WOOSONG UNIVERSITY amazon Team

Drug Detection

By: Amazon Team

Vanessa Garza Enriquez 201912119
Yang Seong Jin 201910134
Jamshidbek Urolov 201910021

Project Goal

DETECT DRUGS FAST AND ACCURATELY

CATCH DRUG DEALERS

HELP WITH FORENSIC INVESTIGATION

List of Drugs

Cocaine ✓

Marijuana ✓

Heroin ✓

LSD ✗

Ecstasy ✗

Meth ✗

Shrooms ✓

Opioids ✗

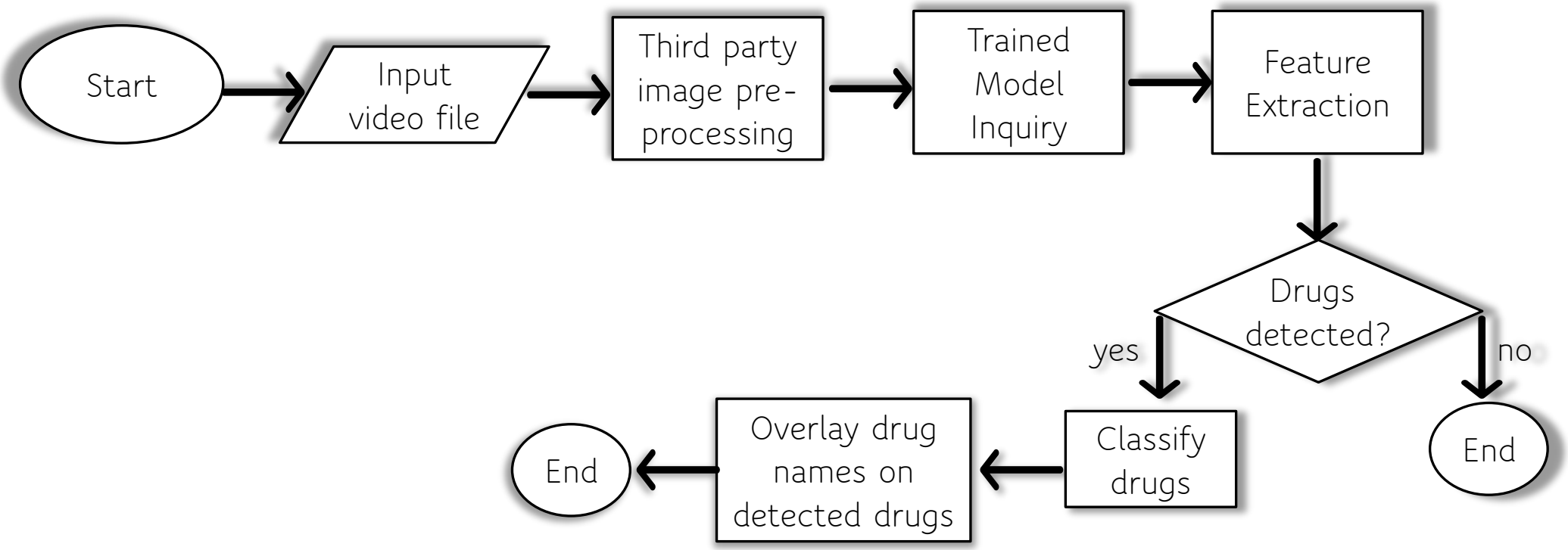
Planned Schedule

세부내용	수행기간(월)																비고
	3				4				5				6				
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	
1. Project research	O	O													-	-	
2. Dataset creation		O	O	O	O	O	O								-	-	
3. Training model						O	O	O	O	O					-	-	
4. Interface creation										O	O	O	O	O	O	-	
5. Testing															O	O	

