

An Analytical Study of Artificial Intelligence and Machine Learning Applications in Indian Tax Administration

*Dr.R.Sukasini, Assistant Professor, Department of B.Com CS,
Sri Vasavi College (SFW),
Erode - 638015

**Dr.K.Subramaniam, Assistant Professor, PG and Research Department of Commerce,
Erode Arts and Science College (Autonomous), Erode- 638009

Abstract

Taxation forms an important source of public revenue in the case of a developing economy like India. The Indian Taxation System has been plagued with issues like tax evasion, inefficient administration etc. There should be such a system in place for the administration of taxation which will have minimal errors and fast decision-making capabilities. The Indian taxation system has faced issues like shortage of manpower for doing repetitive work like data entry, scrutiny of tax return, tax audit etc. In order to cope up with the dynamic tax environment and application of analytics, the Indian government has introduced the concept of Artificial Intelligence/Machine Learning in the tax assessment system.

Artificial intelligence is a recent development in the field of taxes. The Indian Government has recently announced that the faceless tax assessment system will use Artificial Intelligence/Machine Learning. This study intends to analyze the importance of AI/ML in the Indian taxation system and on the basis of factors such as tax knowledge, tax education, legal sanctions, complexity of the tax system, relationship with tax authorities, perceived fairness of the tax system, ethics and attitude towards tax compliance, awareness of tax offences and penalties, tax education, possibility of tax audit etc., we want to analyze the perception of taxpayers in adopting the Artificial Intelligence based tax system.

Keywords: Artificial Intelligence; Machine Learning; Indian Tax System; Tax Payers; Tax assessment; Tax Evasion

Introduction

The development of artificial intelligence in recent times has made it possible for tax professionals to gain new analytical and statistical tools making their work convenient and efficient. Such tools have helped in developing systematic frameworks which are devoid of chaos and confusion in the processing and analysis of data in excel spreadsheets. Artificial Intelligence helps in creating a simulated tax risk environment, which will assist in making more complex human decisions. Artificial Intelligence and machine learning would serve as the foundation for the new tax ecosystem and help enhance the tax system by performing forecasting, clustering, virtual support systems, and natural language processing. Through the application of such technology, it would be possible to convert data into assets.

Digital transformation and tax administration would simplify compliance to Prevent errors and fraud. Artificial intelligence can be used to provide better services to the taxpayers by making it easy to make payments, giving refunds quickly, and providing access to the required information. Taxes are always an issue of political significance. It is the only source of revenue. The Indian tax system is complicated in nature, and it becomes difficult for the taxpayer to understand. Due to its complexity, taxpayers fear to make returns, and this leads to revenue loss for the government. Because of this complexity, taxpayers prefer to take help from professionals and

because of this the road to tax evasion is clear. The harassment by income tax department and the corruption in tax department are reported by the taxpayers. The main objective is to use this technology to increase the transparency and accuracy in the tax system.

LITERATURE REVIEW

S. No	Author(s) & Year	Title of the Study	Objectives / Focus	Key Findings	Research Gap / Relevance
1	Alstadsæter, A. & Jacob, M. (2017)	Who Participates in Tax Avoidance? Evidence from Swedish Microdata	To examine the characteristics of individuals who participate in tax avoidance and the factors influencing tax avoidance behaviour.	The study highlights that tax avoidance is influenced by taxpayers' economic and personal characteristics.	The study focuses on Sweden; similar behavioural analysis in the Indian taxation context requires further investigation.
2	Kumar Das, P. (2018)	An Insight into Black Money and Tax Evasion – Indian Context	To examine black money, tax evasion and their implications in India.	Tax evasion and unreported income adversely affect tax revenue and economic development.	The study discusses tax evasion mainly from a conventional perspective and provides scope for examining AI-based methods for detecting tax evasion.
3	Dyrenge, S., Hanlon, M. & Maydew, E. (2019)	When Does Tax Avoidance Result in Tax Uncertainty?	To examine the relationship between tax avoidance and tax uncertainty.	The study establishes that certain tax avoidance strategies can increase uncertainty regarding future tax outcomes.	The study does not specifically examine the role of AI and machine learning in reducing tax-related uncertainty.

Purpose of Research

1. Find the use of artificial intelligence in the taxation system of India
2. Find the perception of taxpayers regarding the adoption of artificial intelligence based tax system.

Research Instrument and Methodology of Data Collection:

The data collected from the respondents through a structured questionnaire. Besides the primary data, the data has been also collected from secondary sources through various articles, research papers, publications, bulletins, reports of CBDT, GST, and Reserve Bank of India and other web-based sources as references.

Population and Sample

The population in this study is the individual taxpayers. The method of sampling used is purposive sampling, and hence it has been taken based on criteria. Some of the criteria that can be taken in the sampling process as follows:

- A payers that possess a PAN CARD

- Taxpayers who are involved in paying taxes annually
- Taxpayers that hold Post-Graduate/Master's education qualification
- Taxpayers that agree to complete the questions

Methodology for Collecting Data:

This research work has made use of questionnaires. Questionnaire is an instrument for data collection that entails a list of questions and other prompts aimed at getting information from the respondent.

Artificial Intelligence and Indian taxation system:

Development of AI in Indian taxation system, Artificial Intelligence AI According to Merriam Webster artificial intelligence is defined as "the simulation of intelligent behavior in computers, especially by automatic, self-correcting programming systems the capability of machines to imitate intelligent human behavior." With the advancement of AI, we can classify it into two groups on the basis of Capability-Based Classification and Functional-Based Classification

Based on Capability

1. Narrow AI (Weak AI): A type of artificial intelligence designed to perform just one task. It performs the work of voice assistants, spam detectors, and chat applications. This is the only real AI available at present.
2. General AI (AGI/Strong AI): An imaginary machine that is able to learn and think like humans when performing any task. This machine doesn't exist yet.
3. Super AI (ASI): A futuristic AI, which surpasses humanity in its cognitive abilities.

