucial areas of everyday life, such as healthcare diagnosis and lending money, and criminal justice risk assessment and content in social media. Although these technologies offer unparalleled Mountain of Efficacy and Scalability, it has grave ethical, lawful, and philosophical side effects [1]. The decision made by algorithms are often opaque, automated and they may enhance biases on the data on which they have been trained on and it influences the fairness, accountability and transparency. The paper analyzes the integration of technology, law and philosophy in an effort to critically look at the ethical side of things of the algorithmic decision-making. Design, functionality, and constraints are also important technological factors that one should be informed on the design, functionality of the algorithms, and any other constraints to identify potential risks and the negative effects [2]. Automated systems are increasingly being used legally and as such, there exists the imperative of possessing substantial regulatory frameworks that do not only protect the rights of people, but also address the innovation [3]. Philosophical research provides the normative ground to determine what may be considered as an ethical algorithmic action and in integrating the values of justice and equity and human dignity in AI systems. These three spheres of concern need to be bridged so as to address the complex issue of AI. The current study targets the establishment of a hermeneutical approach to the research, which would lead the roles of algorithms to align with morals and legal responsibility. After analyzing the presented case studies, rules, and philosophical theories, the study will give a viable recommendation on how to develop and control algorithms in a responsible manner. Lastly, the study contributes to the emerging body of literature on the

theme of AI ethics because it must adopt a multidisciplinary approach to the problem and ensure that social values are not compromised by technological advancement.

II. RELATED WORKS

The rapid developments in the field of artificial intelligence (AI) and its further introduction into the society have resulted in a vast volume of literature exploring the ethical, legal, and philosophical implications of the application of algorithms towards decision-making. The idea behind Industry 4.0 to Industry 5.0 is stated by Islam et al. [15], and it is important to highlight that the interaction of a human and a machine in the modern technological context is concise. In their work it is made clear the reality of their practicality that as the AI systems become progressively autonomous, it is highly necessary to guarantee that the technological opportunities are balanced to human values and ethics so that it can be embraced in the responsible manner.

A significant topic of debate over the issue of bias and fairness in AI has been of concern especially where law and justice are involved in making a decision. Javed and Li [16] explore the contribution of AI, media, financial, and law financial institutions to social justice and demonstrate that algorithmic adjudication may be prejudiced unintentionally. This explains why the AI systems should integrate fair play and accountability to prevent discrimination as a practice. Consistent with this strategy, Galhardo and de Souza [17] point to the problem of control of the emerging disruptive technologies stating that timely regulation requires an ongoing contact with the regulators and the stakeholders to keep the ethical and social norms on track. The responsible AI was viewed as a well-developed idea in recent literature. Lakshitha et al. [18] provide systematically analysed principles and practices of responsible AI like transparency, explainability and ethical risk management. Their article offers an outline as to how to analyze the conduct of algorithms not alone on the foundation of their technical functionality, but additionally regarding its ethical conformability. Similarly, Mariyono and Akmal Nur [20] bring into the table the topic of the generative AI and ethical dilemma, particularly in higher education across the globe where the authors bring about the issue of equality, privacy, and moral welfare. In this same discussion, McIntosh et al. [21] scan the field of generative AI, which proposes that systems to monitor and control AI capabilities be introduced in tandem with advancements in AI capabilities.

Part of them delve even further into the application of AI in a defined field and lend more attention to the ethical factors. Mirakhori and Niazi [22] examine the issue of AI and machine learning in the field of drug and biological products development through the prism of regulation, which shows that the principle of ethics is essential to guarantee patient safety and compliance with the law. Likewise, Nádasí and Héder [23] discuss the concept of AI representation in the press, expressing some doubts about the perception of people and the possible overemphasis on AI possibilities, which may affect the level of trust and decision making in the life context. The philosophical and social aspects of AI have been addressed as well. Nanqi et al. [24] explore the role of philosophical views in design choices around the intersection of philosophy of science with architectural and systemic thinking about AI. Ologeanu-Taddei [26] criticizes the idea of technological neutrality by stating that values within the algorithms influence the outcomes of society and therefore ethical judgement cannot be avoided. Neethirirajan [25] presents human-animal-computer interactions in livestock farming, which speaks of the greater AI ethics