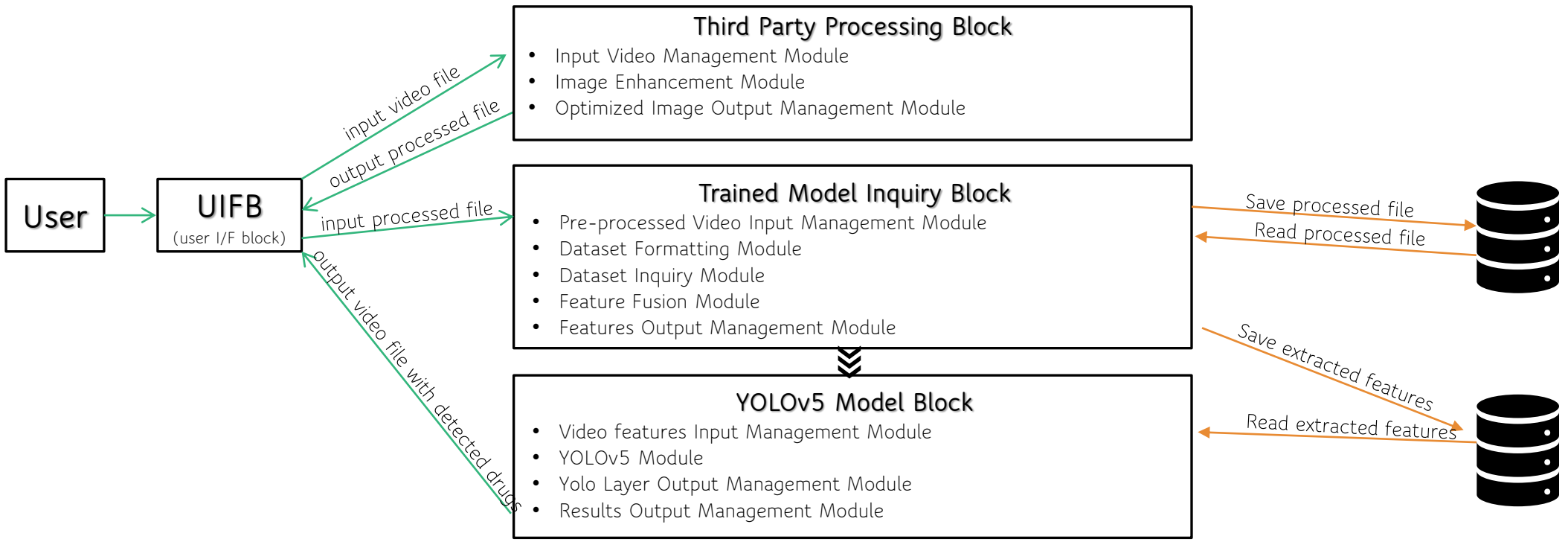
Actual Execution

세부내용	수행기간(월)																비고
	3				4				5				6				
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	
1. Project research	O	O	O	O											-	-	
2. Dataset creation		O	O	O	O	O	O	O	O	O	O	O			-	-	
3. Training model				O				O				O			-	-	
4. Interface creation									O	O	O	O	O	O	-	-	
5. Testing					O	O	O	O	O	O	O	O	O	O	-	-	

Software Overview



Software Architecture



Third Party Processing Block HLD

- Input Video Management Module: in this module the user inputs the desired video file to be optimized for better accuracy of analysis.
- Image Enhancement Module: in this module the image overgoes several steps of optimization like deblurring, denoising, brightness adjustment, etc. in order to enhance the video file. This is done via a third-party software.
- Optimized Image Output Management Module: in this module the pre-processed image is managed for the trained model inquiry block.

Trained Model Inquiry Block HLD

- **Pre-processed Video Input Management Module**: in this module the user inputs the pre-processed video file to be processed for feature extraction with the help of CSPDarknet.
- **Dataset Formatting Module**: in this module we format the dataset for YOLOv5 by resizing the image to 640x640.
- **Dataset Inquiry Module**: in this module we need to access the dataset in order for the trained model to work.
- **Feature Fusion Module**: in this module the data is fed to PANet for feature fusion.
- **Features Output Management Module**: in this module the model outputs the feature extractions and feature fusion for the analysis to take place.

YOLOv5 Model Block HLD

- **Video features Input Management Module**: in this module the pre-processed video and the extracted features from the trained model are added to the model for analysis.
- **YOLOv5 Module**: in this module the YOLOv5 model starts to work to detect drugs with extracted features in the video with the help of the yolo layer.
- **Yolo Layer Output Management Module**: in this module the Yolo Layer outputs the detection results (class, score, location, size).
- **Results Output Management Module**: in this module the model outputs a video file with the results of the detected drugs.

