

# Future Prospects And Developments In Human Intelligence Identification Using Artificial Intelligence

Mrs. Sinu J. Nambiar , D Y Patil , Dr. Purushottam R. Patil

Research Scholar, Department of Computer science and Engineering, School of Computer sciences and Engineering.

Assistant Professor, Institute of Technology, Pimpri, Pune

Associate Professor, Department of Computer science and Engineering, School of Computer sciences and Engineering.

## Abstract:

Human beings possess more than one intelligences, each one of them can be defined as the expertise with which an individual functions or solves problems or the area of creativity, which is considered as the basic inherent intelligence in the individual. Dr.Howard Gardner through his research has made it evident to the world the existence of multiple intelligences: Linguistic, logical mathematical, musical, spatial, bodily kinesthetic, interpersonal, intrapersonal, and naturalist intelligence highly depends on several factors like age, understanding of the environment and the extent of isolation of the brain. Various mechanisms like systematic review and meta-analysis using the traditional paper-and-pencil isolated tasks through several activities enabled the assessment of the intelligence inherently present in an individual in one-to-two-hour sessions and further processing of the collected data. By using Artificial Intelligence algorithms an attempt can be made to develop a framework to identify the multiple intelligence in an individual based on Multiple Intelligence Theory.

**Keywords:** Multiple Intelligence, Linguistic, logical mathematical, musical, spatial, bodily kinesthetic, interpersonal, intrapersonal, naturalist intelligence, Artificial Intelligence, learning.

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## 1. Introduction

The Theory of Multiple Intelligences was developed in 1983 by Howard Earl Gardner and it was first published in his book *Frames Of Mind: The Theory Of Multiple Intelligences* [1]. Its basis opposes the idea of a single dominant type of intelligence, and instead acknowledges the existence of multiple intelligences, that compose a unique blend in each individual. Despite its initially hesitant reception, the theory of multiple intelligences is now widely accepted in learning, providing a unique view of how people learn. Gardner explains that his theory

empowers learners and doesn't restrict them to one modality of learning, allowing multiple ways to teach, rather than just one. Gardner also stated that the best way to take advantage of the theory of multiple intelligences is to first drop the term "learning styles," which creates confusion, than individualize learning, suggesting a learner-centered approach, and, finally, pluralize learning by incorporating multiple methods into it, and not just one.

The theory of multiple intelligences also has strong implications for adult learning and development. Many adults find themselves in jobs that do not make optimal use of their most highly developed intelligences. The theory of multiple intelligences gives adults a whole new way to look at their lives, examining potentials that they left behind in their childhood but now have the opportunity to develop through courses, hobbies, or other programs of self-development.

## 2. Related Work

Artificial Intelligence Algorithm is a field of study where we want computers to do the things which humans do. Obviously, computers are faster when it comes to calculation and analytical abilities, but computers cannot take decisions on their own, that is they don't have the ability to make a decision. Empowering computers to make a decision with their own intelligence is Artificial Intelligence [1].

Several organizations have imbibed artificial intelligence algorithms in different areas to automate the different processes and to avail the benefits provided by the technology. Artificial Intelligence algorithm is a broad field consisting of Machine Learning algorithms and Deep Learning Algorithms. These algorithms' main goal is to enable computers to learn on their own and make a decision or find useful patterns. Artificial Intelligence algorithms Learn from the data itself. In a broader sense, learning can be divided into 3 categories:

- Supervised Learning: When input and output, both labels are known, and the model learns from data to predict output for similar input data.
- Unsupervised Learning: When output data is unknown, or it is needed to find patterns in data given, such type of learning is unsupervised learning.
- Reinforcement Learning: Algorithms learn to perform an action from experience. Here algorithms learn through trial and error, which action yields the greatest rewards. The objective is to choose actions that maximize the expected reward over a given amount of time[1].

According to problems that humans encounter and solve, there are three categories in which these algorithms can be divided to perform the same actions.

- Classification: Humans do make decision-based on classification; algorithms like Naïve Bayes, logistic regression, SVM, etc.
- Regression: Here, the output is continuous; there is no specific category. Algorithms like Linear regression, gradient boosting, random forest, etc.
- Clustering: To make a decision on given input but distinguishing odd ones algorithms like K-means clustering, Hierarchical clustering, etc. are used [1].