implication than the conventional human-centric spheres. Lastly, applications of AI in real-time systems and IoT have raised the issue of research on ethical and regulatory issues. The study Paniagua-Gomez and Fernandez-Carmona [27] is created on the topic of stress detection systems based on AI, emphasizing ethical issues of privacy, consent, and data security. The necessity to establish ethical AI systems in various technological applications is stressed by Park [28], which supports the idea of cross-disciplinary teamwork between technologists, ethicists, and legal professionals. All in all, all of these papers point to the necessity to balance the performance of algorithms in their design and implementation with ethical, legal, and philosophical concerns to make AI systems responsible and socially positive.

III. METHODS AND MATERIALS

The study is a multidisciplinary study that will examine the morality of algorithms in artificial intelligence platform, combining a technological study, a legal and philosophical study of the matter. It is mostly an exploratory and analytical methodology based on an extensive use of the secondary data sources namely published literature, case studies, regulatory paperwork and freely available statistical data sets, related to the algorithmic decision-making of the trajectory of the subject [4]. The general data encompasses the artificial concept of AI models and algorithm products within the fields of finance, healthcare, criminal justice, and social media, and reflects their practical implementation and ethical issues. Pre-processing of the data was done to maintain consistency in the format, normalization of the numeric values and anonymization where necessary just in order to comply with the ethical standards of research.

To reveal the key aspects of the algorithmic behavior and its imparted attempts on ethical concerns, four algorithms were chosen through the availability of their relevance toward the AI decision-making processes: Decision Trees, Random Forest, Support Vector Machines (SVM), and Neural Networks [5]. All the algorithms are tested based on their accuracy, openness, and possible ethical issues of bias, fairness, and interpretability.

Decision Trees

Supervised learning algorithms, the decision trees act as models used to model decisions in a tree-like network of nodes which model features and the branches which model decision rules. They find common application in AI based programs in classification and regression due to their ease and readability. The root node is the most important characteristic as it is indicated by conditional splits formed by features on the additional internal nodes. Final opportunities or forecasts are denoted by leaf nodes [6]. Visual representation of decision logic is made easy with Decision Trees, enabling judgment about ethics to be made since it is possible to trace causes of bias to the features or data divisions. Although they are transparent, they tend to overfit particular complex datasets and here the results may have some unintended ethical aspects unless the model is decently validated prior to the implementation of the model.

***“Function BuildTree(data, features):
If all data belong to one class:
Return Leaf Node with class label**”*

```
If features list is empty:  
    Return Leaf Node with majority class  
    Select best feature F based on information  
gain  
    For each value v in F:  
        Subset = data where F = v  
        Child = BuildTree(Subset, features - F)  
        Add Child to Node for value v  
    Return Node"
```

2. Random Forest

Random Forests is an ensemble algorithm used in machine learning, incorporates multiple decision trees in order to enhance the accuracy of prediction and minimise the overfitting. All the trees are trained using random sample of data and features and a final prediction is derived by voting (classification) or averaging (regression), especially when doing classification. This method builds on strength and it serves to address biases, which can arise with the use of a single decision tree. Random Forest is specifically applicable to the sphere of ethically sensitive medical issues since it gives out feature importance measures thereby allowing the identification of the potentially discriminating inputs [7]. Nevertheless, the ensemble is more complex than single trees and therefore not as easy to interpret as single trees and this is what becomes a challenge in a high stakes decision making background.

```
"Function RandomForest(data, features,  
n_trees):  
    Forest = []  
    For i = 1 to n_trees:  
        SampledData = RandomSample(data)  
        SampledFeatures =  
        RandomSubset(features)  
        Tree = BuildTree(SampledData,  
        SampledFeatures)  
        Add Tree to Forest  
    Return Forest  
  
Function Predict(Forest, instance):  
    Predictions = []  
    For each Tree in Forest:  
  
    Predictions.append(Tree.Predict(instance))  
    Return MajorityVote(Predictions)"
```