Module Requirements

Matplotlib 3.2.2

Numpy 1.18.5

Open CV 4.1.2

Pillow 5.3.1

PyYAML 2.23.0

SciPy 1.4.1

Torch 1.7.0

Torchvision 0.8.1

Tqdm 4.41.0

Tensorboard 2.4.1

Pandas 1.1.4

Seaborn 0.11.0

Coremltools 4.1

Onnx 1.9.0

Onnx-simplifier 0.3.6

Coremltools 4.1

Scikit-learn 0.19.2

Tensorflow 2.4.1

Tensorflowjs 3.9.0

Openvino-dev

Albumentations 1.0.3

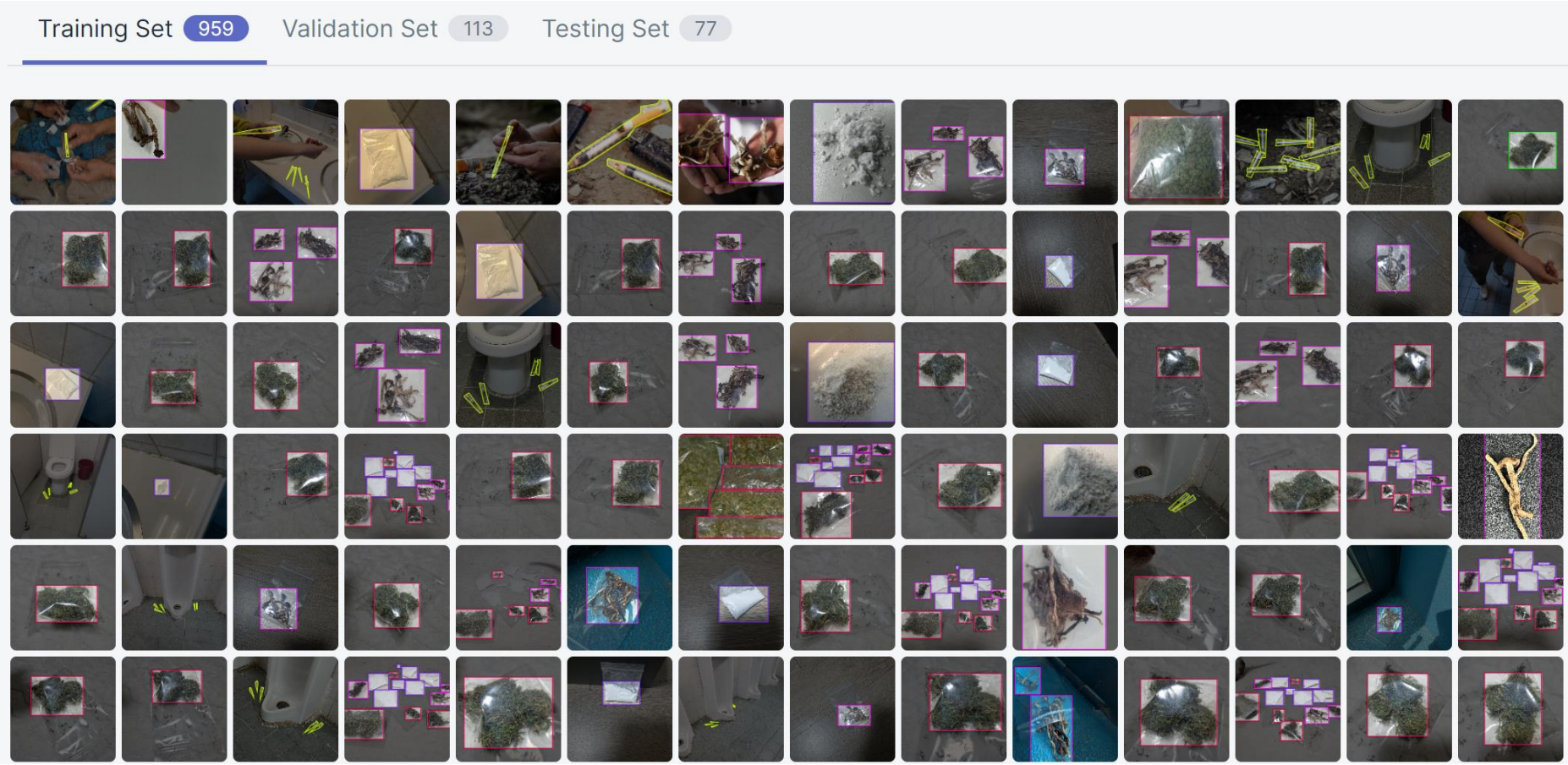
Pycocotools 2.0

Cython

Roboflow

thop

Dataset (version 4)



Contains:

- Heroin
- Cocaine
- Shrooms
- Marijuana

Labeled Data with Roboflow

Shrooms

Heroin

Cocaine

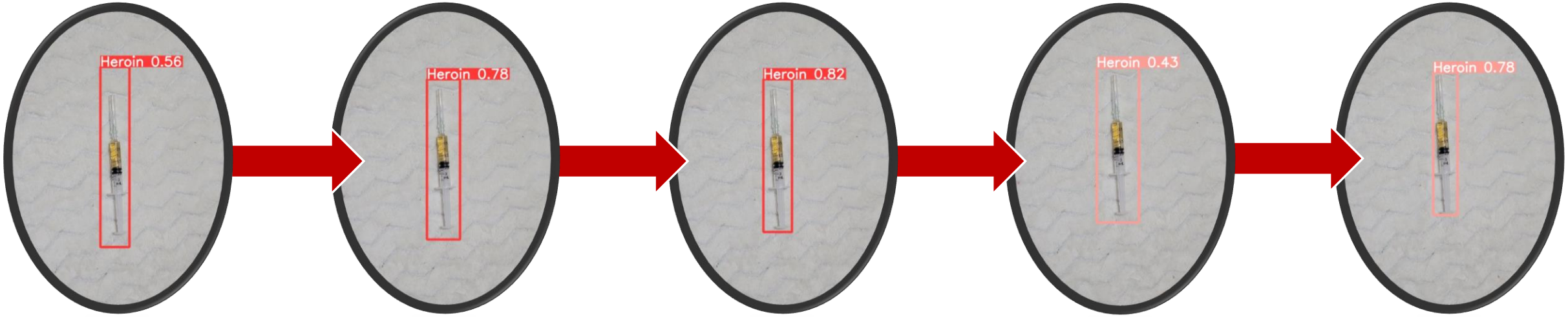
Marijuana

Dataset

Images	Annotations	Average Image Size	Median Image Ratio
1,149	4,064	12.00 mp	4000×3000
0 missing annotations	3.5 per image (average)	from **0.05 mp**	wide
15 null examples	across 4 classes	to **108.00 mp**	

Class Balance

Image Accuracy



50 epochs	100 epochs	200 epochs	237 epochs	277 epochs
56%	78%	82%	43%	78%
V2 dataset (157 imges)	V2 dataset (157 images)	V2 dataset (157 images)	V3 dataset (461 images)	V4 dataset (1,149 images)

Image Resolution

4000 x 2252

1280 x 721

640 x 360

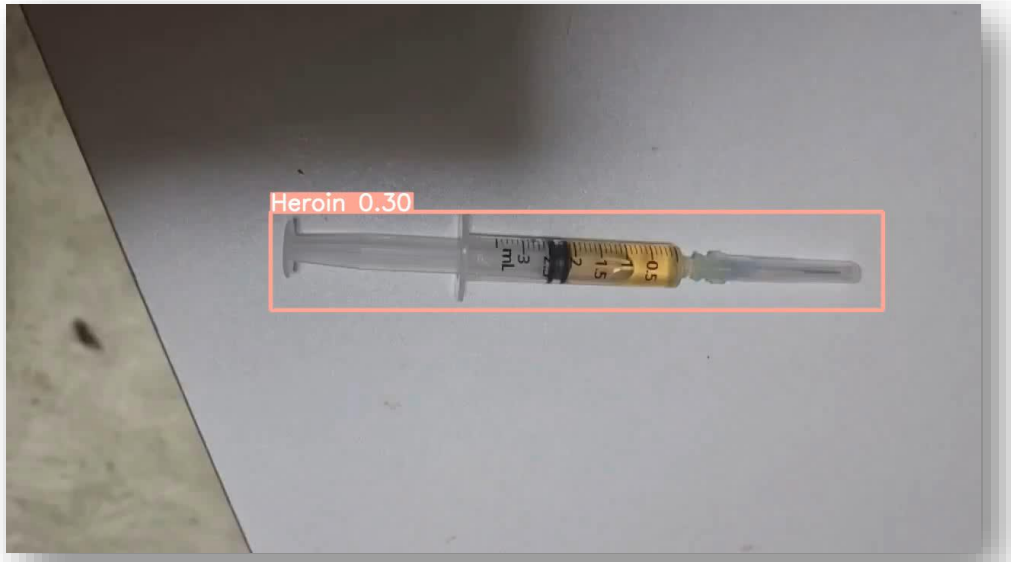
- Image resolution affects the accuracy of the detection.

