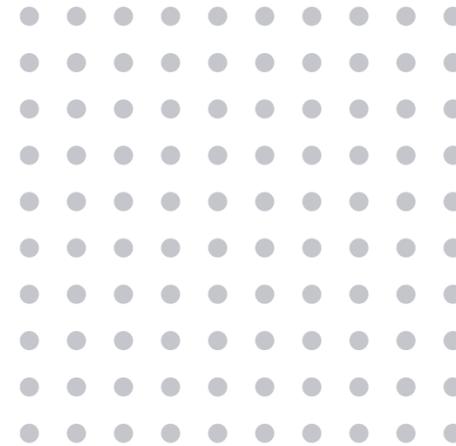




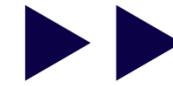
OBJECT DETECTION IN LOW-CAPACITY MODEL



AI & BIG DATA



TEAM



**Professor
Kim Young Il**



**Team leader
Maria**



**Co-leader
Jiyan**



**Presentation maker
Sona**



**Note writer
Sabryna**



**Report writer
Elia**

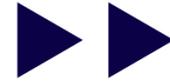


**Presentation
Khayotjon**





AGENDA

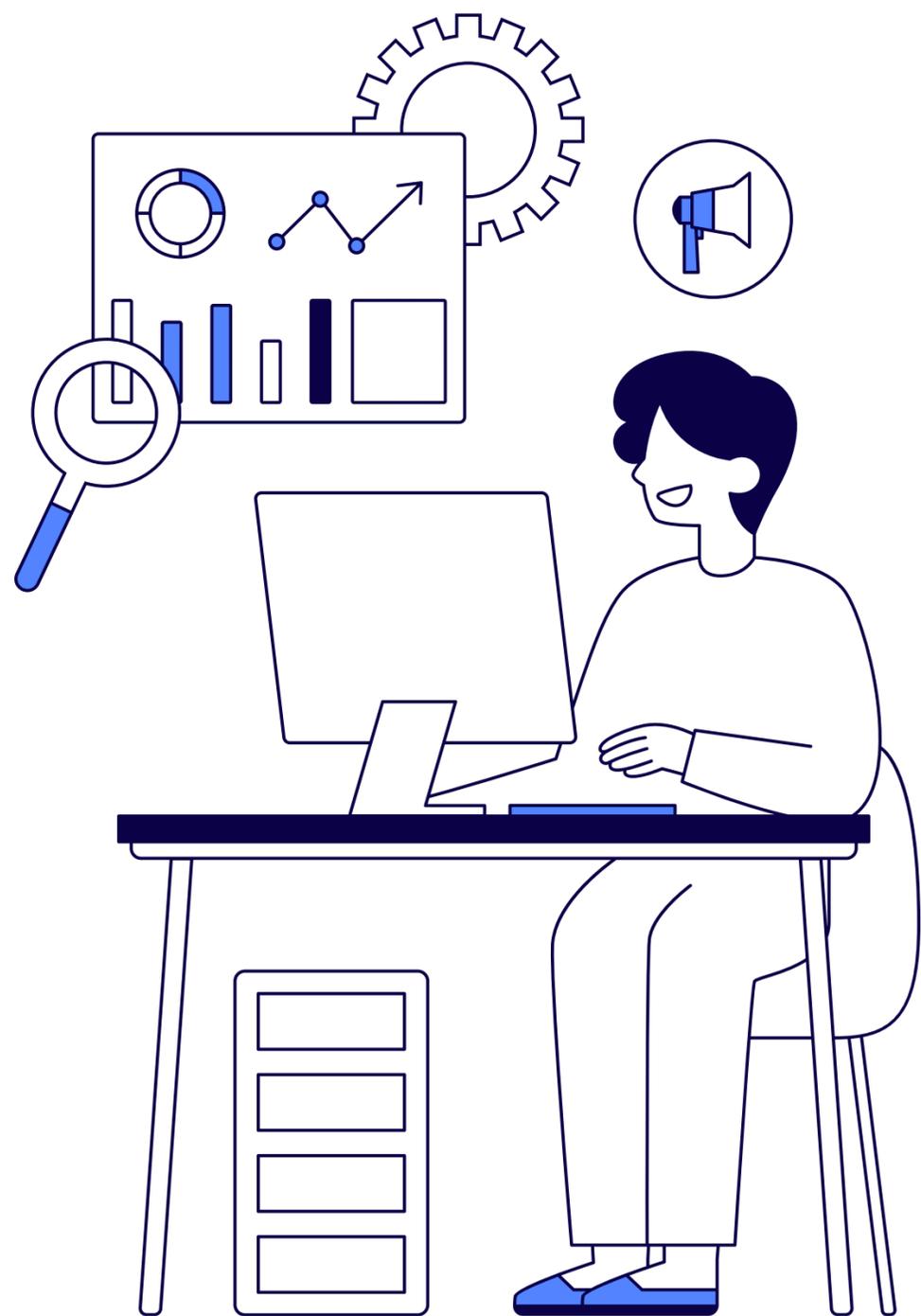


- **Problem**
- **Solution**
- **Objects**
- **Models**
- **Results**
- **UI**
- **Demo**





INTRODUCTION TO OUR PROBLEM