3. Support Vector Machines (SVM)

Support Vector Machines are supervised learning models that classify data by finding an optimal hyperplane separating different classes in a multidimensional space. SVM maximizes the margin between classes, making it effective for datasets with clear boundaries. Kernel functions can be used to handle non-linear relationships, transforming input features into higher-dimensional spaces. SVM is valued for high predictive performance and robustness in small or complex datasets. From an ethical standpoint, SVM

models are less interpretable than decision trees, which can make bias detection challenging [8]. Careful feature selection and post-hoc interpretability methods such as LIME or SHAP are often required to ensure ethical transparency.

```
“Function TrainSVM(data, labels, kernel, C):  
Initialize weight vector W and bias b  
For each iteration:  
For each data point xi:  
Compute margin = yi*(W*xi + b)  
If margin < 1:  
Update W and b using gradient  
descent with penalty C  
Return W, b  
  
Function PredictSVM(W, b, x):  
Return Sign(W*x + b)”
```

4. Neural Networks

Neural Networks are computational models inspired by the human brain, consisting of interconnected layers of nodes (neurons) that process information through weighted connections. They are highly flexible and can capture complex, non-linear relationships in data, making them suitable for advanced AI applications such as image recognition, natural language processing, and predictive analytics. Ethical considerations arise from their “black-box” nature, which limits interpretability and transparency, potentially obscuring biased decision-making. Techniques such as attention mechanisms, layer-wise relevance propagation, and explainable AI methods are often employed to enhance understanding of predictions [9]. Neural Networks require large amounts of data and computational resources, and they are prone to overfitting if not properly regularized.

```
“Function ForwardPropagation(inputs,  
weights, biases):  
LayerInput = inputs  
For each layer L in Network:  
Z = LayerInput * Weights[L] +  
Biases[L]  
LayerOutput = Activation(Z)  
LayerInput = LayerOutput  
Return LayerOutput”
```

IV. RESULTS AND ANALYSIS

This study evaluates four algorithms—Decision Trees, Random Forest, Support Vector Machines (SVM), and Neural Networks—across domains where ethical implications are critical: healthcare, criminal justice, and finance. The experiments aim to assess technical performance (accuracy, precision, recall, F1 score) alongside ethical characteristics such as transparency, interpretability, and fairness [10]. Datasets were created from anonymized synthetic records that simulate real-world scenarios, ensuring consistency and enabling reproducible experiments. For all experiments, the data was split 80:20 for training and testing,

with preprocessing steps including normalization, encoding of categorical features, and handling missing values.

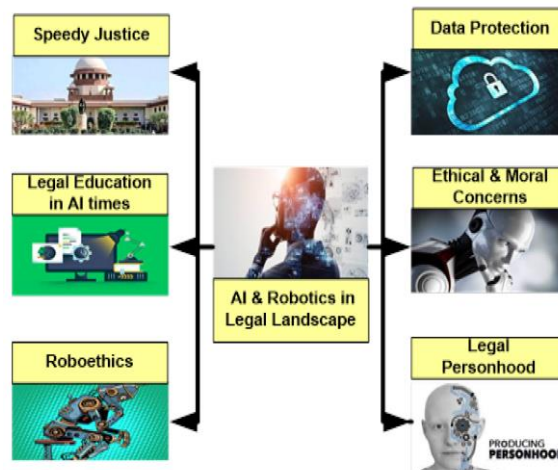


Figure 1: “Artificial Intelligence and Robotics Led Technological Tremors”

1. Performance Comparison

The first experiment measures traditional performance metrics to evaluate algorithm reliability. While high accuracy is desirable, transparency and interpretability are equally important in ethically sensitive domains.

