# Enhancing Human Detection in Images Using HOG-SVM and Interactive Interface

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*Abstract*--**In the rapidly evolving field of computer vision, human detection remains a crucial and challenging task. This paper presents an innovative approach to human detection in images, utilizing the Histogram of Oriented Gradients (HOG) coupled with a Support Vector Machine (SVM) algorithm. Our method significantly enhances detection accuracy while maintaining computational efficiency. Furthermore, we introduce an interactive interface, enabling users to easily apply our detection system to various image inputs. The combination of advanced detection algorithms with user-friendly interaction represents a noteworthy contribution to the field of real-time image processing and human detection.**

## I. INTRODUCTION

T HE automated detection of humans in digital images is a topic of significant interest and practical value in the field of computer vision. This technology has a wide range of applications, from surveillance and security systems to advanced human-computer interaction and assistive technologies. However, accurately detecting humans in diverse and complex environments poses a considerable challenge due to variations in human appearance, pose, and lighting conditions.

To address these challenges, we propose a robust method for human detection leveraging the Histogram of Oriented Gradients (HOG) and a Support Vector Machine (SVM). HOG is effective in capturing edge and gradient structure that characterizes human forms, while SVM provides a powerful framework for classification. Our approach aims to improve detection precision and reduce false positives in varied scenarios.

Moreover, recognizing the importance of accessibility and ease of use in applying such technologies, we have developed an interactive interface. This interface allows users to seamlessly input images and receive immediate human detection results. This integration of advanced machine learning algorithms with a user-centered design philosophy underscores our commitment to making cutting-edge technology accessible and practical for a broad range of applications.

In this paper, we detail our methodology, discuss the implementation of our detection system, and demonstrate its effectiveness through various tests and real-world scenarios. Our work contributes to the ongoing efforts in computer vision to create more accurate, efficient, and user-friendly human detection systems.

## II. OUR ALGORITHM

In our algorithm, we will be detecting the presence of humans in an using by using the Histogram of Oriented Gradients (HOG) method. After the use of the method, we verify the performance of the algorithm by using non-maximum suppression. In the post-processing of our human detection, non-maximum suppression is used to remove redundant bounding boxes, this allows for an accurate count of humans in the image. HOG functions by selecting local gradient information in an image. The image is then analyzed by being divided into small cells which are graded by measuring the gradient in each cell. These gradients are used to create histograms that represent the distribution of edge orientations in the cells. We use HOG feature vectors to analyze or search for the object of interest. After testing our model with various images, we have found that it tends to be more successful with high-definition images. In addition to this, the humans in the images should be full-body, and not covered, they should be in an upright position in order to be identified.

### A. Example Output

IMAGE I
Our Lovely Test Subjects
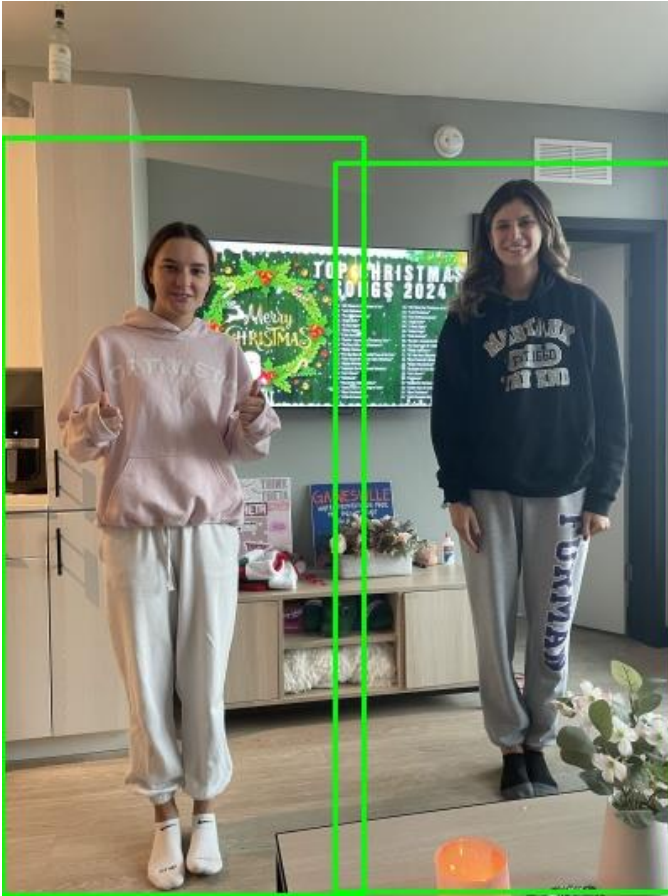
*Here we see the output file correctly detecting our pair of test subjects.*

## III. REFERENCES

[1] Mittal, Karthik. (2020, Dec. 21). A Gentle Introduction into the Histogram of Oriented Gradients. Medium, Analytics Vidhya. [Online]. Available: https://medium.com/analytics-vidhya/a-gentle-introduction-into-the-histogram-of-oriented-gradients-fdee9ed8f2aa

[2] Sharma, Abhishek. (2022, Jan. 29). Pedestrian Detection Using Hogs in Python - Easy Project- with Source Code. Medium. [Online]. Available: https://sharmaji27.medium.com/pedestrian-detection-using-hogs-in-python-5ef014c3f741

[3] Tyagi, Mrinal. (2021, July 24). Hog(Histogram of Oriented Gradients). Medium, Towards Data Science. [Online]. Available: https://towardsdatascience.com/hog-histogram-of-oriented-gradients-67ecd887675f