Object detection is important for extracting crime-related information from cellphones, CCTV and dash cam footage.

GMDSoft has object detection model that weights around 200 MB with wide range of categories, but this is not always the best option.

Traditional object detection models might be not suitable because:

- They are expensive
- Demand substantial computational resources
- Limited in deployment options



► OUR SOLUTION

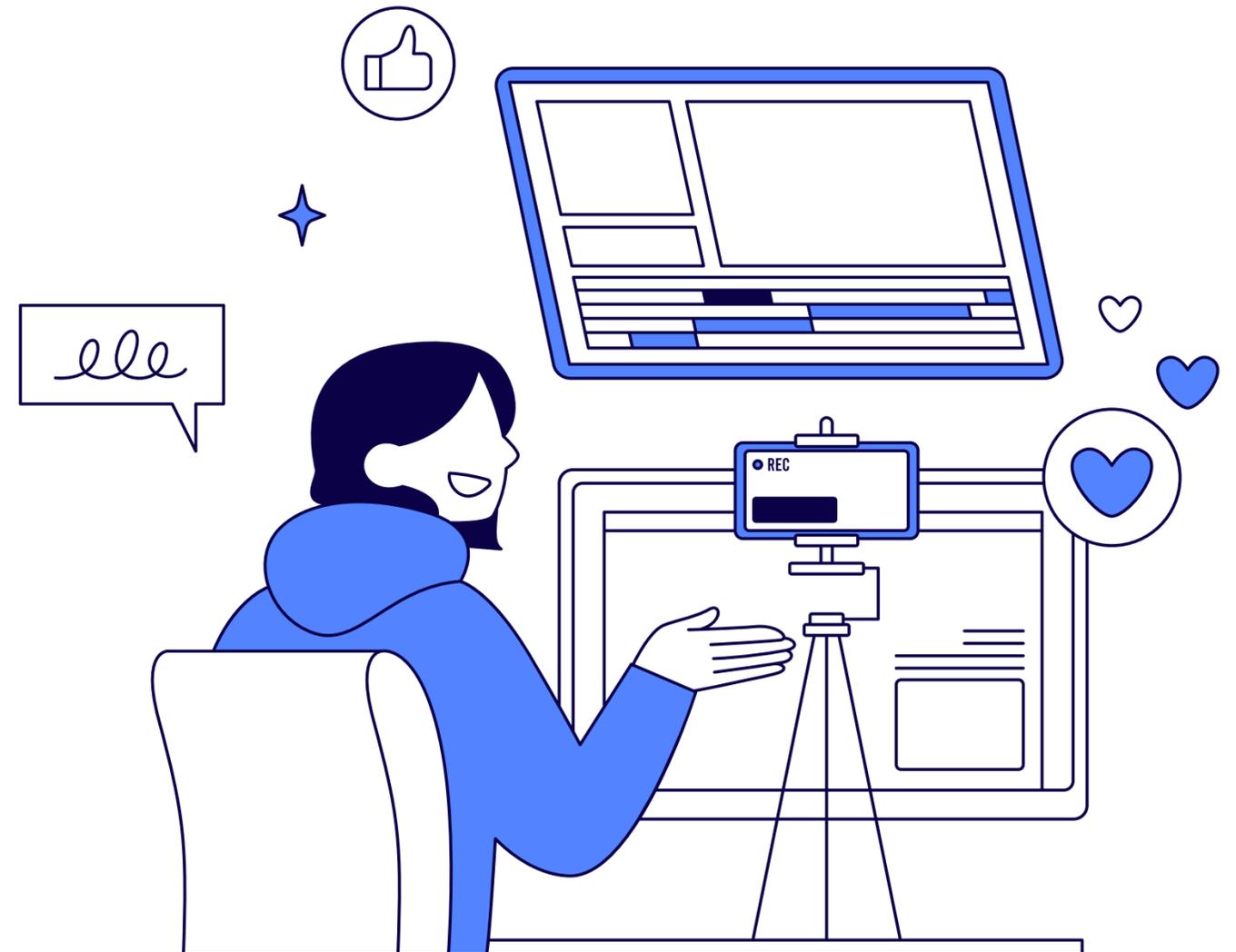
Low-capacity object detection models that are important for:

- Storage efficiency
- Real-time applications
- Embedded devices

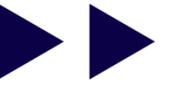
Create 10 low-capacity detection models each:

- One different object
- Around 5 MB
- Accuracy 70-85%
- Maintaining speed

Create user interface to be able to apply our models.



▶ OBJECTS AND DATASETS



Fire



Images in Dataset
12696

Knives



Images in Dataset
3692

Guns



Images in Dataset
3000

Cars



Images in Dataset
5448

Helmets



Images in Dataset
8754

Backpacks



Images in Dataset
4987

Drones



Images in Dataset
8755

Motorbikes



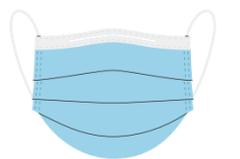
Images in Dataset
4734

Fallen People



Images in Dataset
8675

Masks

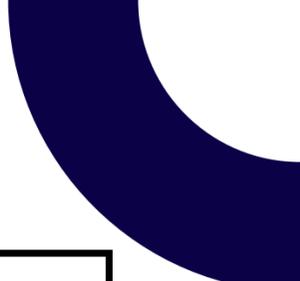


Images in Dataset
6585





MODELS



YOLOv4	<ol style="list-style-type: none">1. The highly optimized architectures making it overfit2. Computational Complexity result in higher latency3. Lack of documentations and tooing available4. Lack of Proven Robustness Complexity and Overhead5. Computationally expensive, require significant resources and expertise
YOLOv5	<ol style="list-style-type: none">1. Slower than Yolov82. Easier to use but less accurate than Yolov83. Gives more False Positives
YOLOv8	<ol style="list-style-type: none">1. More accurate than other Yolo versions2. Gives higher True Positive Count3. Does not need big dataset to give high results4. As fast as Yolov9 but easier to operate5. Default mosaic augmentation during training
YOLO-NAS	<ol style="list-style-type: none">1. 10-20% faster then yolov82. Less suitable for life-detection3. Resource intensive, requires at least 8GB RAM4. Training complicated: requires computational resources and time
YOLOv9	<ol style="list-style-type: none">1. As fast as Yolov8 but increases the size of the model2. Gives less False Positive count and higher False Negative count3. Needs more dataset to give good results

Why YOLOv8 is better than other YOLO versions?

