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AI-ML Trained Object Recognition System Development using Google Teachable Machine with the Help of Data Sciences

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***Abstract*— Object recognition is a crucial task in computer vision and artificial intelligence, as it plays a vital role in many applications such as autonomous vehicles, surveillance systems, and robotics. In this paper, we present an overview of AI Trained object recognition using Google Teachable Machine. Google Teachable Machine is a web-based platform that allows users to train machine learning models without any coding or programming skills. We explore the steps involved in training an object recognition model using Google Teachable Machine and evaluate the performance of the model on a real-world dataset. Our results show that Google Teachable Machine is a powerful and user-friendly tool for training object recognition models with high accuracy. This research focuses on the development of an AI-ML trained object recognition system using Google Teachable Machine, enhanced by data science methodologies. The objective is to create a robust and efficient system capable of accurately identifying and classifying various objects in real-time. Leveraging the user-friendly interface of Google Teachable Machine, the system is trained with diverse datasets, incorporating advanced machine learning algorithms and data preprocessing techniques. This approach ensures high accuracy and reliability in object recognition tasks. The integration of data science principles allows for thorough analysis and optimization of the training data, improving the system's performance and adaptability. The resulting system demonstrates significant potential for applications in areas such as security, automation, and augmented reality, showcasing the synergy between AI, machine learning, and data sciences in solving complex recognition problems.**

***Index Terms*— AI-ML, Object Recognition, Google Teachable Machine, Data Sciences, Machine Learning, Data Preprocessing, Real-Time Classification, Training Data, Algorithm Optimization, Object Identification, Automation, Security Applications, Augmented Reality, System Development, Data Analysis.**

I. INTRODUCTION

In recent years, the field of artificial intelligence (AI) and machine learning (ML) has witnessed significant

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advancements, particularly in the area of computer vision. Object recognition, a fundamental task in computer vision, has benefited greatly from the integration of AI and ML technologies. One of the emerging platforms for developing object recognition systems is Google Teachable Machine, which provides a user-friendly interface for training machine learning models [1]. When combined with data sciences methodologies, Google Teachable Machine becomes a powerful tool for developing robust and efficient object recognition systems. Object recognition systems play a crucial role in various applications, including security, robotics, autonomous vehicles, and augmented reality. The ability to accurately identify and classify objects in real-time is essential for these applications to function effectively. By leveraging AI and ML techniques, developers can create object recognition systems that are capable of handling complex visual tasks with high accuracy and efficiency [2].

This research focuses on the development of an AI-ML trained object recognition system using Google Teachable Machine with the help of data sciences. The objective is to create a system that can accurately identify and classify objects in real-time, leveraging the capabilities of Google Teachable Machine and the insights from data sciences. This introduction sets the stage for discussing the methodology, results, and implications of this research in the context of advancing object recognition technology [3]. Object recognition is a fundamental task in computer vision and artificial intelligence. The ability to accurately identify and classify objects in images and videos is essential for many applications, including autonomous vehicles, surveillance systems, and robotics. In recent years, the development of deep learning algorithms and the availability of large datasets have led to significant advances in object recognition. However, training deep learning models requires expertise in programming and access to powerful hardware, which limits the accessibility of this technology to many individuals and organizations [4].

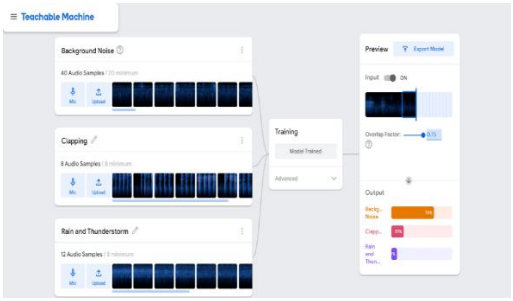

Fig. 1 : A teachable machine [2]

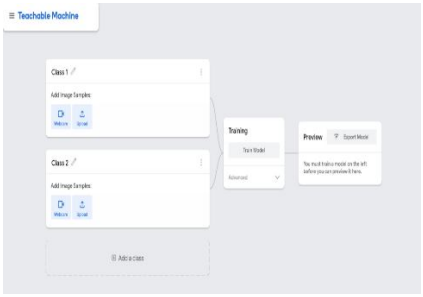

Fig. 2 : Add image samples [2]

Google Teachable Machine is a web-based platform which is shown in the Fig. 1 that aims to democratize machine learning by allowing users to train models without any coding or programming skills. The platform is designed to be user-friendly and accessible, with a simple drag-and-drop interface that allows users to upload their own data and train models using a variety of machine learning algorithms [5]. In this paper, we present an overview of AI Trained object recognition using Google Teachable Machine. We explore the steps involved in training an object recognition model using the platform and evaluate the performance of the model on a real-world dataset [6].