Machine learning and deep learning are types of Artificial Intelligence which consists various algorithms use to several different purposes of the applications. Linear regression, logistic regression, K-mean clustering, Support Vector Machine (SVM), Random Forest, Naïve Bayes, K-Nearest Neighbor(K-NN) etc. are different algorithms of machine learning having various applications in medicine. Artificial Neural Network (ANN), Convolutional Neural Network (CNN), Recurrent Neural Network (RNN) etc. are the deep learning algorithms providing good efficiency in automating different tasks performed by clinicians. Machine learning and deep learning paved the way in the field of human enabled AI world to assist us by automating the process of identifying the intelligence accurately and precisely.

Calculations assume a fundamental part and the gathering examination and ANN calculation are used to distinguish the differentiations between understudies' information sources and learning styles [3].

Insight instructing may take a few structures, including data handling, inventive learning conditions, and data prescient investigation. Man-made intelligence empowered training is turning out to be more significant [12][7]. An insightful arrangement of instruction is one that conveys opportune and individualized preparing as well as evaluation to the two instructors and understudies. Various procedures are utilized in a computer based intelligence framework for learning evaluation, idea, dynamic learning, and information gathering in light of AI [14][6].

Moreover every individual has a different or one' s own learning style based on the inherent intelligence.

### 3. Proposed Work

The proposed work is as follows:

- Data Collection of several individuals.

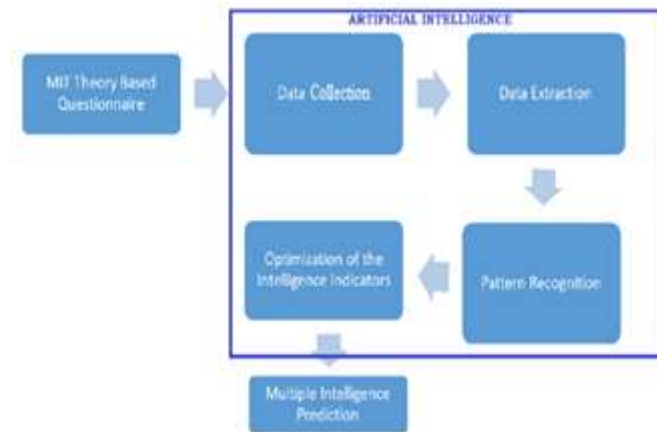


Fig:1 Proposed System

- Data Preprocessing for extracting and clustering factors from the data collected.
- Model Implementation to determine the strength of different intelligences.
- Performance Evaluation to determine the efficiency of proposed techniques in terms of accuracy and precision.
- Use of ANN and AI algorithms for achieving the above stages.

#### 4. Proposed Methodology

Human Intelligence is defined as the quality of the mind that is made up of capabilities to learn from past experience, adaptation to new situations, handling of abstract ideas and the ability to change his/her own environment using the gained knowledge. Thus Fig1 displays an amalgamation of both fields Multiple Intelligence and artificial intelligence i.e. proposed to predict the future prospects and developments in human intelligence identification using artificial intelligence.

#### 5. Experimental Evaluation:

Task:

Knowing the intelligence of a person according to the answers given for the questions asked in a survey.

Data:

Survey data has been collected from 10 thousand people and the survey contains 65 different questions which are related to 10 different intelligences based on Multiple Intelligence Theory based Questionnaires. The different intelligences are:

- 1)Gross Bodily Intelligence
- 2)Fine Bodily Intelligence
- 3)Interpersonal Intelligence
- 4)Logical Intelligence
- 5)Linguistic Intelligence
- 6)Graphic Visual Intelligence
- 7)Spatial Visual Intelligence
- 8)Musical Intelligence
- 9)Intrapersonal Intelligence
- 10)Naturalistic Intelligence

These 65 different questions are multiple choice questions, which are given with the options:

- 1)strongly agree
- 2) agree
- 3) partly agree
- 4) disagree

Different models to train the data to predict the intelligence of the person who has taken the survey. The different models applied on the collected data and the accuracy score is computed based on confusion matrix are:

### 5.1 KMeans model:

Hypothesis:

KMeans as was chosen model as the data has 10 different labels, where KMeans is a model that can classify each label into different clusters and segregate the data easily which gives us way good results in predicting the intelligence

- Data is fit into KMeans model and accordingly different intelligence are predicted according to the answers given by different people
- No\_of clusters = 10(k=10)
- Acc\_score = 0.0901(9.01%)

