# Estimating Crowd Density to Detect Sparse Areas to Aid in Crowd Management


Rhodessa J. Cascaro
(Presenter)

Janelle Cassandra Uy
John Francis Puebla
Ian Miguel Lancian

**Mapua Malayan Colleges Mindanao**
Davao City, Philippines

**Background:**

- Authoritative members of any city should prioritize the safety and security of the citizens
- Crowd surges and stampede-associated crush injuries and deaths are considered as one of the most major non-communicable public health hazards during a mass gathering event
- Davao City Public Safety and Security Office (PSSO) has strengthened their requirements for major event organizers by submitting security and safety plans
- To help prevent accidents during crowding, crowded areas analysis and monitoring can be used

**Targets:**

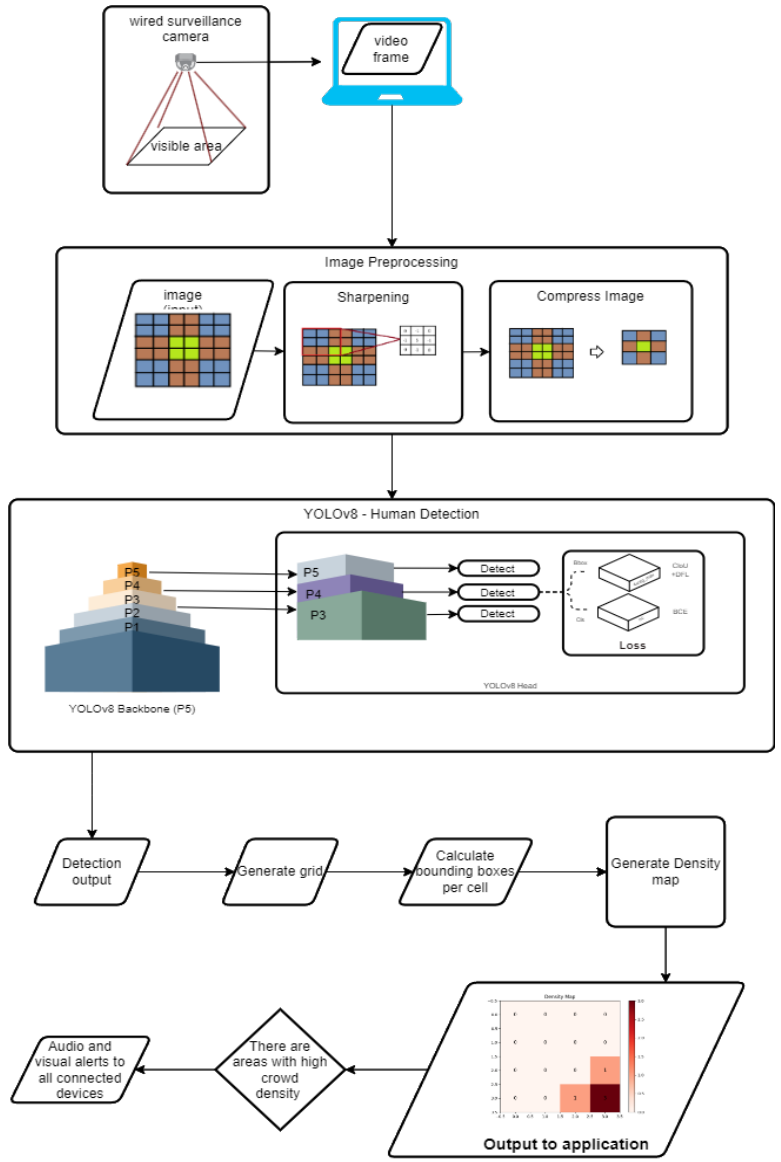
Develop an application that would:

- Sharpen and compress images from video streams
- Estimate crowd density and generate heatmaps to detect dense and sparse areas
- Provide visual and auditory alerts for areas that are excessively crowded

# PROPOSED METHOD: **SCIENTIFIC AND TECHNOLOGICAL**

Currently at the development stage.

