

BLOB-FREE

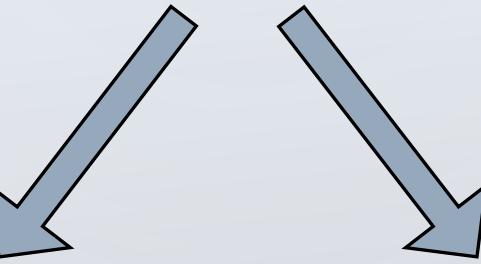
PRELIMINARY DESIGN REVIEW (PDR)

INTERDISCIPLINARY PROJECT A.Y. 2020/21

PROPOSED BY PROF. DOVIS, PROF. PIRAS AND PROF. DI PIETRA

BLOB-FREE

**Computer vision system for reducing
Coronavirus infection risk**



MASK
detection



ASSEMBLAGE
detection

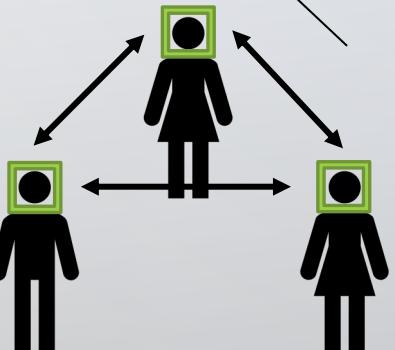


SYSTEM CONCEPT

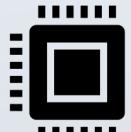
ZED2 Stereo Camera



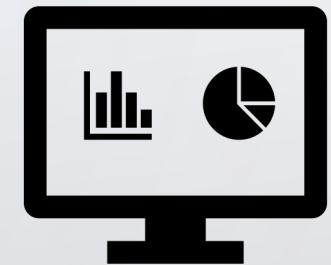
Audio **warning**



NVIDIA Jetson Nano



Management web
interface



Real-time **head detection**



Real-time
face mask
detection



Real-time distances
computation



Real-time **assemblage**
detection

HARDWARE DESIGN

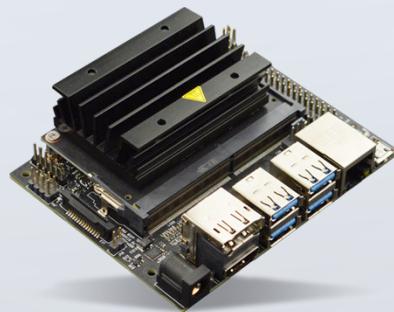
ZED2 Stereo Camera



Available resolution/frame rate combinations:

- 720p – 15, 30, 60 fps
- 1080p – 15, 30 fps
- 2K – 15 fps

NVIDIA Jetson Nano



Computational power:

- 0.5 TFLOPs (FP16)
- 128 CUDA cores
- (not tested yet)

Expected maximum resolution usable with the Jetson is **720p – 30fps** but testing still needs to be performed