Picture Accuracy

	Cocaine	Shrooms	Heroin	Marijuana
237 Epochs V3 dataset	 34%	 48%	 45%	
277 Epochs V4 dataset	 87%	 82%	 72%	 77%

Video Accuracy

200 epochs
V2 (157 images)
85%



237 epochs
V3 (461 images)
30%

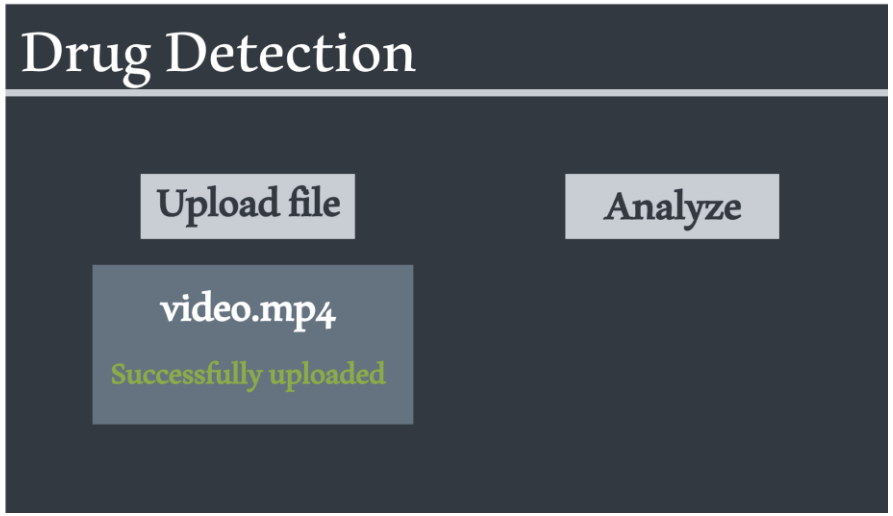
Video Accuracy

277 epochs
V4 (1,149 images)
87%

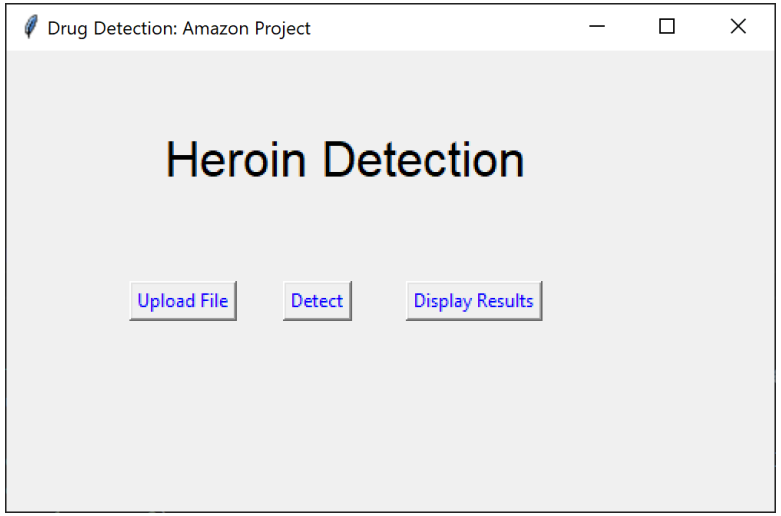
Drug Detection in edges

- Able to detect even if it is showing a small area of the drug.
- The smaller the area the less accurate it gets.