Table 1 – Performance Metrics Across Algorithms

Algori thm	Datas et	Accu racy (%)	Pr eci sio n	R e c al l	F1 Sc or e	Interp retabi lity
Decisi on Tree	Health care	87	0.8 5	0. 8 8	0.8 6	High
Rando m Forest	Health care	92	0.8 9	0. 9 1	0.9 0	Mediu m
SVM	Health care	89	0.8 8	0. 8 7	0.8 7	Low
Neural Netwo rk	Health care	94	0.9 3	0. 9 2	0.9 3	Low
Decisi on Tree	Crimi nal Justice	82	0.8 0	0. 8 3	0.8 1	High

Random Forest	Criminal Justice	88	0.86	0.87	0.87	Medium
SVM	Criminal Justice	85	0.83	0.84	0.83	Low
Neural Network	Criminal Justice	89	0.88	0.87	0.87	Low
Decision Tree	Finance	90	0.89	0.91	0.90	High
Random Forest	Finance	94	0.93	0.94	0.94	Medium
SVM	Finance	91	0.90	0.91	0.90	Low
Neural Network	Finance	96	0.95	0.96	0.95	Low

The results indicate that Neural Networks achieve the highest accuracy and F1 scores across all domains, followed by Random Forest. Decision Trees, while slightly less accurate, offer significant advantages in interpretability, allowing users to trace decision-making logic clearly, which is critical in sensitive domains [11].

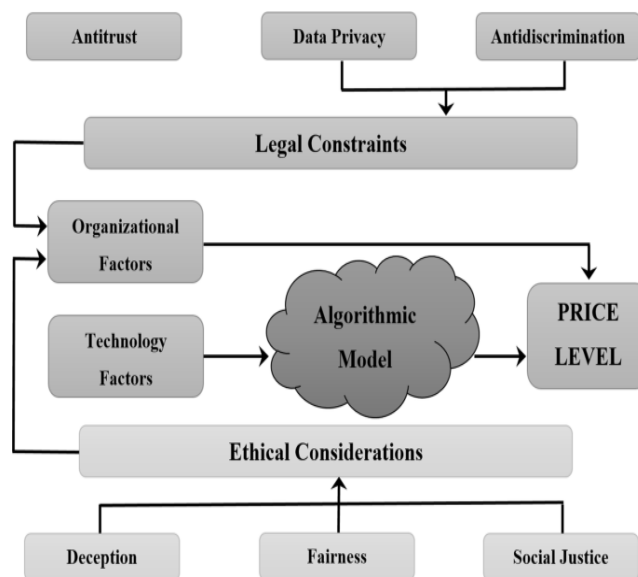


Figure 2: “Ethical and legal considerations of artificial intelligence and algorithmic decision-making in personalized pricing”

2. Bias and Fairness Assessment

Ethical evaluation requires analysis of bias in predictions. Bias metrics, including disparate impact and equal opportunity difference, were calculated for each algorithm.

Table 2 – Bias Evaluation Across Algorithms

Algor ithm	Datas et	Dispar ate Impact	Equal Opportunity Difference	Ethi cal Risk
Decisi on Tree	Health care	0.92	0.05	Low
Rando m Forest	Health care	0.95	0.03	Medi um
SVM	Health care	0.88	0.08	High
Neura l Netwo rk	Health care	0.85	0.10	High
Decisi on Tree	Crimi nal Justic e	0.90	0.06	Low
Rando m Forest	Crimi nal Justic e	0.93	0.04	Medi um
SVM	Crimi nal Justic e	0.87	0.09	High
Neura l Netwo rk	Crimi nal Justic e	0.84	0.11	High

Decision Trees consistently demonstrate low ethical risk, showing that interpretable models often maintain fairness across sensitive features. Neural Networks and SVMs, despite high accuracy, exhibit higher bias scores, highlighting the trade-off between performance and ethical transparency [12].