- High-powered CCTV cameras installation (the area captured by the camera must be specified in m^2 for the density calculation)
- OpenCV image preprocessing
- Crowd density estimation
- YOLOv8 for human detection
  - Density calculation measured by detected_people/area_captured_by_camera (people/m^2)
  - Density grid creation
  - Density map indicating dense and sparse regions
- Alert generation
- Notification system



# PROPOSED METHOD: **IMPLEMENTATION AND EXPERIMENTS**

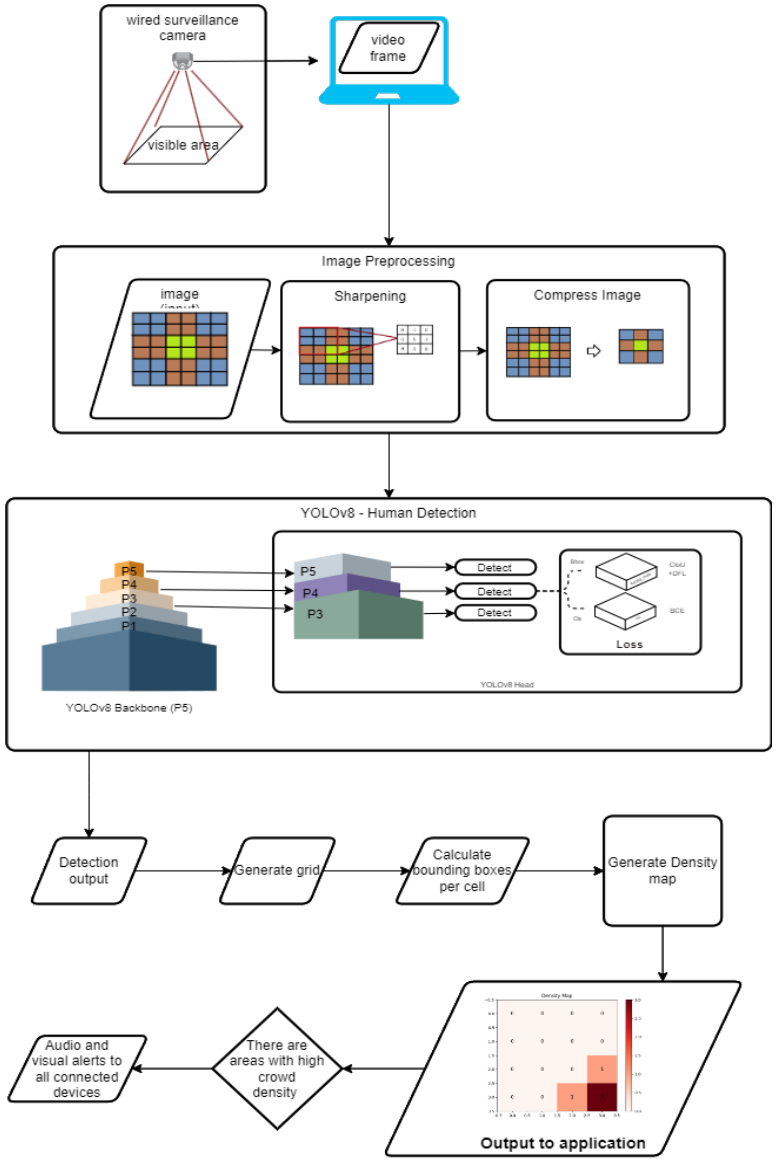
Datasets

- UCF-CC-50
- ShanghaiTech

System Prototype

Testing and implementation will be at:

- Mapua Malayan Colleges Mindanao
- If allowed, to the Barangays of Davao City



# IMPACTS

## SCIENTIFIC

- Advancement in Crowd Management
- Crowd Behavior Analysis
- Data-driven Insights
- Cross-disciplinary Collaboration

## TECHNOLOGICAL

- Real-time Monitoring
- Automation & Reduced Human Error
- Scalability & Safety Enhancements
- Cross-domain Applications

