**CHAPTER 2**

**INTRODUCTION**

Dynamic and competitive business environment, companies are increasingly turning to data-driven approaches to enhance their operations, including their work culture. One such approach is leveraging machine learning algorithms like Random Forest to analyze and improve work culture. Work culture plays a critical role in shaping employee satisfaction, productivity, and overall organizational success. By harnessing the power of machine learning, companies can gain valuable insights into their work culture dynamics and identify areas for improvement.

Random Forest is a popular machine learning algorithm known for its versatility and effectiveness in classification and regression tasks. It is an ensemble learning method that constructs a multitude of decision trees during training and outputs the mode of the classes (classification) or mean prediction (regression) of the individual trees. Random Forest is particularly suitable for analyzing complex datasets with numerous input variables, making it well-suited for exploring the multifaceted nature of work culture. Through sophisticated analysis, Random Forest can pinpoint the key drivers influencing work culture and identify areas ripe for improvement. Armed with these insights, organizations can strategically tailor interventions to bolster positive aspects of their work culture while mitigating areas of concern. Moreover, the predictive capabilities of Random Forest enable companies to anticipate shifts in employee satisfaction and retention, allowing for proactive measures to maintain a vibrant and cohesive workplace. Embracing machine learning in the pursuit of optimizing work culture not only enhances employee morale and productivity but also positions companies for sustained growth and competitiveness in today's dynamic business landscape.

* 1. **ARTIFICIAL INTELLINGENCE:**

Artificial intelligence (AI) is the ability of a computer program or a machine to think andlearn. It is also a field of study which tries to make computers "smart". As machines become increasingly capable, mental facilities once thought to require intelligence are removed from the definition. AI is an area of computer sciences that emphasizes the creation of intelligent machines that work and reacts like humans. Some of the activities computers with artificial intelligence are designed for include: Face recognition, Learning, Planning, Decision making etc.,

Artificial intelligence is the use of computer science programming to imitate human thought and action by analysing data and surroundings, solving or anticipating problems and learning or self-teaching to adapt to a variety of tasks.

surveillance.

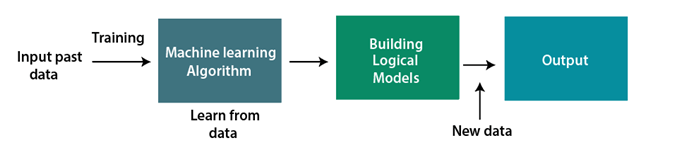
* 1. **MACHINE LEARNING**

Machine learning is a growing technology which enables computers to learn automatically from past data. Machine learning uses various algorithms for**building mathematical models and making predictions using historical data or information.** Currently, it is being used for various tasks such as**image recognition, speech recognition, email filtering, Facebook auto-tagging, recommender system,** and many more.

Machine Learning is said as a subset of **artificial intelligence** that is mainly concerned with the development of algorithms which allow a computer to learn from the data and past experiences on their own. The term machine learning was first introduced by **Arthur Samuel**in**1959.** We can define it in a summarized way as: “Machine learning enables a machine to automatically learn from data, improve performance from experiences, and predict things without being explicitly programmed”.

A Machine Learning system **learns from historical data, builds the prediction models, and whenever it receives new data, predicts the output for it.** The accuracy of predicted output depends upon the amount of data, as the huge amount of data helps to build a better model which predicts the output more accurately.

Suppose we have a complex problem, where we need to perform some predictions, so instead of writing a code for it, we just need to feed the data to generic algorithms, and with the help of these algorithms, machine builds the logic as per the data and predict the output. Machine learning has changed our way of thinking about the problem. The below block diagram explains the working of Machine Learning algorithm:



* + 1. **Features of Machine Learning:**
* Machine learning uses data to detect various patterns in a given dataset.
* It can learn from past data and improve automatically.
* It is a data-driven technology.
* Machine learning is much similar to data mining as it also deals with the huge amount of the data.
  + 1. **Classification of Machine Learning**

At a broad level, machine learning can be classified into three types:

1. Supervised learning
2. Unsupervised learning
3. Reinforcement learning

### 1) Supervised Learning

Supervised learning is a type of machine learning method in which we provide sample labeled data to the machine learning system in order to train it, and on that basis, it predicts the output.

The system creates a model using labeled data to understand the datasets and learn about each data, once the training and processing are done then we test the model by providing a sample data to check whether it is predicting the exact output or not.

The goal of supervised learning is to map input data with the output data. The supervised learning is based on supervision, and it is the same as when a student learns things in the supervision of the teacher. The example of supervised learning is **spam filtering.**

Supervised learning can be grouped further in two categories of algorithms:

* **Classification**
* **Regression**

### 2)Unsupervised Learning

Unsupervised learning is a learning method in which a machine learns without any supervision.The training is provided to the machine with the set of data that has not been labeled, classified, or categorized, and the algorithm needs to act on that data without any supervision. The goal of unsupervised learning is to restructure the input data into new features or a group of objects with similar patterns.

In unsupervised learning, we don't have a predetermined result. The machine tries to find useful insights from the huge amount of data.

