Title: Identify hand gestures for remote commands

Problem statement

In modern technology-driven environments, the need for intuitive and efficient remote command mechanisms is increasingly critical, particularly in contexts where physical touch is impractical or impossible (Guo et al., 2021; Munir Oudah et al., 2020). Hand gesture recognition offers a promising solution, but current models lack the accuracy and reliability needed for widespread adoption in controlling smart TVs, virtual reality interfaces, and industrial machinery (Nahla Majdoub Bhiri et al., 2023). Developing precise and robust gesture recognition models is essential to revolutionize user interfaces, enhancing accessibility for individuals with disabilities and significantly improving user experience across various interactive platforms (Guo et al., 2021). This project addresses the urgent need for improved gesture-based control systems, which will not only facilitate more inclusive technology use but also streamline operations in diverse application areas.

Computational Resources

I will use Google Colab, which provides the necessary computational resources to complete this project efficiently. Google Colab offers free access to powerful GPUs and TPUs, making it ideal for training deep learning models on large datasets. Additionally, its integration with popular machine learning libraries such as TensorFlow, Keras, and PyTorch will facilitate the implementation and testing of various models. The collaborative features of Google Colab also allow for easy sharing and iteration of the project with peers and advisors.

Proposed Data Sources

The dataset will be sourced from Kaggle.com, which contains thousands of pictures of hand signals captured from different angles and at varying frame rates for our model to learn from. This supervised classification approach aims to predict the specific hand gesture being made by a user. The predictors will include features extracted from input data, such as raw pixel data and processed image data from frames capturing the hand gestures. To find the most accurate method, we will use both traditional machine learning approaches, such as Random Forest, and deep learning approaches.

Final Deliverable

The final deliverable will be a web service application with an API that can be integrated with other programs to detect commands. The API will successfully recognize hand gestures from a camera, accommodating different frame rates, sizes, and angles.

Link to Github/Dataset:

https://github.com/Emeron16/UCSD/tree/main/16.4CapstoneSubmission

Resources

Guo, L., Zongxing, L., & Yao, L. (2021). Human-Machine Interaction Sensing Technology

Based on Hand Gesture Recognition: A Review. *IEEE Transactions on*

Human-Machine Systems, *51*, 300–309. https://doi.org/10.1109/THMS.2021.3086003

Munir Oudah, Al-Naji, A., & Javaan Chahl. (2020). Hand Gesture Recognition Based on

Computer Vision: A Review of Techniques. *Journal of Imaging*, *6*(8), 73–73.

https://doi.org/10.3390/jimaging6080073

Nahla Majdoub Bhiri, Safa Ameur, Ihsen Alouani, Mohamed Ali Mahjoub, & Anouar Ben

Khalifa. (2023). Hand gesture recognition with focus on leap motion: An overview,

real world challenges and future directions. *Expert Systems with Applications*, *226*,

120125–120125. https://doi.org/10.1016/j.eswa.2023.120125