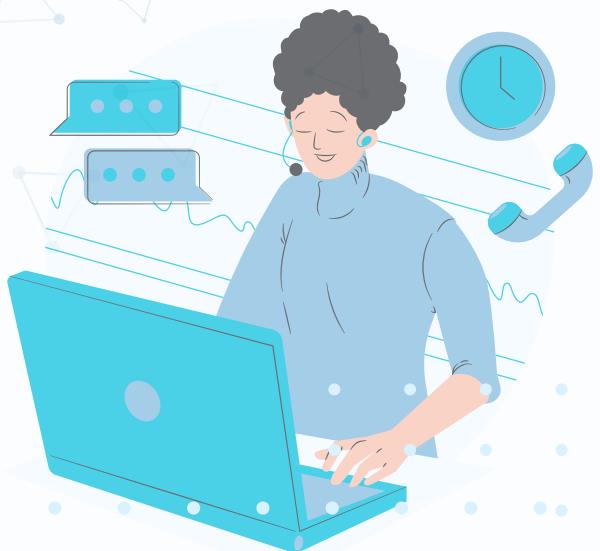


# SAFEHIVE



## CONTACT US

Have questions or need support? Contact us.

Email: [safehive.live\\_01@gmail.com](mailto:safehive.live_01@gmail.com)

Phone: (+63) 915 833 4188

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**WEST VISAYAS STATE UNIVERSITY**  
College of Information and  
Communication Technology

# USER MANUAL



SafeHive: A Deep Learning-Based Crowd Analysis System for  
Efficient Management of Large-Scale Events

An Undergraduate Thesis  
Presented to the Faculty of the  
College of Information and Communications Technology  
West Visayas State University  
La Paz, Iloilo City

In Partial Fulfillment  
Of the Requirements for the Degree  
Bachelor of Science in Computer Science

By  
Mathew Adriane I. Briones  
Frenchie E. Chua  
Samuel Jeth A. Datiles  
Areane S. Samontan  
Rhona Mae P. Taccad

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# DISCLAIMER

The following information pertains to the undergraduate thesis titled "SafeHive: A Deep Learning-Based Crowd Analysis System for Efficient Management of Large-Scale Events." This thesis was presented to the Faculty of the College of Information and Communications Technology at West Visayas State University, La Paz, Iloilo City, as partial fulfillment of the requirements for the degree of Bachelor of Science in Computer Science by Mathew Adriane I. Briones, Frenchie E. Chua, Samuel Jeth A. Datiles, Areane S. Samontan, and Rhona Mae P. Taccad in April 2024.

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# GETTING STARTED

The SafeHive system was designed to provide efficient crowd management and enhance safety measures during public gatherings. The implementation involved utilizing a deep learning algorithm, specifically the CSRNET, to analyze crowd scenes, generate density maps, and accurately count the number of people in highly congested scenes. SafeHive is highly relevant as it addresses the growing need for advanced crowd management technologies to ensure public safety at events, especially those with large and diverse crowds. With the increasing popularity of events and the potential for unforeseen incidents, SafeHive's deep learning algorithm and image processing techniques, along with its real-time crowd analysis and color-coded notifications, provide a cutting-edge solution to enhance event safety and optimize crowd management strategies.



# KEY FEATURE OF SAFEHIVE

## 1. Crowd Count:

- Track crowd count dynamically, offering precise, real-time numbers of attendees in a designated area. This feature ensures accurate monitoring, enabling swift adjustments to crowd management strategies as event populations fluctuate.

## 2. Density Map

- Visualize crowd density through an intuitive map that highlights areas of varying crowd concentrations, enabling quick identification of high-density zones that may require attention.

## 3. Crowd Threshold

- Set specific crowd size thresholds for different areas or events; receive alerts when numbers exceed these limits to proactively manage capacity and prevent overcrowding.

## 4. Crowd Density and Crowd Status

- Provides an at-a-glance overview of the current crowd situation and density frequency, through their crowd count, to offer clear insights into overall crowd dynamics.