# IMPACTS

## SOCIETAL

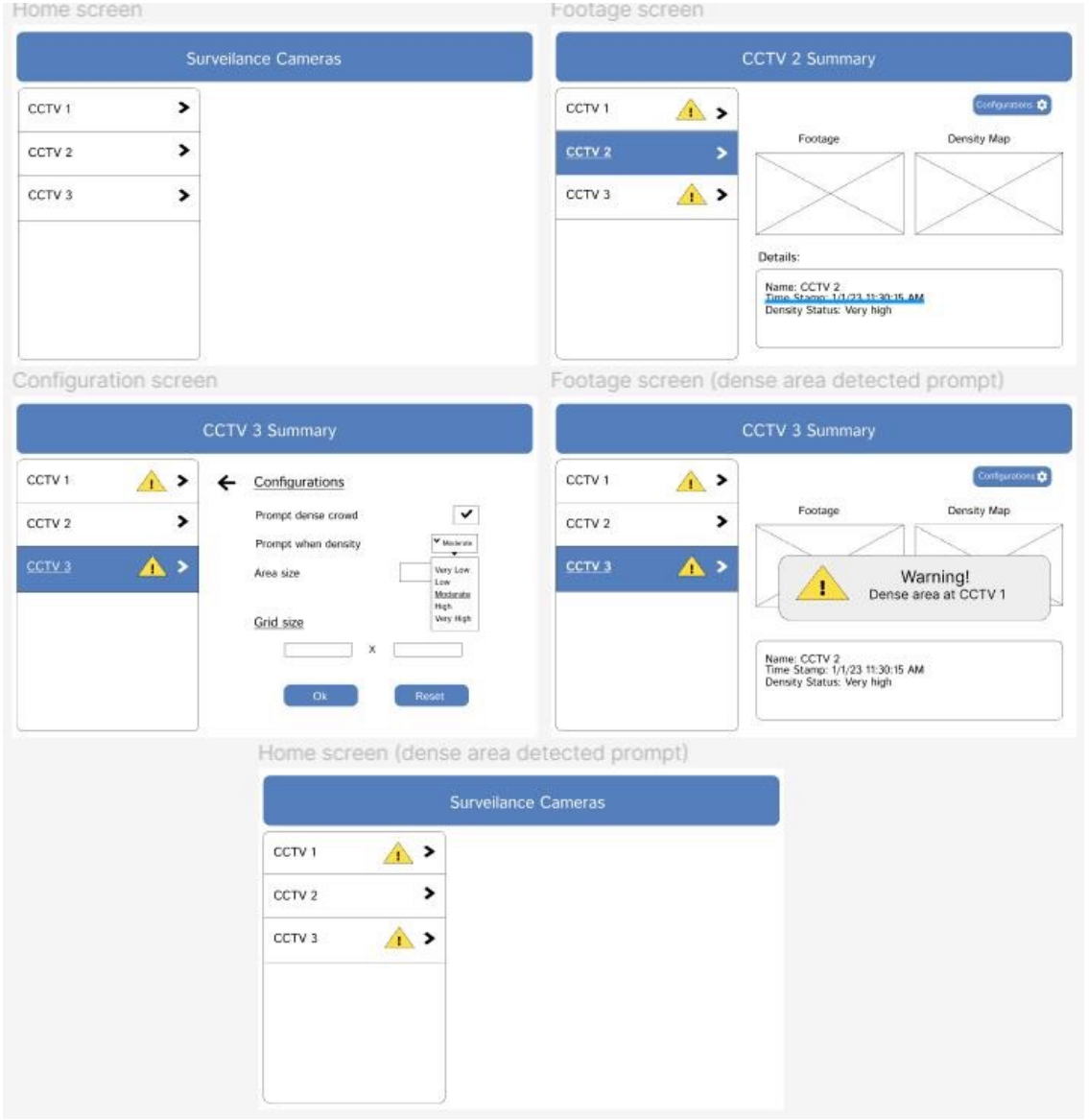
- Enhanced Public Safety
- Reduced Congestion & Inclusive Events
- Emergency Response Efficiency
- Improved Urban Planning
- Data-Driven Decision Making

## COLLABORATIVE

- Interdisciplinary Collaboration
- Industry Integration
- Knowledge Sharing
- Policy and Regulation Development
- Community Engagement

# OUTPUT/OUTCOME

- Model/Framework
- Dataset for public use
- Desktop application
- Training materials/manual
- Partnership with barangays and local organizations
- Journal articles published



# CONCLUSION

**TARGET:**

Develop an application that will estimate crowd density and generate heatmaps to detect dense and sparse areas.

**METHOD:**

Utilize YOLOv8, generate density map indicating crowded/dense and sparse areas, give out alerts through a notification system.

**TAKEAWAYS:**

- Scientific Advancement
- Technological Innovation
- Societal Benefits
- Collaboration
- Probable Outcomes


Terima kasih
Salamat po
ขอบคุณ
ขอบใจ
Thank you
Cảm ơn Bạn
សូមអរគុណ
ありがとうございました
ကျေးဇူးတင်ပါတယ်