It can be further classifieds into two categories of algorithms:

* **Clustering**
* **Association**

**Random forest:**

**Random Forest is a powerful machine learning algorithm that belongs to the ensemble learning category. It's widely used for both classification and regression tasks due to its flexibility, scalability, and robustness.**

**Here's how Random Forest works:**

**Ensemble of Decision Trees: Random Forest builds multiple decision trees during the training phase. Each tree is trained on a random subset of the training data and a random subset of the features. This randomness helps to reduce overfitting and ensures that each tree is diverse.**

**Voting: During prediction, each decision tree in the forest independently predicts the outcome. For classification tasks, the mode (most common) prediction among all trees is taken as the final prediction. For regression tasks, the mean prediction of all trees is computed.**

**Bootstrap Aggregation (Bagging): Random Forest employs a technique called bagging, which involves training each decision tree on a bootstrap sample of the training data. A bootstrap sample is created by randomly selecting data points from the original dataset with replacement. This process helps to create diverse trees and reduce the variance of the model.**

* 1. **LITERATURE REVIEW**

# **[1] Title:** Machine learning and role of artificial intelligence in optimizing work performance and employee behavior

# **Authors:** K.K. Ramachandran

# **Description:**

# In today’s business world, firms are using analytics to diving deeper into their data to improve productivity, acquire a competitive edge, and boost their bottom lines. That is why businesses are eager to integrate machine learning (ML) and artificial intelligence (AI) because they want a faster, more accurate result. In addition, machine learning and artificial intelligence improved productivity by reducing repetitive tasks. As a result, nearly every sector in the world intends to use artificial intelligence and ML. Artificial intelligence and ML have various roles in business, ranging from enhancing employee and customer interactions to discovering patterns in massive amounts of data to automating monotonous activities. The goal is to seize the opportunity that artificial intelligence provides in employee success and productivity. Implementing artificial intelligence and machine learning may be a vital tool for any company seeking quantitative help in their decision-making since it can analyze vast quantities of data and spit forth trend directions and actionable suggestions. AI helps employees and businesses to set and achieve better goals results. This paper highlights the impact of using artificial intelligence and ML to enhance employee behaviour and work outcome. This research also provides insights into artificial intelligence, which will usher in a new era in industry.

# **[2] Title:** A review of machine learning applications in human resource management

# **Authors:** Swati Garg

# **Description:**

This paper reviews 105 Scopus-indexed articles to identify the degree, scope and purposes of machine learning (ML) adoption in the core functions of human resource management (HRM).A semi-systematic approach has been used in this review. It allows for a more detailed analysis of the literature which emerges from multiple disciplines and uses different methods and theoretical frameworks. Since ML research comes from multiple disciplines and consists of several methods, a semi-systematic approach to literature review was considered appropriate. Findings The review suggests that HRM has embraced ML, albeit it is at a nascent stage and is receiving attention largely from technology-oriented researchers. ML applications are strongest in the areas of recruitment and performance management and the use of decision trees and text-mining algorithms for classification dominate all functions of HRM. For complex processes, ML applications are still at an early stage; requiring HR experts and ML specialists to work together.

**[3] Title:** Application of machine learning models and artificial intelligence to analyze annual financial statements to identify companies with unfair corporate culture

**Authors:** Joanna Wyrobek

**Description:** The purpose of the publication was to create a model that, based on the annual financial statements, identifies the risk of significant financial irregularities occurring in the enterprise. These irregularities may relate to different types of financial fraud that do not necessarily affect the annual financial statements. A characteristic feature of irregularities is that they are large-scale and will have a drastic impact on the company’s reputation. The results of the research show that machine learning and artificial intelligence algorithms were able to learn to recognize patterns of such scams and can detect them very effectively. An element of the novelty of the presented research is that it shows the possibility of training algorithms to recognize fraud based on information that is often not related directly to the observed fraudulent activities. The practical importance of research is the possibility of using the model in the decision-making process in the enterprise. The model allows assessing the risk that a potential business partner may commit financial fraud, which requires careful examination of the integrity of such an enterprise.

**[4] Title:** A comparative analysis of machine learning systems for measuring the impact of knowledge management practices

**Authors:** Dursun Delen

# **Description:**

# Knowledge management (KM) has recently emerged as a discrete area in the study of organizations and frequently cited as an antecedent of organizational performance. This study aims at investigating the impact of KM practices on organizational performance of small and medium-sized enterprises (SME) in service industry. Four popular machine learning techniques (i.e., neural networks, support vector machines, decision trees and logistic regression) along with statistical factor analysis (EFA and CFA) are used to developed predictive and explanatory models. The data for this study is obtained from 277 SMEs operating in the service industry within the greater metropolitan area of Istanbul in Turkey. The analyses indicated that there is a strong and positive relationship between the implementation level of KM practices and organizational performance related to KM. The paper summarizes the finding of the study and provides managerial implications to improve the organizational performance of SMEs through effective implementation of KM practices.

# **[5] Title** : Using Machine Learning in Business Process Re-Engineering

# **Authors:** Younis Al-Anqoudi

# **Description:**

A business process re-engineering value in improving the business process is undoubted. Nevertheless, it is incredibly complex, time-consuming and costly. This study aims to review available literature in the use of machine learning for business process re-engineering. The review investigates available literature in business process re-engineering frameworks, methodologies, tools, techniques, and machine-learning applications in automating business process re-engineering. The study covers 200+ research papers published between 2015 and 2020 in reputable scientific publication platforms: Scopus, Emerald, Science Direct, IEEE, and British Library. The results indicate that business process re-engineering is a well-established field with scientifically solid frameworks, methodologies, tools, and techniques, which support decision making by generating and analysing relevant data. The study indicates a wealth of data generated, analysed and utilised throughout business process re-engineering projects, thus making it a potential greenfield for innovative machine-learning applications aiming to reduce implementation costs and manage complexity by exploiting the data’s hiding patterns. This suggests that there were attempts towards applying machine learning in business process management and improvement in general. They address process discovery, process behaviour prediction, process improvement, and process optimisation. The review suggests that expanding the applications to business process re-engineering is promising. The study proposed a machine-learning model for automating business process re-engineering, inspired by the Lean Six Sigma principles of eliminating waste and variance in the business process.