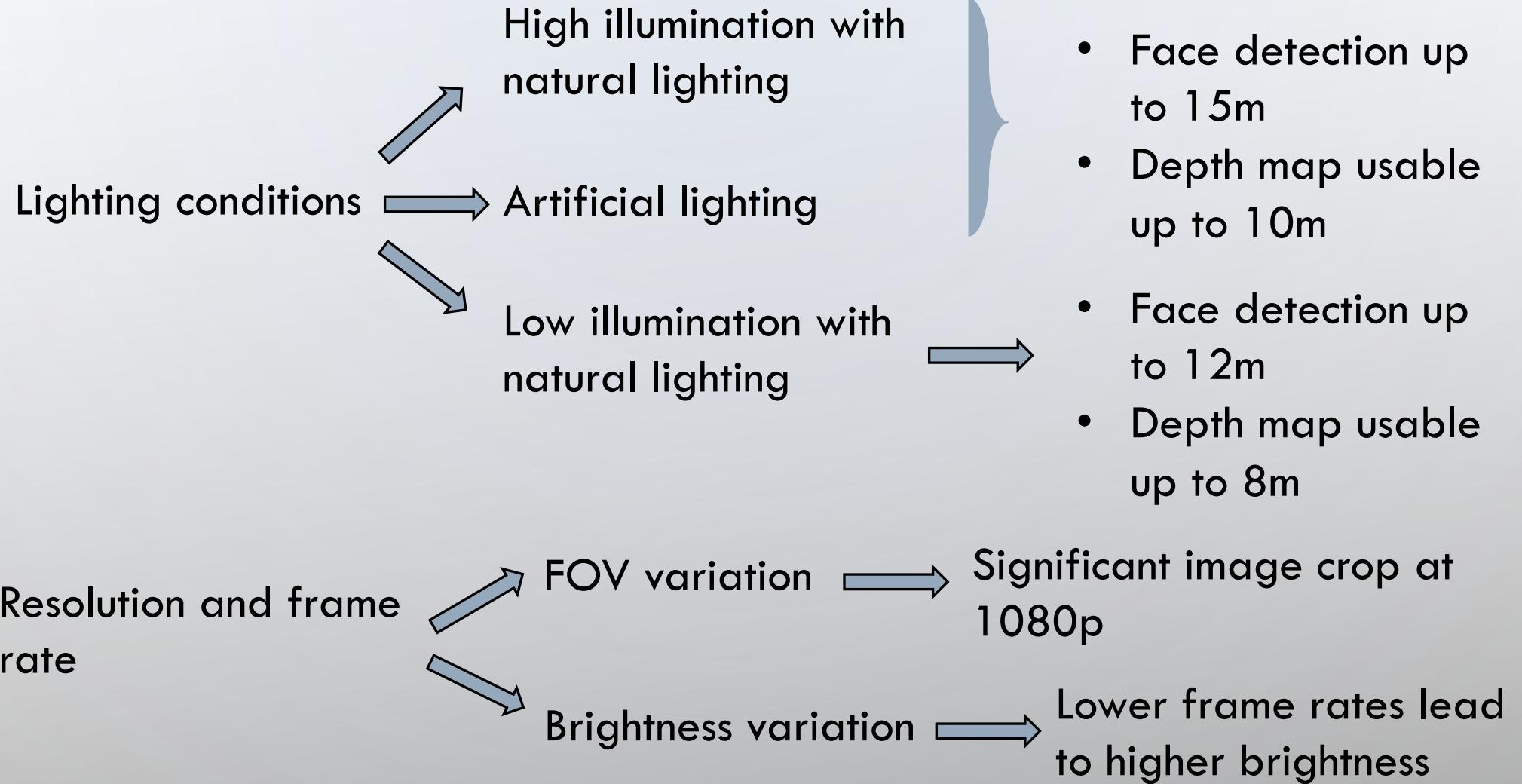
NVIDIA Quadro P1000