## 5. Colour-coded Warning Signals

- Employ colour-coded signals (e.g., green, yellow, red) to indicate their crowd density and crowd status, allowing for quick comprehension and immediate action based on real-time data.

# INTRODUCTION

In today's world, where events ranging from international sports competitions to local festivals attract thousands, effective crowd management has never been more crucial. The ability to safely and efficiently manage large groups of people not only enhances the experience for attendees but also significantly reduces the risk of incidents. Enter SafeHive, a state-of-the-art crowd management system designed to empower organizers and authorities with real-time insights and tools for managing outdoor events.

SafeHive leverages cutting-edge technology, including artificial intelligence and deep learning algorithms that specialize in analyzing large scale outdoor events to provide a comprehensive solution to the complex challenges of crowd management. By integrating data from Shanghai Tech Dataset, SafeHive offers a real-time overview of crowd dynamics, enabling proactive management and decision-making.

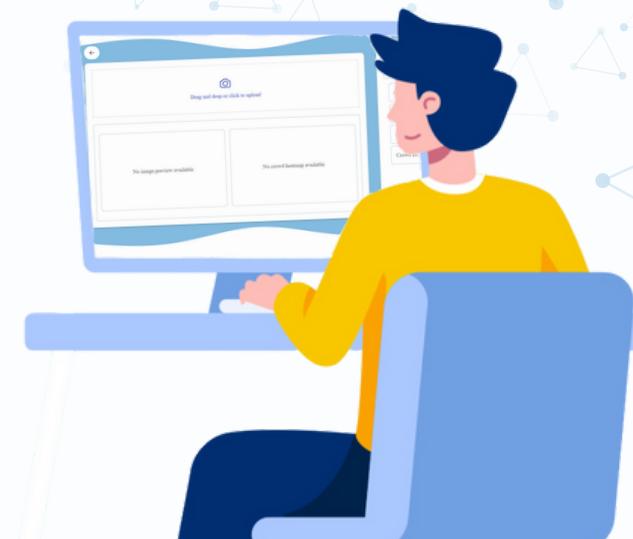


# INTRODUCTION

Our system is built to cater a wide range of applications from concerts, sports events, and festivals to public demonstrations and rallies. SafeHive delivers unmatched control over your crowd management needs.

SafeHive is more than just a software solution; it is a new paradigm in crowd management, designed to enhance safety, improve attendee satisfaction, and streamline operational logistics. Our mission is to provide you with the tools and insights you need to create safe, enjoyable, and successful events.

Welcome to the future of crowd management with SafeHive, where technology meets safety and efficiency to transform the way we gather.



# USER GUIDE TO THE WEBSITE

## 1. Homepage

The homepage serves as the entry point to SafeHive, providing an overview of our system's services and features.

### Here's what you'll find:

A brief overview of the system's purpose and features, and intuitive navigation options to different sections of the system.

## 2. System's Interface/Program Section

The Interface for the crowd analysis, which serves as the core functionality of the system. Users can upload raw images and set the crowd threshold. The page is designed to be user-friendly, with clear instructions and an interactive interface to facilitate easy image uploading and result visualization.

### Here's what you'll find:

At the center you can see the drag and drop row where you can upload your image to be analyzed. At the right side is where you can set your crowd limit and click enter to analyze the image. After analyzing, the crowd management outputs will be shown immediately and their colour coded warning signals will be shown according crowd count and crowd threshold.

## 3. Crowd Density Frequency and Status Metrics Section

Prompt the "How does it work" pop-up by clicking the question mark button at the lower-right portion of the screen.

### Here's what you'll find:

This serves as an instructional interface, encapsulating fundamental information about the metrics for identifying the crowd density frequency and status with their corresponding color-coded level. The color-codes are represented as follows: Green to signify Very Low/Low for No Crowd/Sparse Crowd scenarios, Yellow denotes Medium for Medium Dense Crowd situations, and Red indicates High/Very High for Dense Crowd conditions.

# USER GUIDE TO THE WEBSITE

## 4. About Us Section

Where users can learn more about the team behind the system.