▶ RESULTS



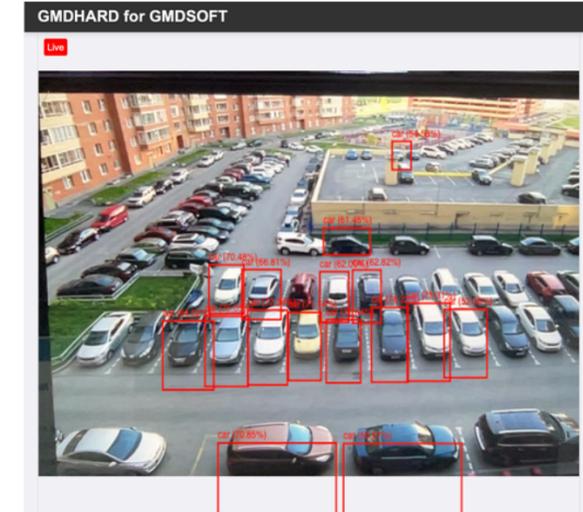
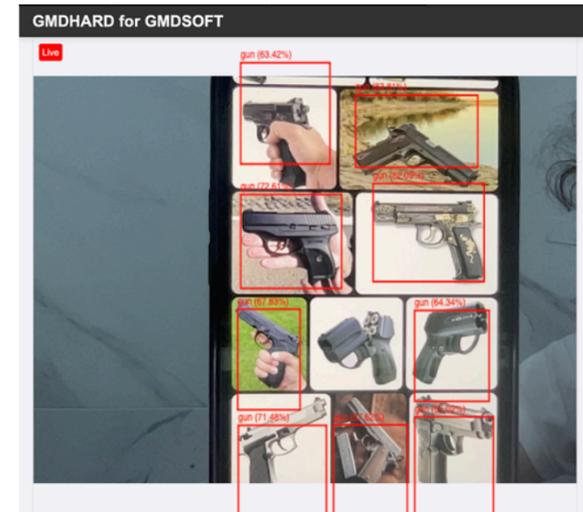
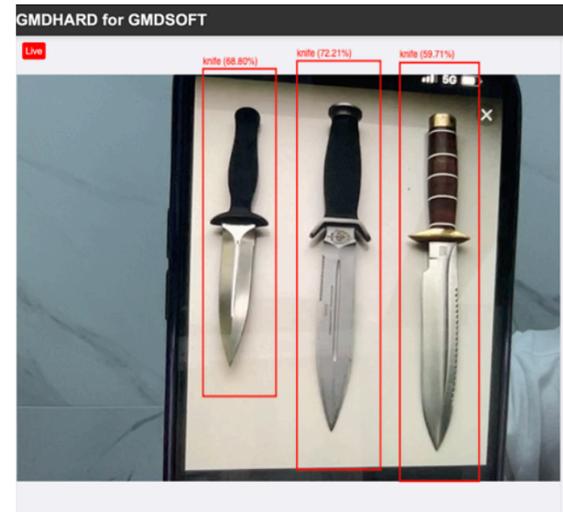
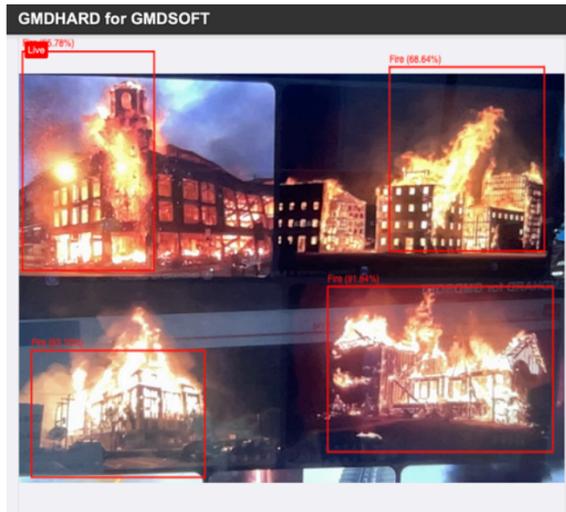
Fire