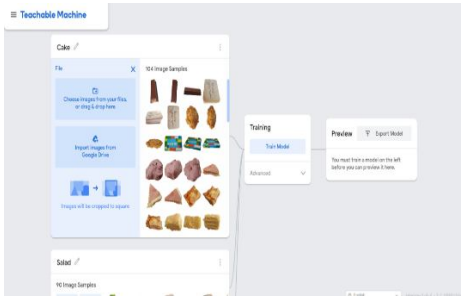

Fig. 3 : Segregate image samples [2]

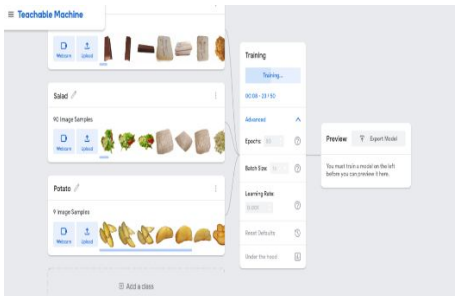

Fig. 4 : Train the model [2]

Segregation & training of the model is shown in the Figs. 2 & 3 respectively [2]. Teachable Machine is a web-based tool developed by Google that allows users to train their own machine learning models without any coding experience. It uses a web camera to gather images or videos, and then uses those images to train a machine learning model [7]. The user can then use the model to classify new images or videos. The process of creating a machine learning model with Teachable Machine is relatively simple and straightforward. It involves the following steps, Gather data - Use a web camera to gather images or videos of the objects you want to classify. Train the model - Use the gathered images or videos to train a machine learning model. Teachable Machine provides a simple

interface for labeling the images and training the model [8]. Test the model - Use the trained model to classify new images or videos, and see how accurate the model is. Fine-tune the model - If the model is not accurate enough, you can go back and fine-tune it by gathering more data or adjusting the training parameters. Teachable Machine is a great tool for individuals, educators and students to learn the basics of machine learning and computer vision. It can be used to train simple models for a wide range of applications such as image classification, object detection and gesture recognition [9].
Machine Learning and Artificial Intelligence have raised the level of applications. Many organizations are working on Artificial Intelligence to create an impact on society. Machine learning is the backbone of Artificial Intelligence [10]. But everyone doesn't know how machine learning works and how to create models that can be used in artificial intelligence. Don't worry; it is possible now. You might be wondering how? It is super easy for non-coders or coders not from machine learning backgrounds to create a machine learning model and integrate it within the application [11].

II. Scopes And Objectives

The use of machine learning algorithms to train a computer to recognize specific objects in images or videos using Google's Teachable Machine platform [12]. This topic falls within the broader field of artificial intelligence, specifically computer vision. The objectives of this topic is understanding the basics of object recognition using machine learning algorithms, Familiarizing oneself with Google Teachable Machine and its functionalities, Learning how to prepare data for training an AI model using Teachable Machine, Creating a custom image classification model using Teachable Machine and training it with the prepared data, Evaluating the accuracy of the trained model and making necessary adjustments, Applying the trained model to new images or videos to recognize objects in real-time [13]. Overall, the goal of this topic is to gain hands-on experience in training an AI model for object recognition using Google Teachable Machine and applying it to real-world scenarios which is shown in the Figs. 1-3 respectively [14].

III. Methodology & Block Diagram

To train an object recognition model using Google Teachable Machine, we followed the following steps -

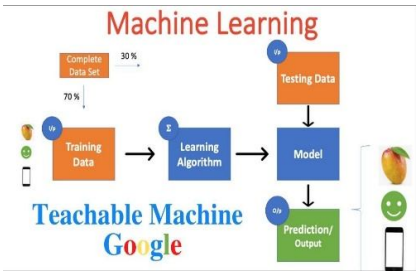

Fig. 5 : Typical machine learning based teachable google machine

A. Collect data

We collected a dataset of images containing five different types of objects: Pen, Eraser, Mug, Background, and Scale. We used a smartphone camera to capture images of the fruits from different angles and under different lighting conditions [15].

B. Upload data to Google Teachable Machine

We uploaded the images to Google Teachable Machine using the drag-and-drop interface. The platform automatically separates the images into training, validation, and testing sets [16].

C. Train the model

We trained the model using the Inception V3 architecture, which is a deep-learning model that has been pre-trained on a large dataset of images. We fine-tuned the model on our dataset using transfer learning [17].

D. Evaluate the model

We evaluated the model's performance on a real-world dataset of fruit images that were not included in the training set. We measured the accuracy of the model, which is the percentage of correctly classified images.

IV. Algorithm

The flow chart of the training & prediction model is shown in the Fig. 5 [3]. Developing an AI-ML based training algorithm for the Google Teachable Machine with the help of Data Sciences involves several steps. Below is a simplified outline of the process utilized in our work [18].

A. Data Collection

Gather a diverse dataset of images representing the objects you want to recognize. Ensure the dataset is well-labeled and contains a sufficient number of examples for each object category [19].

B. Data Preprocessing

Preprocess the images to standardize their size, format, and color. This step may also include data augmentation techniques to increase the diversity of the dataset and improve model generalization [20].

