Liver Disease Detection Using Machine Learning and Deep Learning: Ethical Consideration

Akimuddin Aslam Shaikh
School of Computing
National College of Ireland
x22123245@student.ncirl.ie

***Abstract*—Liver disease remains a major health problem in India which impacts millions of people and creates load on the health care facility. This paper aims to identify several techniques of ML and DL involved in the diagnosis of the liver disease in large scale based on the "Indian Liver Patient Records" dataset. The ethical consideration of this project would include that the data would be anonymized, unbiased training data set, and the medical data to be secured. It aims to address the diagnostic gap by means of action research for practitioners in the health care sector who operate with limited ethical space.**

I. Introduction

Liver disease has affected millions of people and is a huge burden to the healthcare system. Conventional diagnostic methods often lack in scalability, accuracy, and objectivity leading to several missed opportunities for timely intervention. This research is based on an urgent need to improve the detection of liver disease in India through implementation of advanced diagnostic techniques.

The specific research activity which is proposed in this study is the use of ML and DL methods to enhance the accuracy of diagnosis of liver disease and the detection of risk factors of the disease using the dataset of "Indian Liver Patient Records". It aims to help the healthcare practitioners to come across the most accurate & actionable tools for diagnosis.

The issue of ethical behaviour has also been taken into consideration in this study [1]. To this end, all the information that will be used concerning the patients will be anonymised and secured for security reasons against any form of articulation.

II. Evaluation of Ethical Issues

A. Before Starting the Project

1) Ethical Data Sourcing: The dataset was collected from Kaggle website, which assess its adherence to privacy and data protection legislation. Each record in the dataset was examined to ensure patient confidentiality was maintained whereby no direct identifiers were included in the dataset. This was required to maintain ethics sensitivity and to minimize instances of an inappropriate breach of confidentiality and poor data annotation or quality can directly impact the reliability of ML/DL models [2].

2) Addressing Potential Biases in the Dataset: The dataset was looked at whether the demographics of its sample were skewed by any of its features [3]. EDA was performed to address the bias. If an imbalanced representation does exist, the presence of bias will likely propagate towards the models and renders them inefficient within specific groups.

B. During Research

1) Ethical Handling of Data: In the analysis phase, individual patients' data was anonymized, so that any identifiers related to a patient or a subject were removed or masked. Such procedures also included maintaining appropriate storage measures, where the data sets and intermediate files were placed on encrypted disks or protected internet cloud settings from external intrusion. Only specified research personnel were given data access to protect the sensitive information [4]. Strong data management practices were used in order to minimize or completely eliminate chances of data loss. Backups were stored in secured areas periodically, and data exchange between systems was done over secure channels.

2) Transparency and Accountability: Every single step such as data preprocessing, feature selection, and model building was documented to guarantee transparency. Besides, this strong emphasis on methodology means that all methodologies are within the reach of one's colleagues for review, replication, and critique which serves the purpose of accountability and it shows that ethical principles are observed in the conduct of research.

3) Mitigation of Bias in Methodologies:

- Data Preprocessing: To minimize within group bias effects, procedures to ensure proper representation of subgroups in both the training and test datasets for model development.
- Algorithm Selection: Different machine learning and deep learning models and algorithms were reviewed and the best algorithms were implemented.
- Evaluation Metrics: Some of the fairness-sensitive measures that were used apart from the conventional perfor-

mance evaluation measures including accuracy, precision, and recall are discussed.

C. After the Research

1) Transparency and Open-Source Availability: To enhance team work, all the models developed have been made available for the public. However, to secure the privacy of the data as well as ethical considerations, sensitive patient information is in a dataset is not shared publicly. Also, all the derived datasets from the research work, for instance pre-processed data, feature sets etc are made available in aggregate and de-identified formats such that it is impossible to identify any supplied or individual patient information.

2) Societal Impact: This research confirms the potential of AI-based diagnostic tools by demonstrating the effectiveness of machine learning and deep learning algorithms in improving diagnosis, and such tools can be assimilated into routine clinical practice. Policymakers can use these insights to promote the argument for funding to ensure that AI-based healthcare systems reach out to populations with great need and who cannot afford timely and accurate diagnosis.

The ethical concerns and strategies mentioned in this report have been carefully understood to address the challenges for using ML and DL techniques. It ensures alignment with the unique healthcare landscape and ethical requirements of this domain.

REFERENCES

[1] S. Miller. Machine learning, ethics and law. *Australasian Journal of Information Systems*, 23:1–13, 2019.

[2] J. Zhang and Z. M. Zhang. Ethics and governance of trustworthy medical artificial intelligence. *BMC Medical Informatics and Decision Making*, 23(1):7, 2023.

[3] T.P. Pagano, R.B. Loureiro, F.V. Lisboa, R.M. Peixoto, G.A. Guimarães, G.O. Cruz, M.M. Araujo, L.L. Santos, M.A. Cruz, E.L. Oliveira, and I. Winkler. Bias and unfairness in machine learning models: a systematic review on datasets, tools, fairness metrics, and identification and mitigation methods. *Big Data and Cognitive Computing*, 7(1):15, 2023.

[4] B. A. Kaplan, S. P. Gilroy, W. B. DeHart, J. M. Brown, and M. N. Koffarnus. Data handling: ethical principles, guidelines, and recommended practices. In *Research Ethics in Behavior Analysis*, pages 191–214. Academic Press, 2023.