Knives

Guns

Cars

Helmets



Size

6.3 MB

Accuracy

77%

Speed per frame

93.28 ms

Size

6.0 MB

Accuracy

79%

Speed per frame

92.99 ms

Size

6.2 MB

Accuracy

89%

Speed per frame

95.58 ms

Size

6.3 MB

Accuracy

90%

Speed per frame

96.58 ms

Size

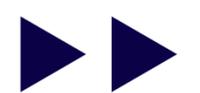
6.1 MB

Accuracy

91%

Speed per frame

92.27 ms



▶ RESULTS



Backpacks



Size

6.3 MB

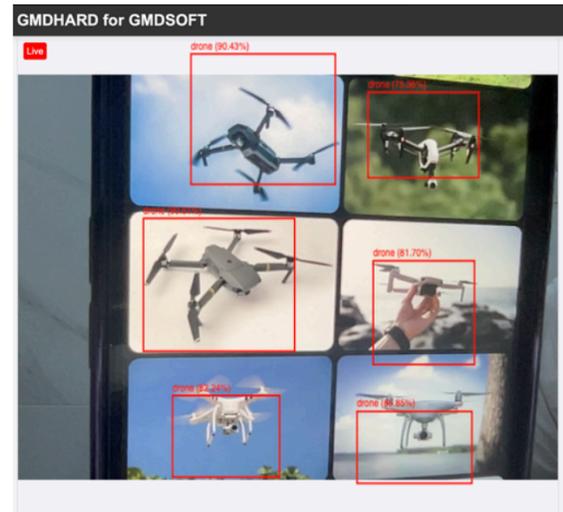
Accuracy

79%

Speed per frame

101.33 ms

Drones



Size

6.1 MB

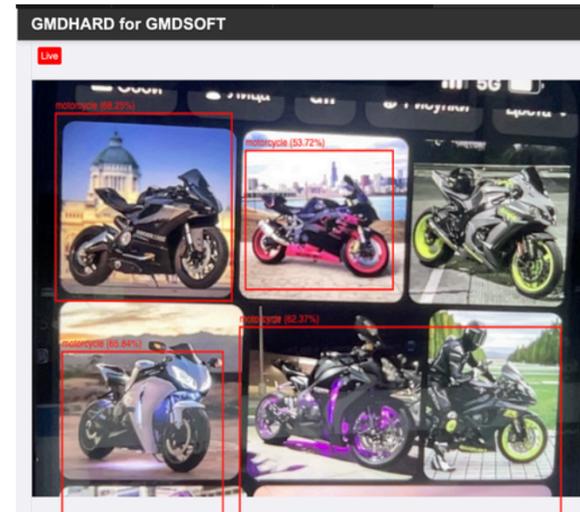
Accuracy

92%

Speed per frame

98.22 ms

Motorbikes



Size

6.2 MB

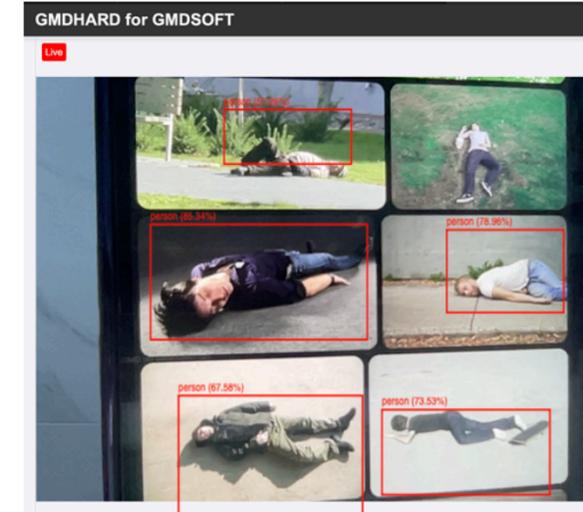
Accuracy

85%

Speed per frame

99.93 ms

Fallen People



Size

6.2 MB

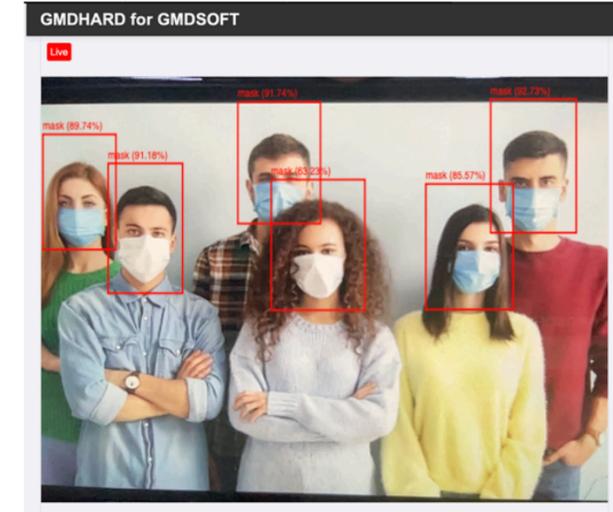
Accuracy

92%

Speed per frame

93.62 ms

Masks



Size

6.0 MB

Accuracy

93%

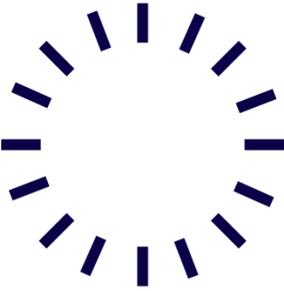
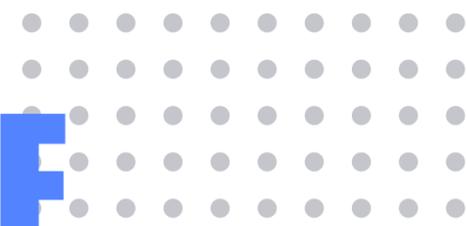
Speed per frame

