Hand Sign Detection

Team Members

Bhuvan M	4MC21IS023
Chethan Nazre S	4MC21IS034
Deekshith Chandra	4MC21IS032
Deepika R S	4MC21IS034

Under the Guidance of,

Dr. Nanditha B R

Overview of AI and ML Techniques

1 Machine Learning

Machine learning algorithms algorithms enable computers computers to learn from data without explicit programming.

2 Deep Learning

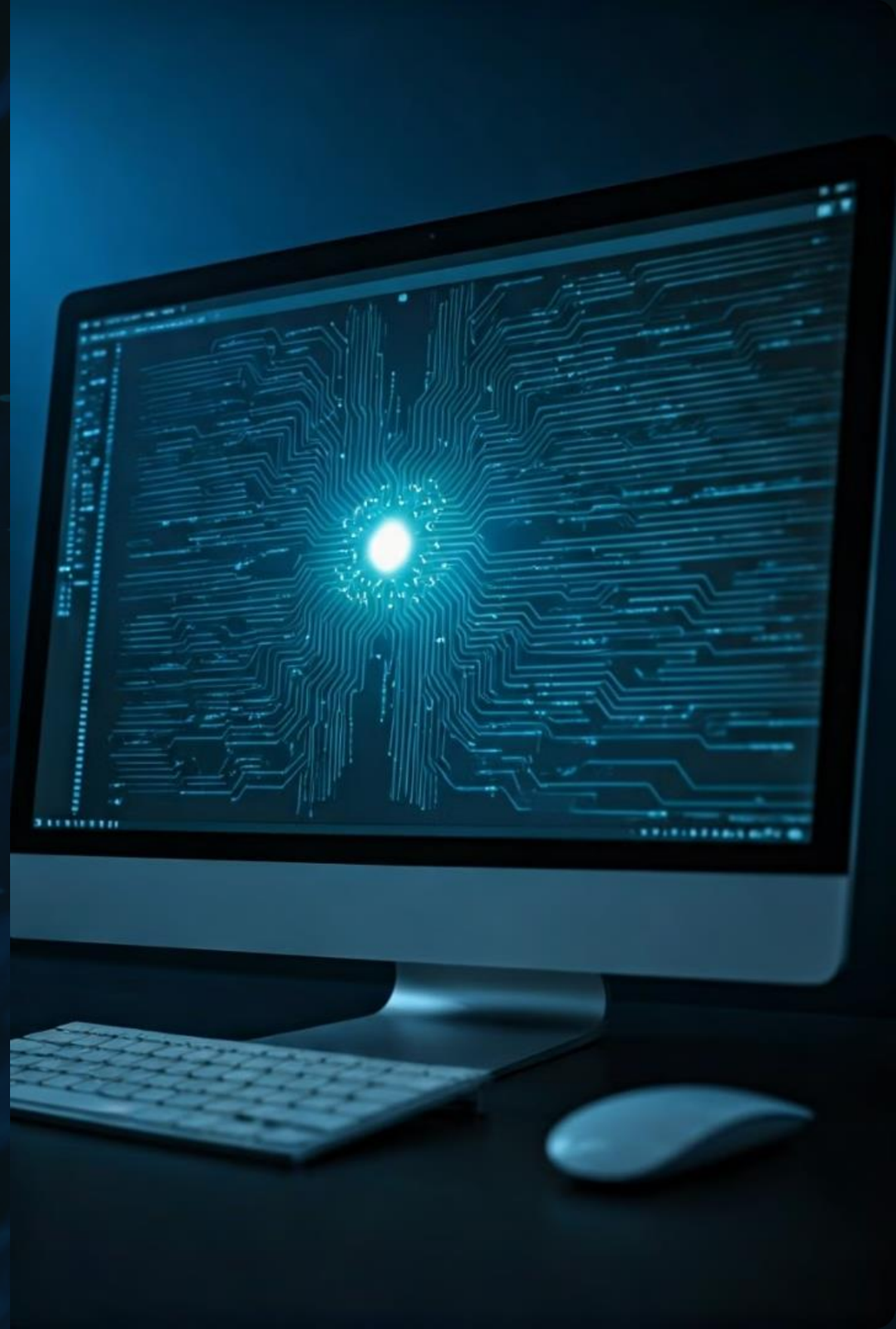
Deep learning utilizes artificial neural networks with multiple layers to extract complex patterns from data.