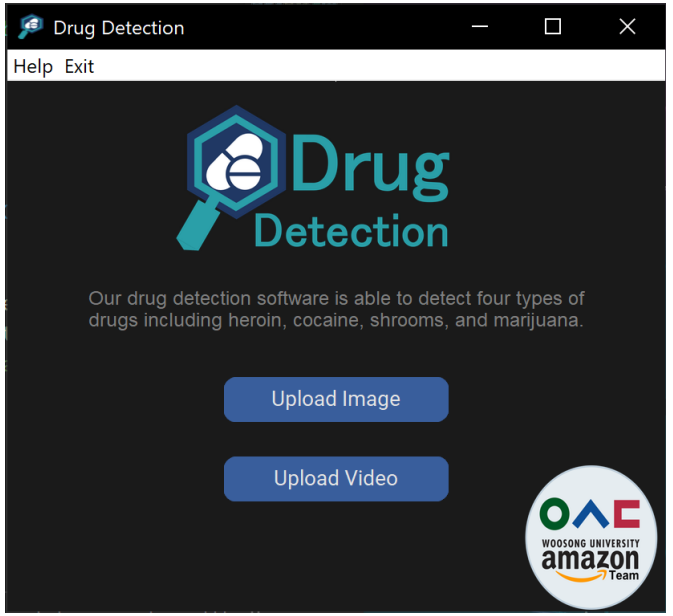
Interface Design



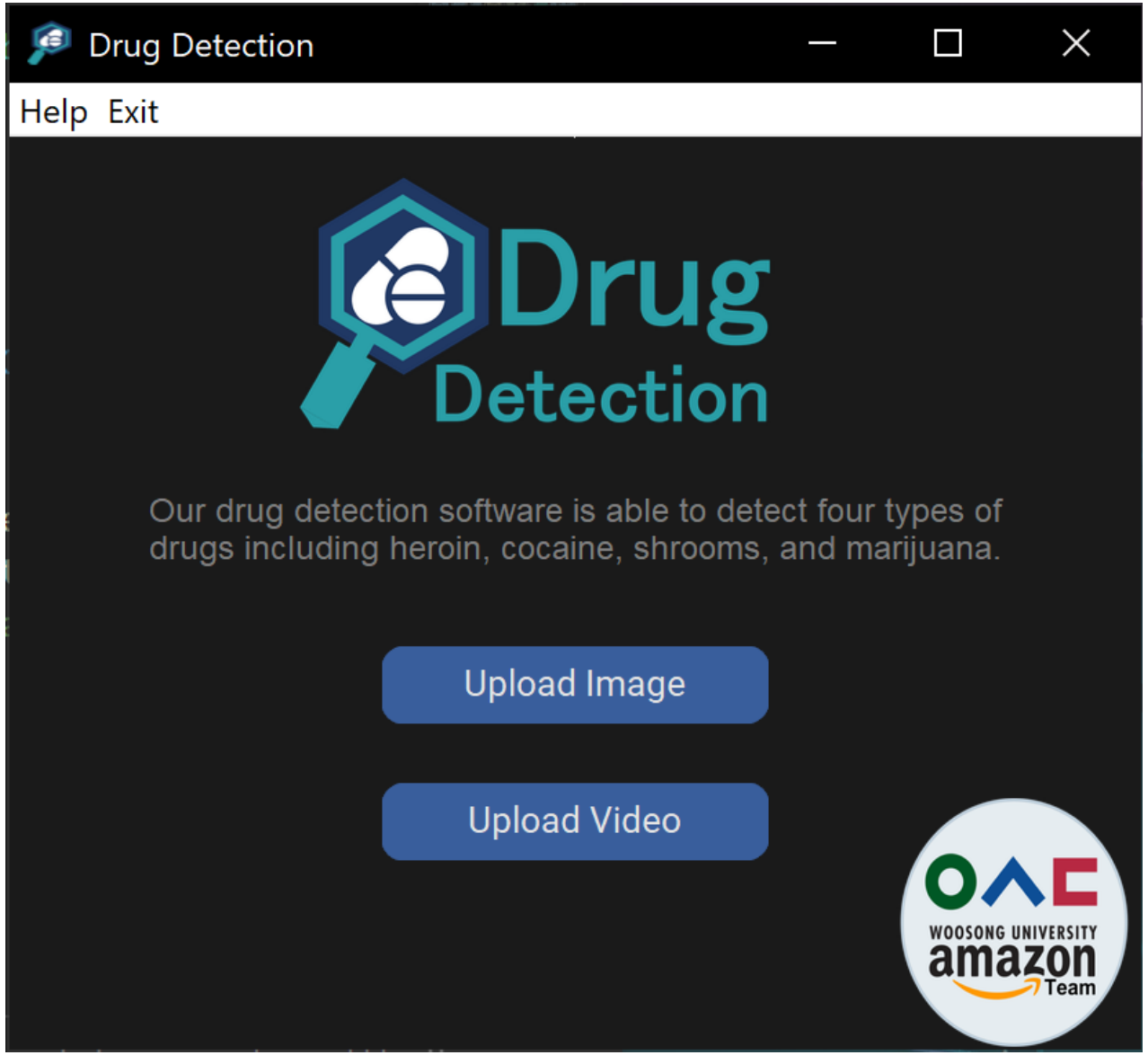
Initial Design



Testing Tkinter



Final Result


Drug Detection
Help Exit
Drug
Detection