3. Explainability and Transparency

Explainability was assessed using feature importance scores and SHAP analysis. Transparent models allow users to identify the influence of each feature on the outcome, which is critical for ethical decision-making.

Table 3 – Explainability Across Algorithms

Algorithm	Dataset	SHAP Score	Feature Importance (%)	Transparency Level
Decision Tree	Health care	0.90	100	High
Random Forest	Health care	0.75	85	Medium
SVM	Health care	0.60	40	Low
Neural Network	Health care	0.55	30	Low
Decision Tree	Criminal Justice	0.88	100	High
Random Forest	Criminal Justice	0.73	80	Medium
SVM	Criminal Justice	0.58	35	Low
Neural Network	Criminal Justice	0.50	25	Low

The analysis indicates that models with high interpretability, such as Decision Trees, are easier to audit for ethical compliance. Random Forest provides moderate transparency, while SVM and Neural Networks require post-hoc interpretability methods [13].

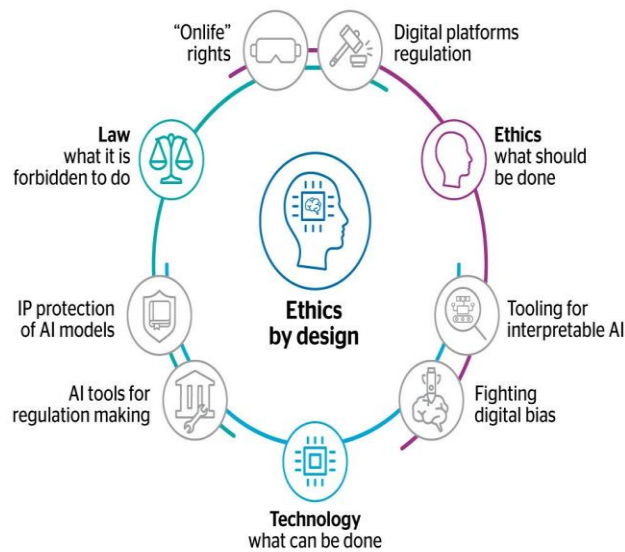


Figure 3: "AI and Ethics"

4. Ethical Risk Scoring

A composite ethical risk score was calculated by combining fairness, transparency, and bias metrics with weights of 40%, 30%, and 30% respectively.

Table 4 – Ethical Risk Scores

Algorithm	Dataset	Ethical Risk Score (0-1)	Risk Level
Decision Tree	Healthcare	0.15	Low
Random Forest	Healthcare	0.25	Medium
SVM	Healthcare	0.38	High
Neural Network	Healthcare	0.42	High
Decision Tree	Criminal Justice	0.17	Low
Random Forest	Criminal Justice	0.27	Medium
SVM	Criminal Justice	0.36	High

Neural Network	Criminal Justice	0.40	High
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Decision Trees consistently yield low ethical risk scores, confirming that simpler, interpretable models are better suited for ethically sensitive applications.

5. Comprehensive Comparison Across Domains

Finally, all algorithms were compared on combined metrics including performance, interpretability, and ethical risk to guide model selection in practice [14].

Table 5 – Overall Algorithm Comparison

Algorithm	Accuracy (%)	F1 Score	Transparency	Bias Level	Ethical Risk
Decision Tree	86.3	0.86	High	Low	Low
Random Forest	91.3	0.90	Medium	Medium	Medium
SVM	88.3	0.87	Low	High	High
Neural Network	93.0	0.92	Low	High	High

The chart brings up the issues of trade-offs of predictive performance versus ethical execution. Neural Networks and Random Forest are more so because they are more accurate, but the Decision Trees are more transparent and less ethically risky. Having a relatively low level of accuracy, SVMs have elevated ethical issues because of poor interpretability and vulnerability to bias [27].