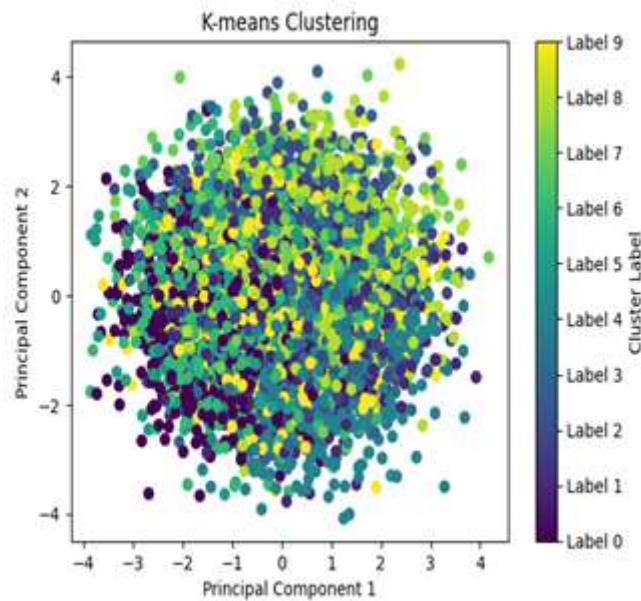


Fig: 2 Graphical representation of the clusters before training the data with k- means model

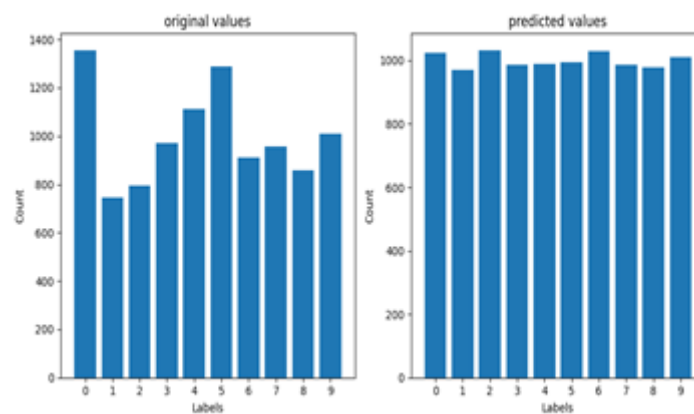


Fig: 3 Graphical representation of the original intelligence and the predicted intelligence using K-Means

A heatmap is a graphical representation of data that uses a system of color-coding to represent different values. Heatmaps are used in various forms of analytics. Using a heatmap to visualise a confusion matrix, time-series movements, temperature changes, correlation matrix and SHAP interaction values. Heatmaps can bring your data to life. Versatile and eye-catching. There are many situations where they can highlight important relationships in the data being analyzed.

In a correlation heatmap, each variable is represented by a row and a column, and the cells show the correlation between them. Heatmaps show relationships between variables. These variables are plotted on both axes. We look for patterns in the cell by noticing the color change. It only accepts numeric data and plots it on the grid, displaying different data values by varying color intensity

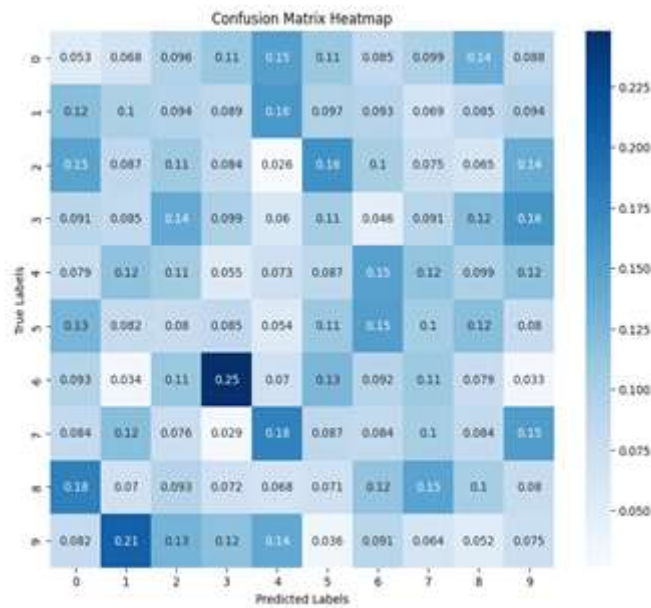


Fig 4 Heatmap between true labels and predicted labels of the K-Means model

Drawback:

KMeans is not able to separate the labels using the data since the data is huge, so the accuracy rate is low that is 9.1%

## 5.2 Decision Tree Classifier

Hypothesis:

We chose Decision Tree as our model as Decision Tree can work both on categorical and numerical data and can easily classify data into different classes

6. Data is split into 2 parts
  - Training – 80
  - Testing – 20%
  - Training data is trained with Decision Tree Classifier model

Accuracy score = 24.5% (0.2455)

Drawback:

Decision trees can suffer from overfitting, leading to poor generalization and sensitivity to small changes in the training data. Therefore the accuracy score is 24.5%

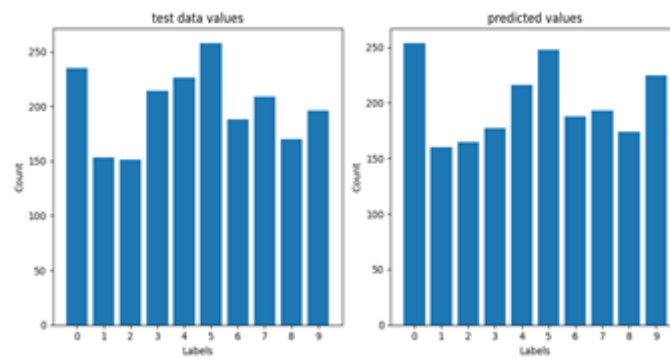


Fig 5: Graphical representation of Test data values and the predicted values of the Decision Tree model



Fig 6 Heat map between Y test values and the predicted values of the Decision Tree model

### 5.3 Random Forest

#### Hypothesis:

Random forests method is chosen because random forests can effectively handle high-dimensional data, provide robustness against overfitting, and offer reliable feature importance estimates.

- Data is split into 2 parts
- Training Data – 80%
- Testing Data – 20%
- Training Data is trained using Random Forest Classifier model



Accuracy score = 58.45%

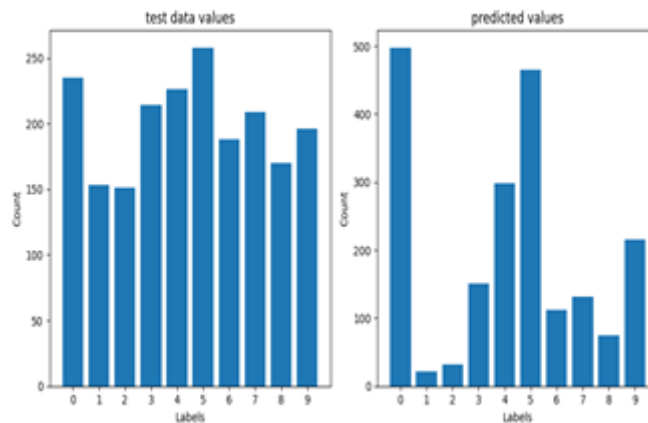


Fig 7 Graphical representation of Test data values and the predicted values of the Random Forest model



Fig 8 Heat map between Y test values and the predicted values of the Random Forest model

**Drawback:**

Random Forests could be inadequate feature selection, insufficient training data, or imbalanced class distribution, which may affect the model's ability to effectively learn patterns and make accurate predictions. Additionally, hyper parameter tuning and model optimization might be necessary to improve performance.

**5.4 K Neighbor classifier**

Hypothesis:

KNN (K-Nearest Neighbors) is a simple and intuitive classification algorithm that can handle complex decision boundaries and is robust to noisy data.

- Data is split into 2 parts
- Training data – 80%
- Testing data – 20%
- Training data is trained using KNeighborsClassifier model

No of neighbors = 360

Accuracy score = 60.55%

**Drawback:**

KNN is sensitive to the choice of the number of neighbours (k) and the distance metrics used, which can significantly impact its performance and results. KNN struggles with imbalanced datasets, as it can be biased towards the majority class due to its reliance on local neighbourhood information

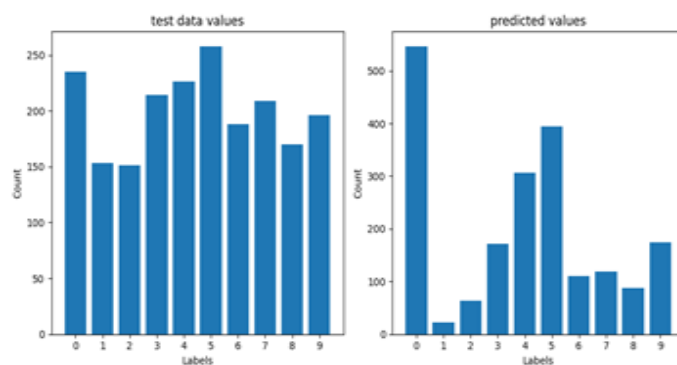


Fig9 : Graphical representation of Test data values and the predicted values of the KNN model.