Our drug detection software is able to detect four types of drugs including heroin, cocaine, shrooms, and marijuana.
Upload Image
Upload Video
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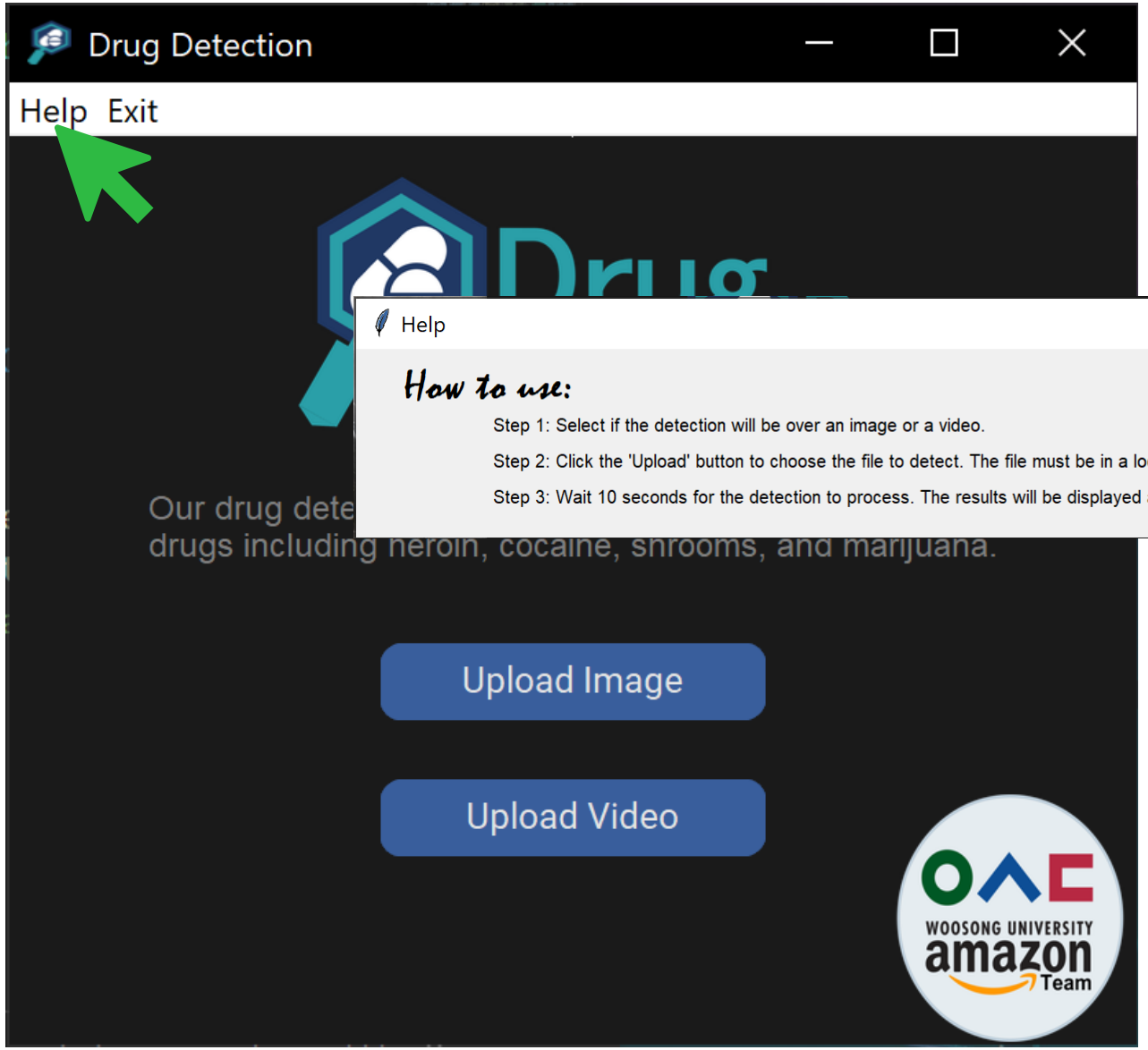
Interface