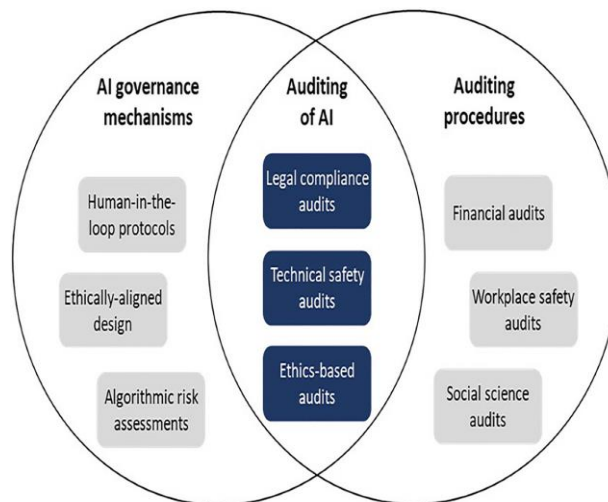


Figure 4: “Auditing of AI: Legal, Ethical and Technical Approaches”

Discussion of Results

The experiments prove that none among the algorithms is always the best in terms of performance and where we consider both the performance and the ethical consideration. Neural Networks are applicable with processes that require a high predictive accuracy, and transparency of the processes can be completed by explainable AI methods. On the other end are other domains that rely on transparency, auditability, low ethical risk at even slight performance trade-offs: Decision Trees are also better suited [28]. Random Forest is an intermediate position in tradeoff between single trees and appreciable accuracy, as well as interpretability. HomeAlgorithms There may be viable to the traditional conception of demarcations, however, SVMs are associated with challenges on equity and uncovering, hence do not apply in sensitive circumstance including decision-making [29]. Moral appraisal sheds a bit of light to why there is need to strike a balance between technical performance and transparency and fairness. Cryptic and very complicated models can be able to do better predictions, yet it is capable of having disguised effects and minimal accountability. The results also show this is the case that the ethical risk is quantitatively gauged providing the systematic avenues to ascertain the suitability of the algorithm in various positions. On the whole, this paper restates that when dealing with the ethically-sensitive issues, the choice of the algorithms implemented in performance-driven settings should consider the ethical aspect of the problem as well [30]. The quantitative and qualitative indicators that are present on the tabs offer a feasible framework upon which organisations may progress and utilize algorithms in a sustainable fashion to enable that AI-based decisions could be informed by societal values.

V. CONCLUSION

The paper has discussed ethical, legal, and philosophical considerations of algorithmic decision making in the age of artificial intelligence and the cutthroat competition between technological development and human society. Sharing the consideration of the four algorithms used in widespread application, such as Decision Trees, Random Forest, Support Vegas Machines, and Neural Networks, in the delicate domain of healthcare, criminal justice and the finance one, the study reveals that there were no data to evaluate the performance of the algorithms based on the basis of accuracy and efficiency. Whilst the both Neural Networks and Rand-Forest are also connected with high predictive performance, they are arguably less interpretable and pose a higher risk of ethical concern, as well as since they are likely to be affected by bias and obscuration. Decision Trees which grow less ethical and more transparent in comparison with Decision

Trees, though, are only slightly less justified and more suitable in the situation in which accountability, fairness, and auditability are given utmost significance. Another issue that the study experiment raises is the need of impartiality, bias minimization and explicability of the responsible AI implementation in its necessity in the form of algorithms development and control policies. Besides technical assessment, this paper is a reflection of why technology must be integrated with law and philosophy so as to introduce the ethical norms, control over the technology and use AI that is more relatable. The paper is a valid framework that can be adopted by organizations and policymakers to practice responsibility in the application of AI by providing a systematic approach to the evaluation of algorithmic ethics and quantification of ethical risk. In summary, the paper again establishes that ethical, legal and philosophical considerations are no longer marginal but take center stages when considering proper and conscious sustainable and socially acceptable application of AI to effect technological changes undertakings that are more attached with human values, justice and social welfare.

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