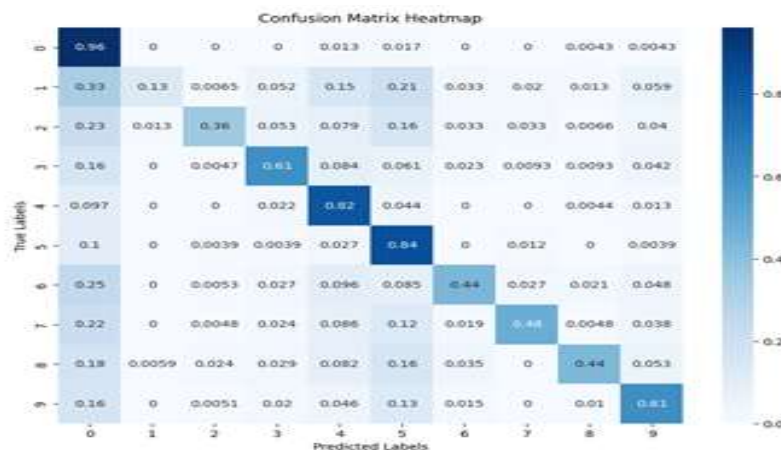


Fig 10: Heat map between Y test values and the predicted values of the KNN model

## 5.5 ANN model:

### Hypothesis:

Artificial Neural Networks (ANNs) because ANN model can capture complex patterns and relationships in data, making them powerful models for classification problems with high-dimensional data and non-linear decision boundaries.

- Data is split into 2 parts
- Training data – 80%
- Testing data – 20%
- Training data is used to train the ANN model using
- Loss function – categorical\_crossentropy
- Activation function – relu and softmax
- Optimizer – adam
- Metrics – accuracy
- No of epochs – 100
- Batch size – 32
- Test accuracy = 82.6%

Test loss = 0.5278

Fig 11 : Graphical representation of Test data values and the predicted values of the ANN model  
A confusion matrix is a summary of prediction results on a classification problem. The number of correct and incorrect predictions are summarized with count values and broken down by each class. This is the key to the confusion matrix.

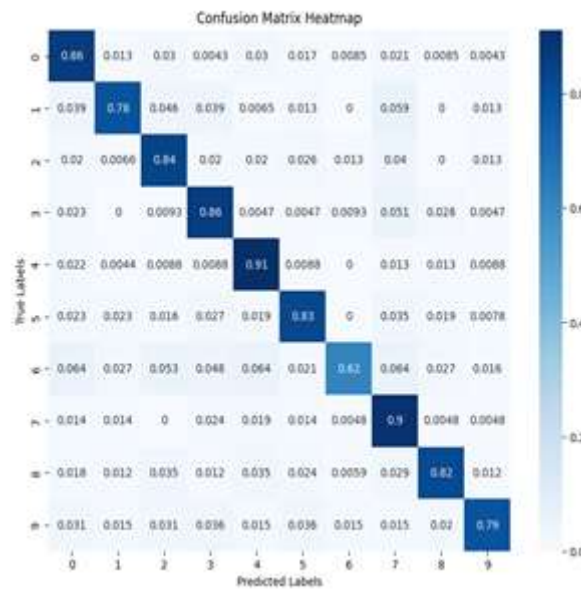


Fig 12 : Heat map between Y test values and the predicted values of the ANN model

A confusion matrix is a table that is used to define the performance of a classification algorithm. A confusion matrix visualizes and summarizes the performance of a classification algorithm. Target values are partitioned into 20 intervals. True values and prediction values are then discretized into those intervals. Confusion matrix between true values and prediction values is formed by counting the number of matches within each interval.

Heatmaps show relationships between variables. These variables are plotted on both axes. An attempt is made to look for patterns in the cell by noticing the color change. It only accepts numeric data and plots it on the grid, displaying different data values by varying color intensity.

## 7. Conclusion

Artificial Intelligence algorithms constitute both Machine Learning algorithms and Deep Learning Algorithms which enables the machines the ability to recognize patterns, make decisions and draw useful conclusions which basically means that it renders the machines the capability to acquire intelligence identical to human beings. This paper focuses on several approach for learning (Supervised, Unsupervised, and Reinforcement learning) for enabling the Artificial intelligence algorithms to compute accurate results. Further, these algorithms are categorized into three categories according to the type of problems namely: classification, regression and clustering methods. Out of the applied models namely K Means, Decision tree classifier, Random Forest Classifier, K Neighbors classifier and ANN. ANN provides the precise

results. The proposed system mainly works on substitution of Trained instructor by an Artificial Intelligence powered system, reduction of the cost incurred in performing Psychometrics analysis and reduction of the time involved in getting the analysis done.

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