### Here's what you'll find:

This page includes details about the development team, and their expertise. It aims to provide users with a sense of trust and credibility, showcasing the expertise and passion of the team.

## 5. Contact Us Section

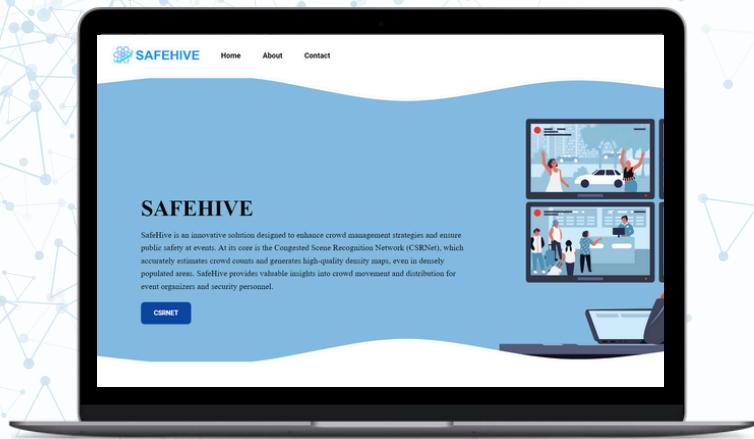
Where users can reach out to the system's support team or administrators for assistance or inquiries.

### Here's what you'll find:

This page includes asking the name of the user who wants to reach out, their email addresses, and the message. This page is made allowing users to easily get in touch.



# SAFEHIVE



SafeHive is an innovative solution designed to enhance crowd management strategies and ensure public safety at events. At its core is the Congested Scene Recognition Network (CSRNet), which accurately estimates crowd counts and generates high-quality density maps, even in densely populated areas. SafeHive's key features include Crowd Density Frequency and Crowd Metric Status. This feature provides approximate crowd count, along with the crowd density frequency and crowd status with their corresponding color-code level to aid event organizers in maintaining the safety of public events.

## SYSTEM REQUIREMENTS

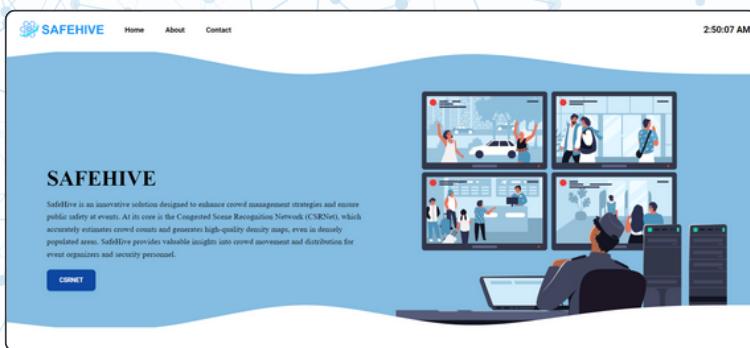
Our web application is designed to be highly versatile and user-friendly, capable of running smoothly on any device, including desktops, laptops, tablets, and smartphones. It is compatible with all major web browsers, ensuring accessibility and convenience for all users. Additionally, the application requires a minimum internet speed of just 5 Mbps to function efficiently, providing a seamless experience across varying network conditions.

## APP INSTALLATION

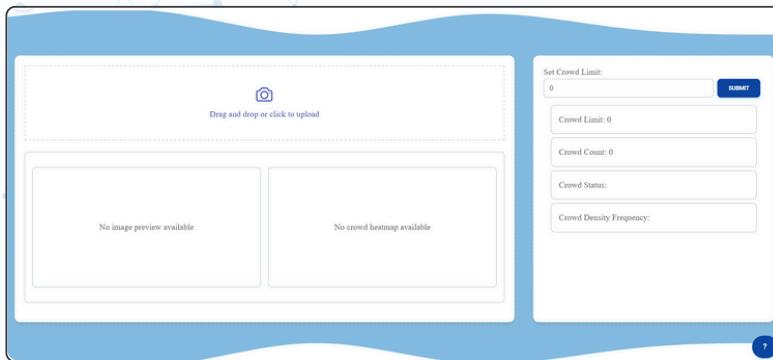
Our web application requires no installation, making it incredibly convenient for users. Simply access the application using any compatible web browser on your device, and you're ready to go. This seamless process ensures you can start using our application immediately without any additional steps or downloads.