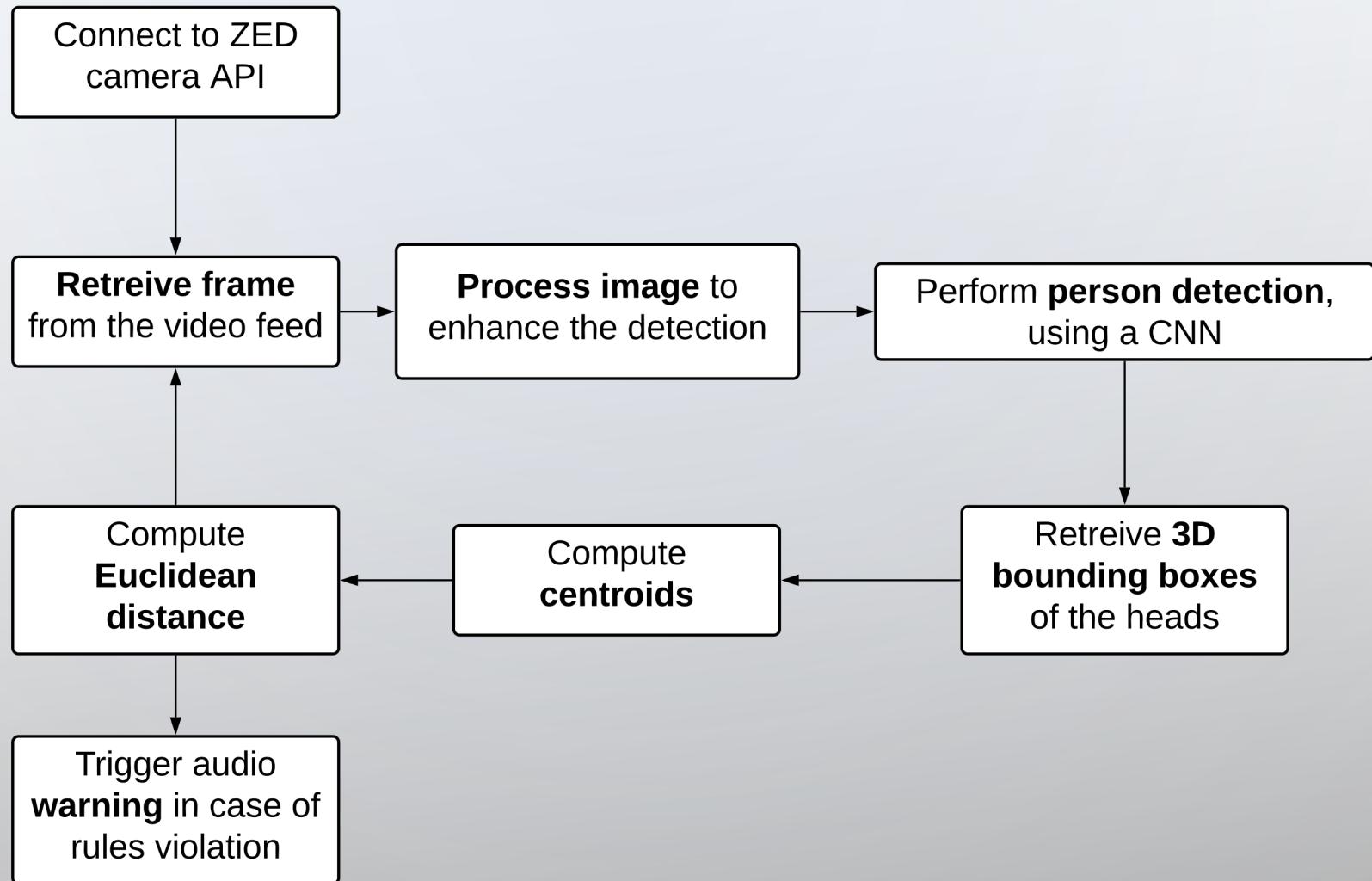
Computational power:

- 30 TFLOPs (FP16)
- 640 CUDA cores
- **Successfully tested up to 2K – 15 fps**

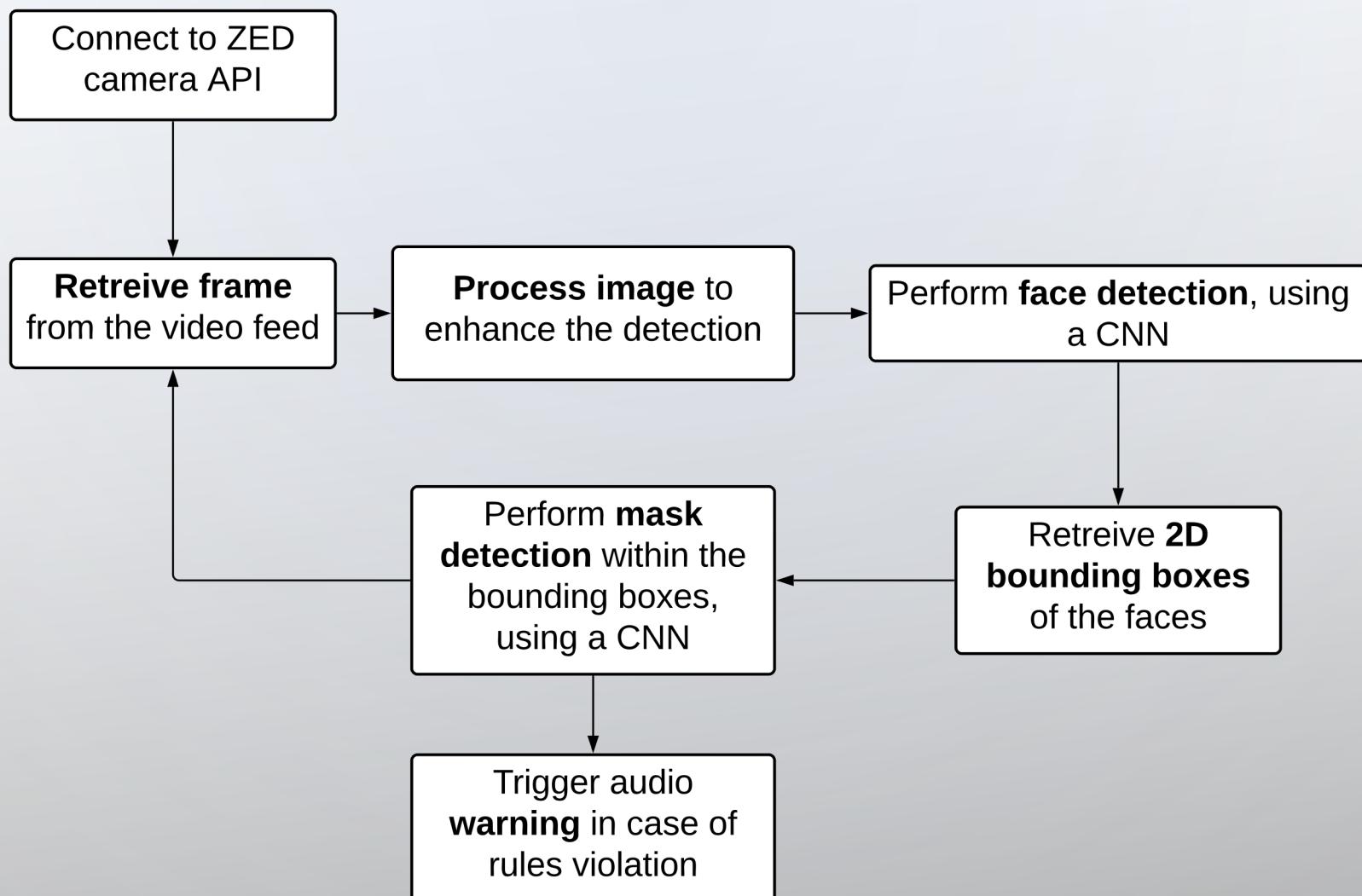
PERFORMANCE TESTING



OBJECT DETECTION & DISTANCE COMPUTATION



OBJECT DETECTION & MASK RECOGNITION



OBJECT DETECTION

ZED person/face detection model:

- Built-in the SDK
- **High computational power** requirements

Next steps:

- **Pre-process images** to increase accuracy
- **Test performance** of Jetson Nano



MASK RECOGNITION

Open dataset (Kaggle):

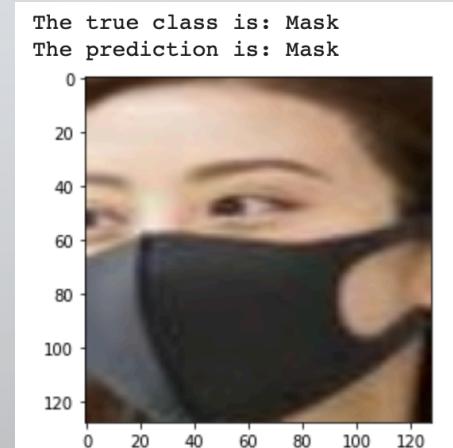
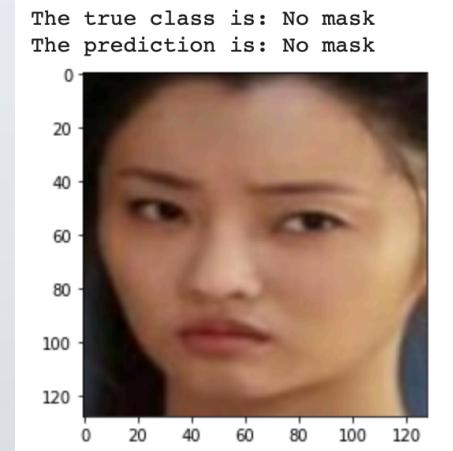
- 7555 images (3726 with mask,
3829 without mask)

Transfer learning:

- **MobileNetV2** model
- Trained on Google Colab

Next steps:

- Optimize the model
- Export the model to work in **real-time** with ZED SDK



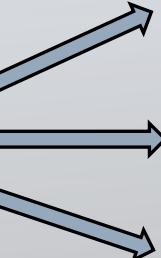
MANAGEMENT INTERFACE

Local **web application**:

- CherryPy
- MongoDB



Web UI with **charts**
regarding aggregated
statistics and system status
real-time overview