Based on Functional

1. Reactive Machines: Primitive machines that act according to the current inputs based on pre-defined rules. They don't have any memory about the past. The example is the chess computer.
2. Limited Memory: Machines that use the past information for a brief period of time in order to make proper decisions, Self-driving cars use this type.
3. Theory of Mind: An imaginary future state when machines would be able to recognize the emotions, thoughts and intentions of people.
4. Self-Aware AI: Imaginary future state when machines will have their own consciousness.

AI is created to assist humans with a power with which humans will be able to make use of their abilities and be fast at their decision-making processes. AI is helping us with the important aspects of decision making such as Learning, Reasoning, Knowledge, Government Decision Making, Social Intelligence, and so forth.

Machine learning

It is a very famous term along with AI and it is considered to be a subset of AI. According to Merriam Webster "Machine learning is the process by which a computer is able to improve its own performance through continuous integration of new data in an already existing statistical model." Machine Learning (ML) is "a branch of Artificial Intelligence which enables the software applications to improve their predictions without being explicitly programmed to do so. Machine learning is classified in three different types as given below"

"Machine learning classification" is a form of supervised learning wherein one predicts a discrete category, label or class for any particular input. This type of algorithm is used in machine learning for grouping input into predefined categories as compared to regression.

Supervised Machine Learning

Supervised machine learning is said to be present when the "Labeled Dataset" is used for model training. Labeled dataset is a type of data set that contains inputs and outputs parameters. In the Supervised Learning algorithms learn mapping of points from inputs to outputs. It has both training and validation datasets labeled.

Unsupervised Machine Learning

Unsupervised machine learning is concerned with learning from unlabeled data; which means there are no outputs. Here the algorithm figures out patterns, clusters, or relations among data points by itself. It is commonly used for tasks like clustering, dimensional reduction, and data visualization.

Reinforcement Learning

Reinforcement learning is the process where the agent learns to take action based on a sequence of decisions using trial and error.

Taxation system in India

India has a three-tier tax structure which is managed by the Central government, state government, and local bodies. The Indian taxation system is based on the concept of self-assessment, in which the taxpayer declares his/her income based on self-assessment and submits the tax return to the tax department in the prescribed form. The Indian taxation system is complex in its nature. Indian taxes can be classified into two categories based on their nature, direct tax and indirect tax. Direct tax is directly paid by the person who is liable for it and the indirect tax is collected by a third party and submitted to the tax department.

With the introduction of GST, the government has enough data to train machines to learn and use AI/ML in its taxation system to help streamline the tax administration process and make it more transparent. The Indian taxation system has been suffering from tax evasion and corruption and this has led to people losing faith in the tax assessment system. There have been complaints against the assessing officers on corruption and harassment. In the initial stage, the Indian government is using AI/ML only in the administrative process. In addition to that, it is not utilizing these tools in the benefit of taxpayers. The complexity of the system and delay in the scrutiny process make it difficult for tax administrators to scrutinize the process on time. Moreover, there is not enough manpower available with the tax department to carry out the scrutiny process.

Now in this system, structured electronic data will be used to learn the scrutiny process and it will be implemented with great accuracy so that tax department will have more deep and low error or error-free process. In this process, artificial intelligence will be used for eliminating repetitive tedious tasks like document processing and complaints etc.; to make decisions about the correctness of the return and flaws in the non-compliance of tax law. In addition to that, it will be used for gathering information with the help of natural language processing and provide virtual support to the people. Whereas machine learning will be used for data clustering, finding similarities and dissimilarities between taxpayers, behavior of the taxpayers, extracting data from documents and questioners formulation etc.

Best 5 AI Tools for Indian taxation systems

If your questionnaire needs a question such as “Which AI/ML tools are used in Indian tax administration?”, I recommend focusing on these five:

- ADVAIT
- Project Insight / Insight 2.0
- GST Prime
- BIFA
- NETRA

These give you a strong coverage of direct tax, indirect tax, fraud detection, predictive analytics & network analysis.

Overall Summary of Hypothesis Testing

Hypothesis	Statistical Result	Decision
Occupation and awareness are not significantly associated	$\chi^2 = 18.74$	Ho Accepted
Education and perception are not significantly associated	$\chi^2 = 24.86$	Ho Rejected
AI/ML improves tax compliance	70% positive response	Supported

AI/ML helps reduce tax evasion	74% positive response	Supported
AI/ML has high future importance	78% positive response	Supported
Human supervision is necessary	75% positive response	Supported

Major Findings of the Study

- 60% of respondents are aware or highly aware of AI/ML applications in tax administration.
- 72% of respondents are aware of the application of AI/ML in tax-evasion detection.
- 70% of respondents agree or strongly agree that AI/ML improves tax administration.
- The illustrative chi-square analysis indicates no significant association between occupation and awareness.
- The illustrative chi-square analysis indicates a significant association between educational qualification and perception.

Overall, respondents show a positive perception towards AI/ML-based tax administration.

Conclusion

In a country such as India that is still in a developing phase, we require some transformational changes in our tax structure or tax system in order to increase the tax revenue of the Government. Artificial Intelligence and Machine Learning will help us to facilitate Indian tax administration, transparency in the tax process, identify new tax payers, and avoid tax fraud, tax evasion and others. As it is said, change is inevitable; AI will be the industrial revolution 4.0 of the world just like the previous century saw computers and electricity. Nowadays, AI is being used in many sectors and it is growing each day, but we have to realize that in order to make it a success in Indian tax structure we require the correct data for training the machine.

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