# CROWD DENSITY FREQUENCY AND CROWD METRIC STATUS

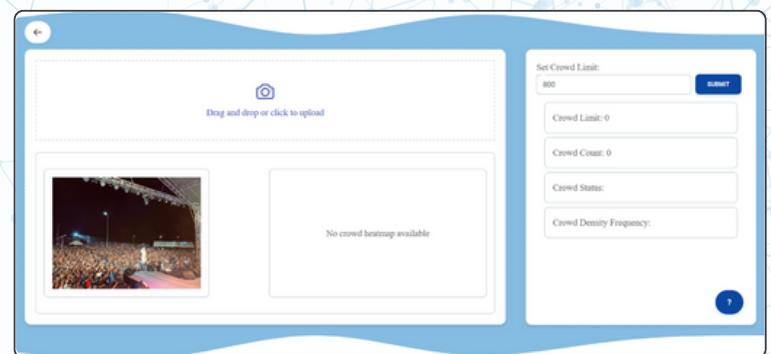
1. On landing page, you can see a box component on the lower left. Within the component, click "CSRNET".



2. After clicking the "CSRNET" you will see the component below:

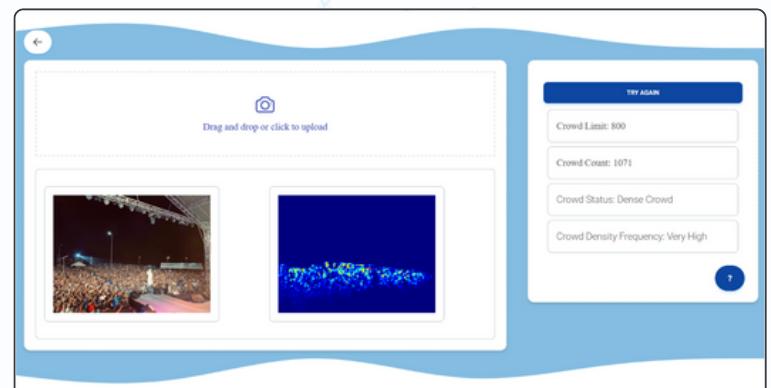


3. On the Right side, the first box is where you upload raw image and to be analyzed by the application. On the first box from the left side you can set the crowd threshold based on the crowd limit of the area.



4. After inputting the image and crowd limit, you can click the "Submit". This will display a loading component while it analyzes the image.

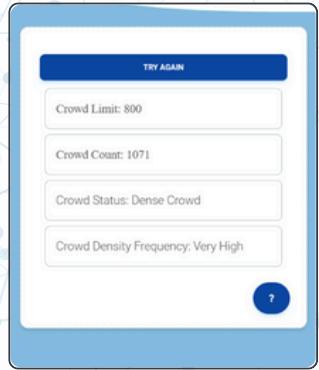
5. After the application analyzes the crowd. It will generate a crowd heatmap, estimated crowd count, crowd status, and crowd density frequency. Sample Output:



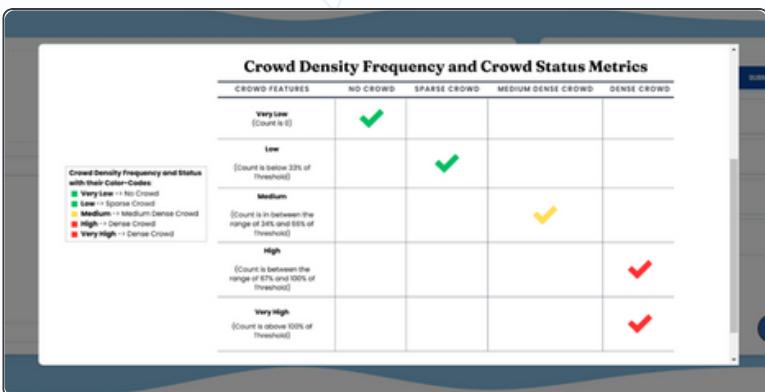
# TROUBLESHOOTING

## HOW DOES IT WORK

1. To better understand the information shown from the application, click the "?" button on the lower right side of the application.