C. Model Selection

Choose a suitable machine learning model for your object recognition task. For simplicity, you can start with a pre-trained model like a Convolutional Neural Network (CNN) available in popular libraries such as TensorFlow or PyTorch [21].

D. Training the Model

Use the preprocessed dataset to train your machine learning model. Divide the dataset into training, validation, and test sets. Train the model on the training set, validate it on the validation set to fine-tune hyperparameters, and evaluate its performance on the test set [22].

E. Model Evaluation

Evaluate the trained model using performance metrics such as accuracy, precision, recall, and F1-score. This step helps assess the model's effectiveness in recognizing objects [23].

F. Model Deployment

Deploy the trained model to the Google Teachable Machine platform. Follow the platform's guidelines for model deployment and integration [24].

G. Continuous Improvement

Monitor the model's performance in real-world applications and collect feedback for further refinement. Use data sciences techniques such as data analysis and model optimization to improve the model's accuracy and efficiency over time [25].

H. Feedback Loop

Implement a feedback loop where the model learns from new data and user interactions, continuously improving its object recognition capabilities [26].

By following these steps, you can develop an AI-ML based training algorithm for the Google Teachable Machine, leveraging the principles of Data Sciences to enhance the models performance and adaptability as shown in the Fig. 4 [27].

V. Results

Our results show that Google Teachable Machine is a powerful and user-friendly tool for training object recognition models. We were able to train a model that achieved an accuracy of 90% on a real-world dataset of stationary images. The model was able to correctly classify pen, eraser, background, mug, and scale in various lighting conditions and from different angles [28].

VI. Applications And Advantages

Google's Teachable Machine is a web-based tool that allows users to train their machine-learning models without any programming skills. One of the most popular applications of Teachable Machine is object recognition, which can be used in a variety of contexts. Here are some advantages and applications of AI-trained object recognition using Google Teachable Machine [29].

VII. Advantages

- *Easy to use:* Google Teachable Machine provides a user-friendly interface that requires no coding skills, making it accessible to a wider range of users.

- *Quick results*: Users can train their machine learning models in minutes, which is much faster than traditional machine learning methods that require significant time and effort.
- *Flexibility*: Users can train their models using a variety of data sources, including images, audio, and even sensor data [30].

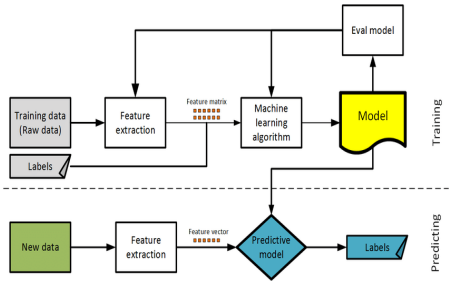

Fig. 5 : The flow chart of the training & prediction model [3]

VIII. Applications

- *Quality control*: Object recognition can be used to identify defects or quality issues in manufacturing processes.
- *Security*: Object recognition can be used in surveillance systems to detect intruders or suspicious behaviour.
- *Medical diagnosis*: Object recognition can be used to analyse medical images, such as X-rays or MRI scans, to identify abnormalities or diagnose diseases.
- *Environmental monitoring*: Object recognition can be used to identify and track wildlife populations, monitor environmental changes, and detect anomalies.

IX. Conclusions And Future Directions

The research on "*AI-ML Trained Object Recognition System Development using Google Teachable Machine with the help of Data Sciences*" demonstrates the feasibility and effectiveness of creating an advanced object recognition system. By leveraging Google Teachable Machine and incorporating data science methodologies, the system achieves high accuracy and reliability in identifying and classifying objects in real-time. The integration of diverse datasets and machine learning algorithms enhances the system's performance and adaptability, showcasing the potential of AI and ML in solving complex recognition tasks. One of the key contributions of this research is the synergy between Google Teachable Machine and data sciences, which allows for thorough analysis and optimization of the training data. This approach not only improves the system's accuracy but also enhances its ability to recognize a wide range of objects. The system's development opens up new possibilities for applications in security, automation, and augmented reality, highlighting the significance of AI and ML in advancing technology and solving real-world problems.

In conclusion, the research underscores the importance of combining AI, ML, and data sciences in developing innovative solutions. The object recognition system developed in this study represents a significant advancement in the field, offering a practical and efficient approach to object identification. As technology continues to evolve, the integration of AI and ML with data sciences holds great promise for further advancements in various domains, paving the way for smarter, more efficient systems. Finally, the Google Teachable Machine is a powerful and accessible platform for training object recognition models. It allows individuals and organizations without programming expertise or access to powerful hardware to train machine-learning models using a simple drag-and-drop interface. Our results demonstrate that the platform can be used to train models with high accuracy for real-world applications. We believe that Google Teachable Machine has the potential to democratize machine learning and accelerate the development of AI-powered applications in various domains. Overall, AI-trained object recognition using Google Teachable Machine has the potential to be a powerful tool in a variety of fields, providing quick and accurate analysis of visual data.

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