Drug Detection
Help Exit
Help
How to use:
Step 1: Select if the detection will be over an image or a video.
Step 2: Click the 'Upload' button to choose the file to detect. The file must be in a local storage.
Step 3: Wait 10 seconds for the detection to process. The results will be displayed automatically in a new window.
Our drug dete
drugs including heroin, cocaine, shrooms, and marijuana.
Upload Image
Upload Video
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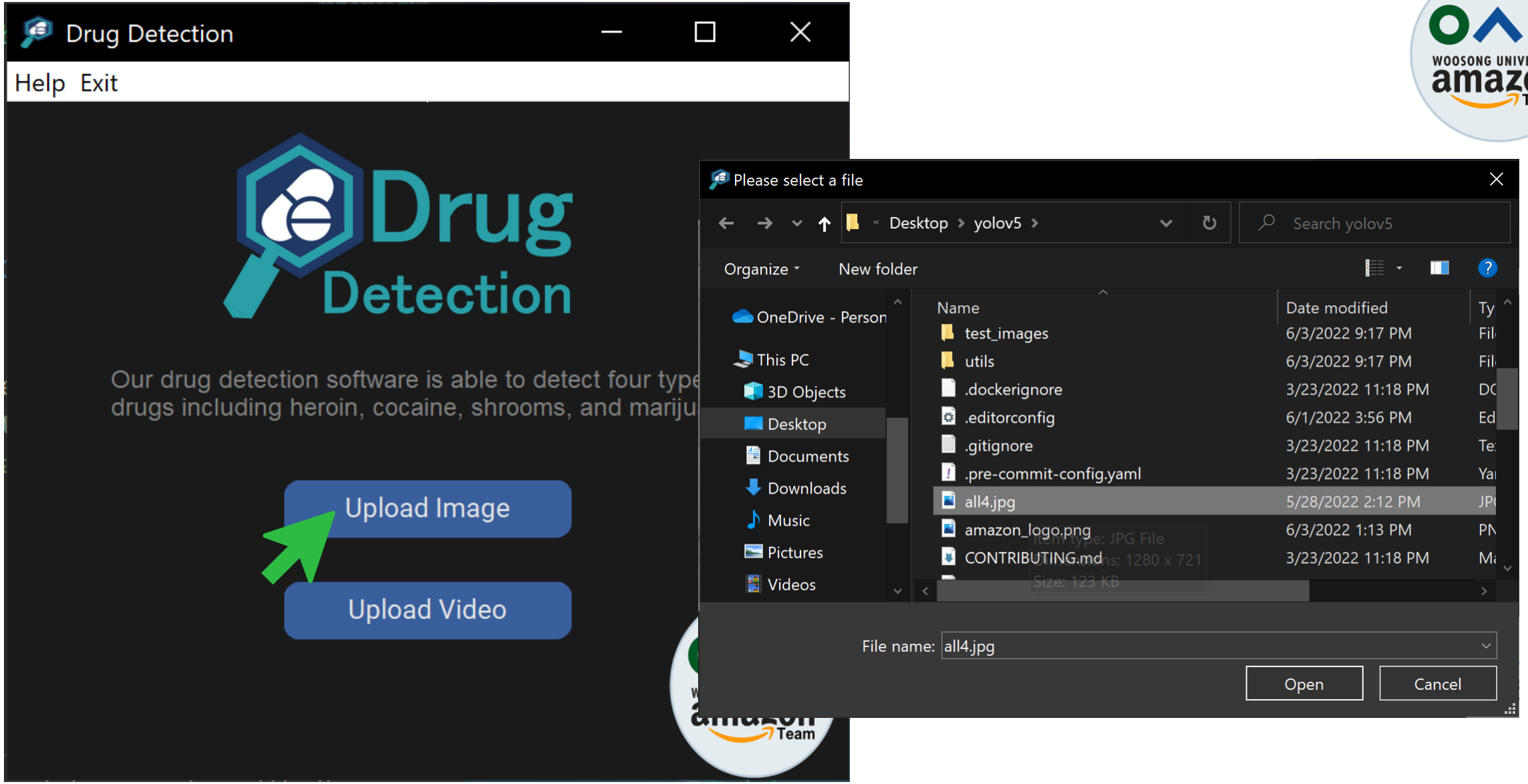
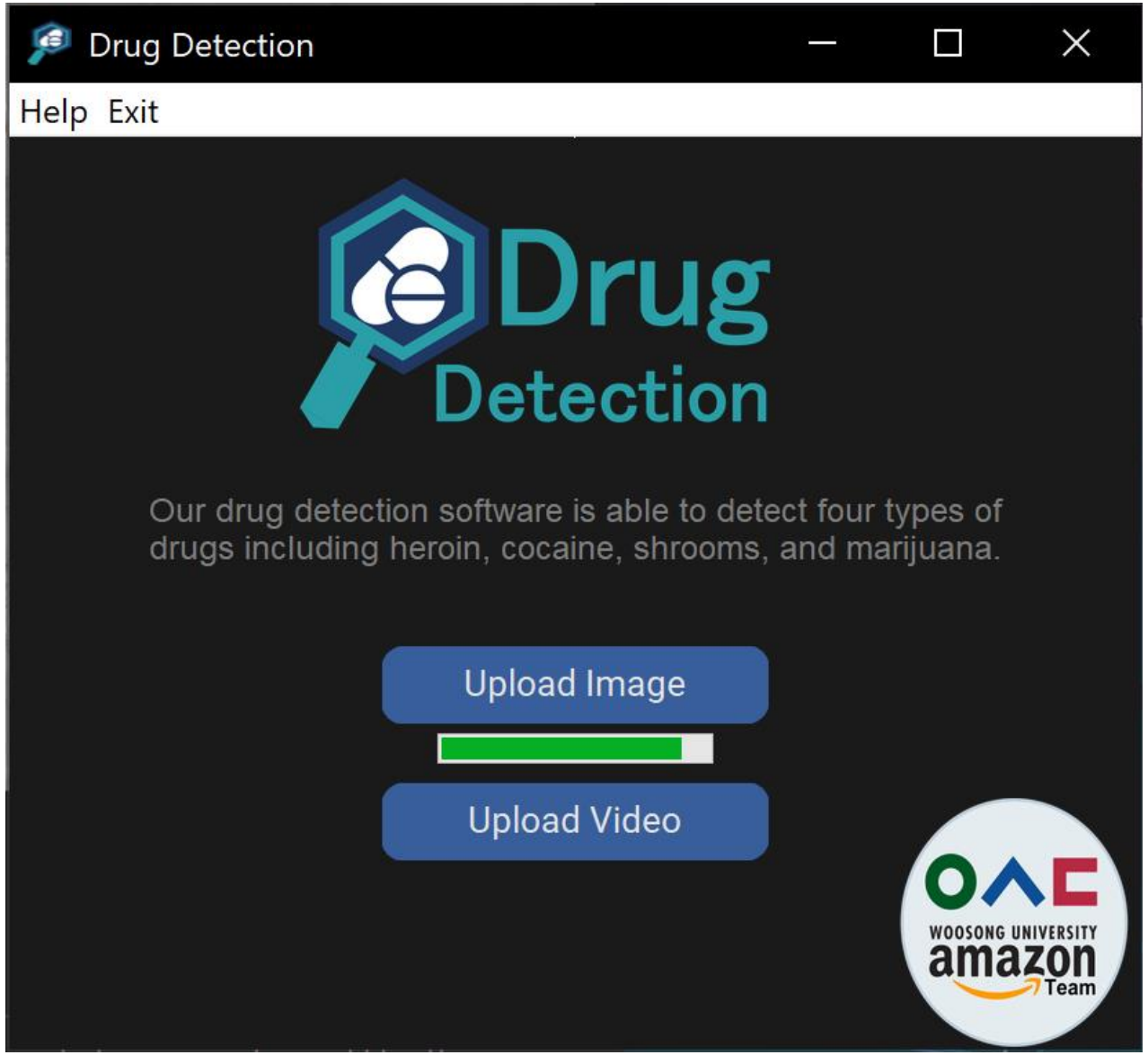
Interface