2. Upon clicking the "?" button, it will show the "How does it work" pop-up. This serves as an instructional interface, encapsulating fundamental information about the metrics for identifying the crowd density frequency and status with their color-coded level.



### 1. Real-Time Monitoring Not Updating

Problem: The real-time monitoring dashboard is not showing updated data.

Solution: Click the try again button and re-upload the image to be analyzed. If the issue persists, refresh the website and try again.

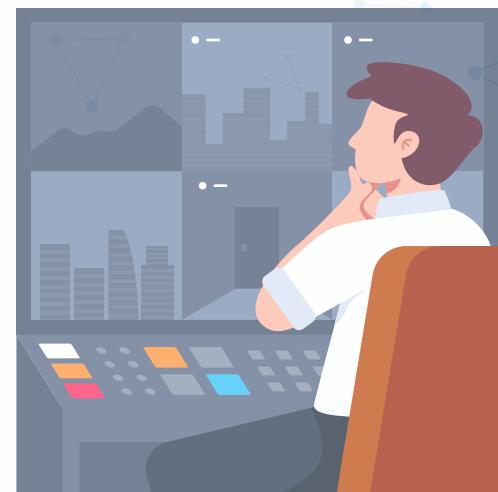
### 2. Inaccurate Crowd Management Outputs

Problem: The system shows inaccurate crowd management outputs on the dashboard.

Solution: Click on the "?" button located on the bottom-right of the interface. Check the metrics as to why the system produced the corresponding output.

Note: Image quality may affect the result of the analysis.

Note: Ensure an internet connection if the website is not working. If the website is inaccessible contact us through our provided contact details.



# FREQUENTLY ASKED QUESTIONS

These FAQs provide an overview of SafeHive and address common inquiries about its functionality and implementation. If you have any further questions, feel free to reach out to us for clarification.

## 1. What is SafeHive?

- SafeHive is an innovative solution designed to enhance crowd management strategies and ensure public safety at events.

## 2. How does SafeHive work?

- SafeHive utilizes the Congested Scene Recognition Network (CSRNet) to accurately estimate crowd counts and generate density maps in densely populated areas.

## 3. What insights does SafeHive provide?

- SafeHive provides valuable insights into crowd movement and distribution, aiding event organizers and security personnel in making informed decisions.

## 4. Why is SafeHive beneficial for event management?

- SafeHive helps optimize event coordination by providing real-time information about crowd dynamics, enabling proactive measures to ensure safety and efficiency.

## 5. How accurate is SafeHive's crowd estimation?

- SafeHive's Congested Scene Recognition Network (CSRNet) ensures high accuracy in crowd count estimation, even in densely populated areas.

## 6. How can I learn more about SafeHive and its implementation?

- For more information about SafeHive and its implementation, please email us at [safehive.live\\_01@gmail.com](mailto:safehive.live_01@gmail.com) or visit our website for updates and news.

# MEET THE TEAM



**MATHEW ADRIANE BRIONES**  
Back-end Developer

Email: matthewadriane.briones@wvsu.edu.ph  
Phone: (+63) 951 294 5449



**FRENCHIE CHUA**  
Front-end Developer

Email: frenchie.chua@wvsu.edu.ph  
Phone: (+63) 915 833 4188



**SAMUEL JETH DATILES**  
Project Manager

Email: samueljeth.datiles@wvsu.edu.ph  
Phone: (+63) 970 051 3581



**RHONA MAE TACCAD**  
Researcher

Email: rhonamae.taccad@wvsu.edu.ph  
Phone: (+63) 921 665 6887



**AREANE SAMONTAN**  
Researcher

Email: areane.samontan@wvsu.edu.ph  
Phone: (+63) 927 818 3047