98.59 ms





USER INTERFACE



Live video:

Detected objects boundary boxes

Filter options:

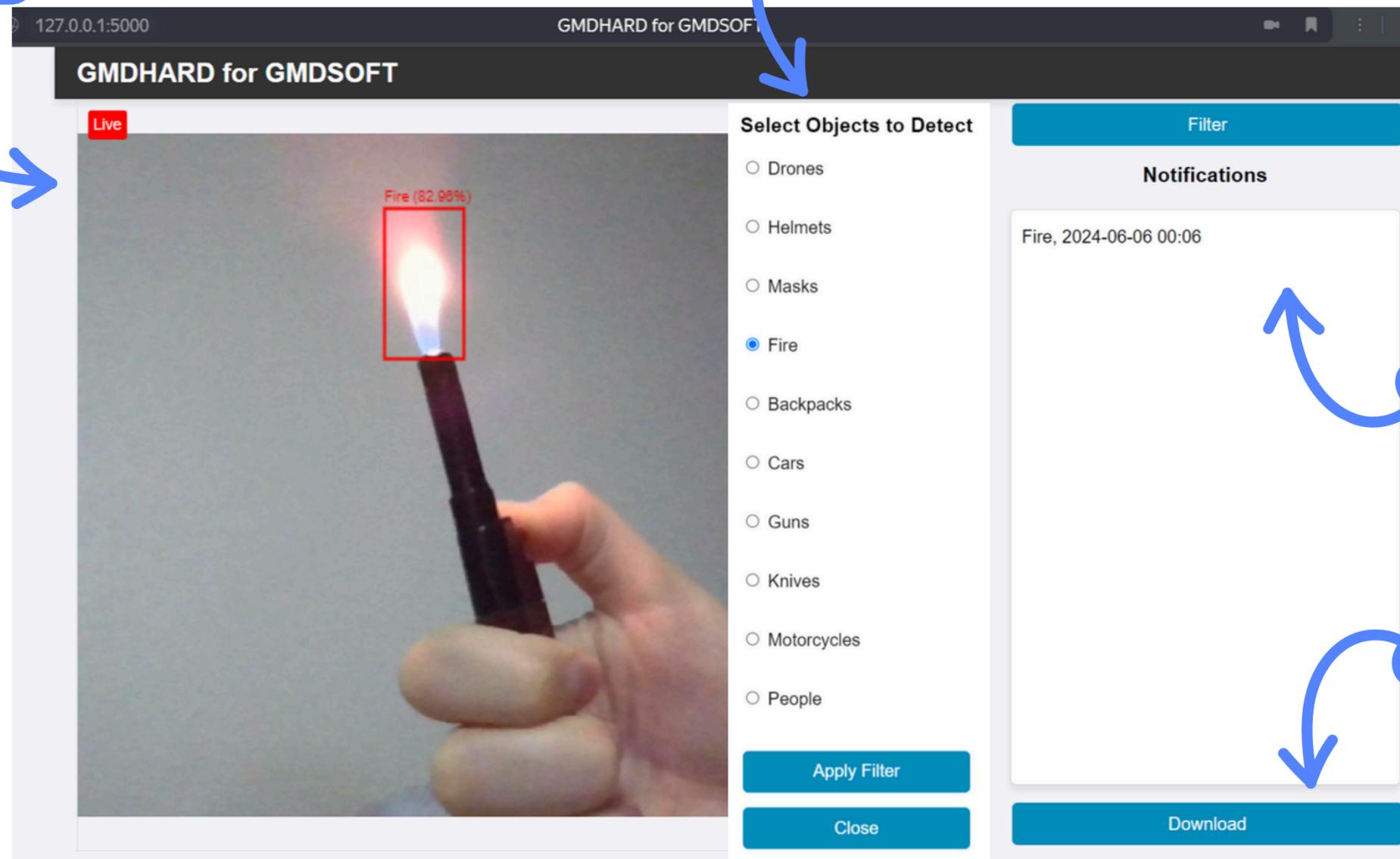
Choose 1 out of 10 objects for detection

Notifications:

Detected object, Date and Time of detection saved once a minute

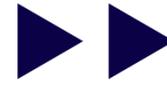
Download:

Download history of notifications





DEMO



127.0.0.1

GMDHARD for GMDSOFT

Live



Filter

Notifications

Download





**THANK
YOU**