3 Computer Vision

Computer vision focuses on enabling computers to "see" and interpret visual information, such as images and videos.

4 Image Processing

Image processing techniques are essential for manipulating and analyzing digital images to prepare them for analysis.



Data Collection and Preprocessing

1

Data Acquisition

Collecting a large and diverse dataset of images and videos showcasing different hand signs is crucial for training robust models.

2

Data Cleaning

Removing corrupted or irrelevant data ensures the quality and accuracy of the training process.

3

Data Augmentation

Generating synthetic data variations like rotations and flips enhances the model's ability to generalize to different hand poses and lighting conditions.

Feature Extraction and Representation

Convolutional Neural Networks (CNNs)

CNNs excel at identifying patterns and features in images by applying filters to extract relevant information.

Hand Landmark Detection

Identifying key points on the hand, such as fingertips and joints, provides valuable information about the hand's shape and orientation.

Feature Descriptors

These descriptors capture the essence of the hand's shape and orientation, enabling efficient comparison and classification.

Model Architecture and Training

1

Model Selection

Choosing an appropriate model architecture, such as CNN or recurrent neural networks (RNNs), depends on the specific hand sign recognition task.

2

Training

The model learns to associate hand sign features with their corresponding labels by iteratively adjusting its internal parameters using a large dataset.

3

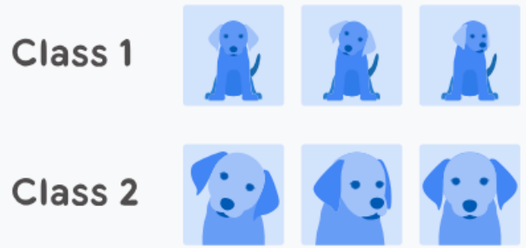
Evaluation

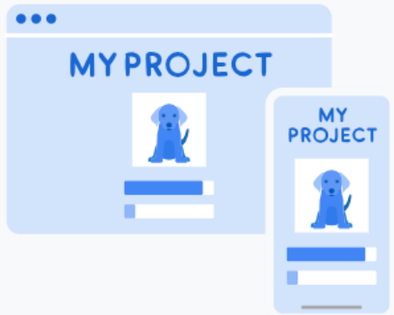
Assessing the model's performance on unseen data ensures its accuracy and generalization ability.

TEACHABLE MACHINE

Teachable Machine is a web-based tool that makes creating machine learning models fast & easy.

How do I use it?





1 Gather

Gather and group your examples into classes, or categories, that you want the computer to learn.

Video: Gather samples

2 Train

Train your model, then instantly test it out to see whether it can correctly classify new examples.

Video: Train your model

3 Export

Export your model for your projects: sites, apps, and more. You can download your model or host it online.

Video: Export your model

```
folder =
"/Users/prash/Desktop
/sign language
detection/Data/Okay"
```

1. Upload these images on teachable machine and create a model.
2. Download the model & add it to the test code

```
classifier =
Classifier("/Users/prash/Desktop/Model/keras_model.h5",
"/Users/prash/Desktop/Model/labels.txt")
```

Demonstration

Challenges and Limitations

Lighting Conditions	Shadows or poor lighting can hinder accurate feature extraction.
Hand Occlusion	Hands obscured by objects or other body parts can make detection difficult.
Hand Diversity	Variations in hand size, shape, and skin tone can impact model performance.
Sign Ambiguity	Some hand signs may be visually similar, leading to potential confusion in interpretation.

Applications and Use Cases

Sign Language Interpretation

Bridging communication gaps for people who are deaf or hard of hearing.

Human-Robot Interaction

Enabling intuitive and natural control of robots and other intelligent systems.

Gaming and Entertainment

Creating immersive and interactive gaming experiences.

Smart Home Control

Hands-free control of smart devices and appliances.

Ethical Considerations

1 **Privacy**

Ensuring responsible data collection and usage to protect users' privacy and prevent misuse.

2 **Bias and Fairness**

Addressing potential biases in the dataset and model training to ensure equitable and accurate performance.

3 **Accessibility**

Making hand sign detection accessible to all, including individuals with disabilities.

Conclusion and Future Directions

Hand sign detection has vast potential to revolutionize human-computer interaction. Future research aims to improve accuracy, robustness, and real-time performance while addressing ethical considerations.

THANK YOU..!