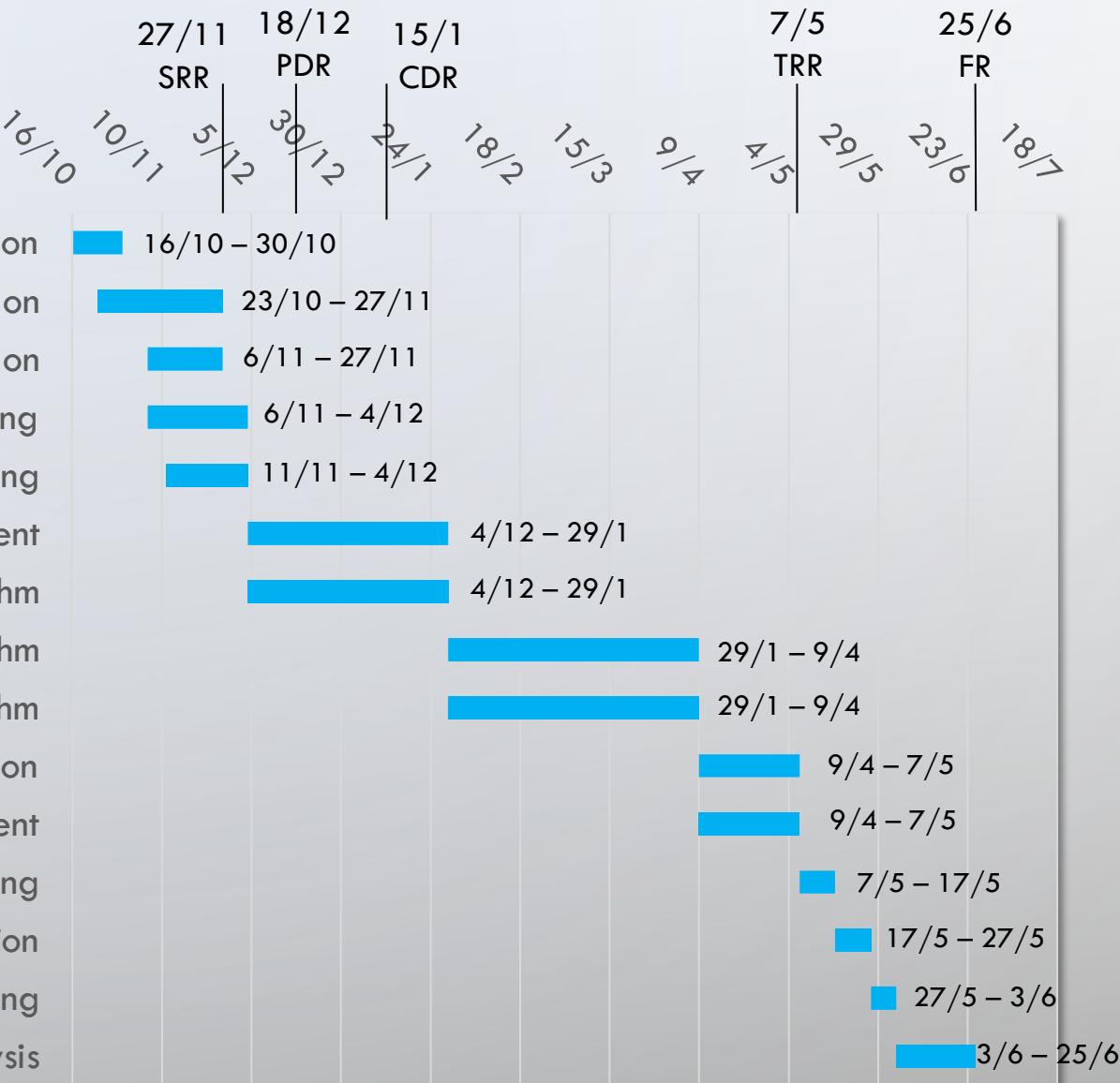
Number of people detected

Number of rules violations

Percentage of rules violation

WORKPLAN

- Project plan definition
- User requirements definition
- Image recognition methodology evaluation and definition
- Training dataset gathering
- Cameras testing
- Solid image composition algorithm development
- Person recognition algorithm
- Assamblages detection algorithm
- Mask detection algorithm
- Statistics visualization
- Warning issuing management
- Controlled-scenario testing
- Results analysis and validation
- Real-world scenario testing
- Final results analysis





THANK YOU
FOR THE
ATTENTION!

Team members:

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