Drug Detection
Help Exit
Drug
Detection
Our drug detection software is able to detect four type
drugs including heroin, cocaine, shrooms, and mariju
Upload Image
Upload Video
Please select a file
Desktop › yolov5 ›
Search yolov5
Organize
New folder
OneDrive - Person
This PC
3D Objects
Desktop
Documents
Downloads
Music
Pictures
Videos
Name
Date modified
test_images
6/3/2022 9:17 PM
utils
6/3/2022 9:17 PM
.dockerignore
3/23/2022 11:18 PM
.editorconfig
6/1/2022 3:56 PM
.gitignore
3/23/2022 11:18 PM
.pre-commit-config.yaml
3/23/2022 11:18 PM
all4.jpg
5/28/2022 2:12 PM
amazon_logo.png
6/3/2022 1:13 PM
CONTRIBUTING.md
3/23/2022 11:18 PM
Item type: JPG File
Size: 123 KB
File name: all4.jpg
Open
Cancel


Drug Detection
Help Exit
Drug
Detection
Our drug detection software is able to detect four types of drugs including heroin, cocaine, shrooms, and marijuana.
Upload Image
Upload Video
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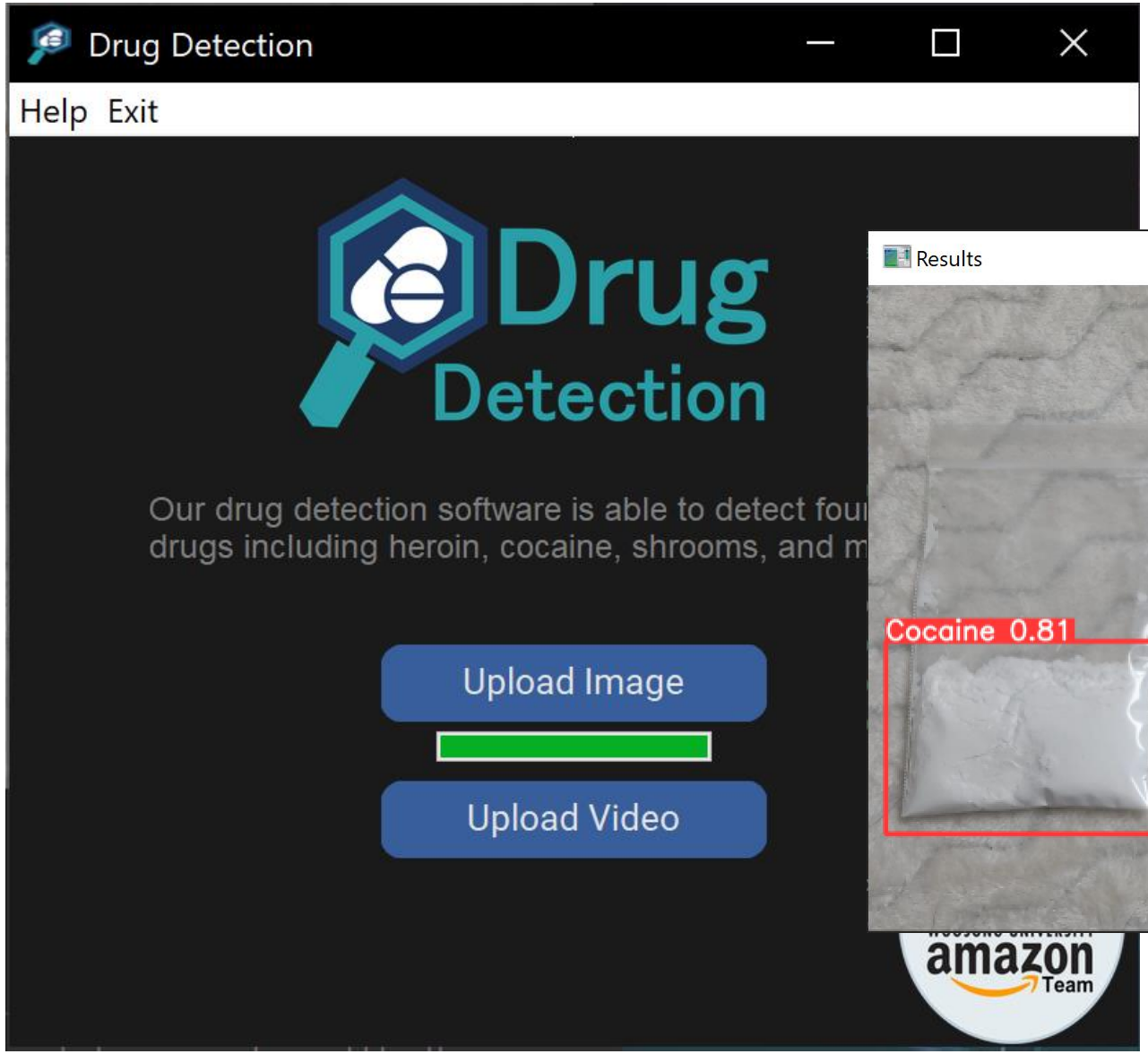
Interface


Drug Detection
Help Exit
Drug
Detection
Our drug detection software is able to detect fou
drugs including heroin, cocaine, shrooms, and m
Upload Image
Upload Video
amazon
Team


Results
Cocaine 0.81
Marijuana 0.83
Heroin 0.86
Shrooms 0.87

Supported Image Formats

Pictures

bmp, dng, jpeg, jpg, mpo, png, tif, tiff, webp

Videos

asf, avi, gif, m4v, mkv, mov, mp4, mpeg, mpg, ts, wmv

Conclusion

- We can increase the level of confidence by around 10% by using images with high resolution.
- Integrating several classes of drugs decreases the level of confidence in the detection, however this can be solved by increasing the dataset.
- We will keep adding more drugs while increasing the dataset at the same time.

Future Work

Ecstasy

LSD

Thank you

Q & A

https://github.com/AmazonTeam-Woosong/DrugDetection