

# Machine Learning & Data Science Professional Projects

Amir Jamali

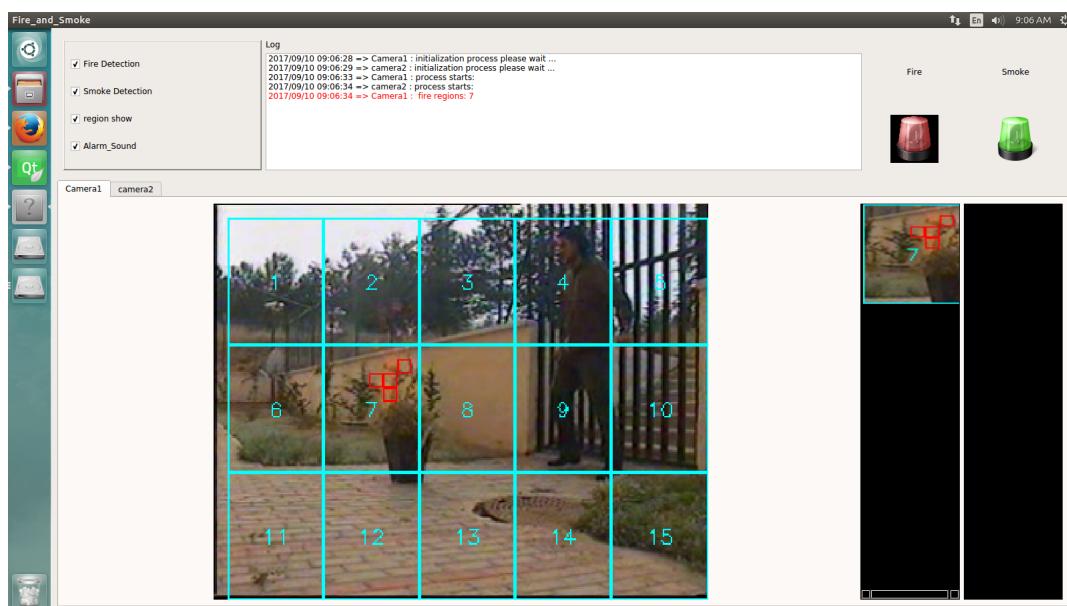
## introduction

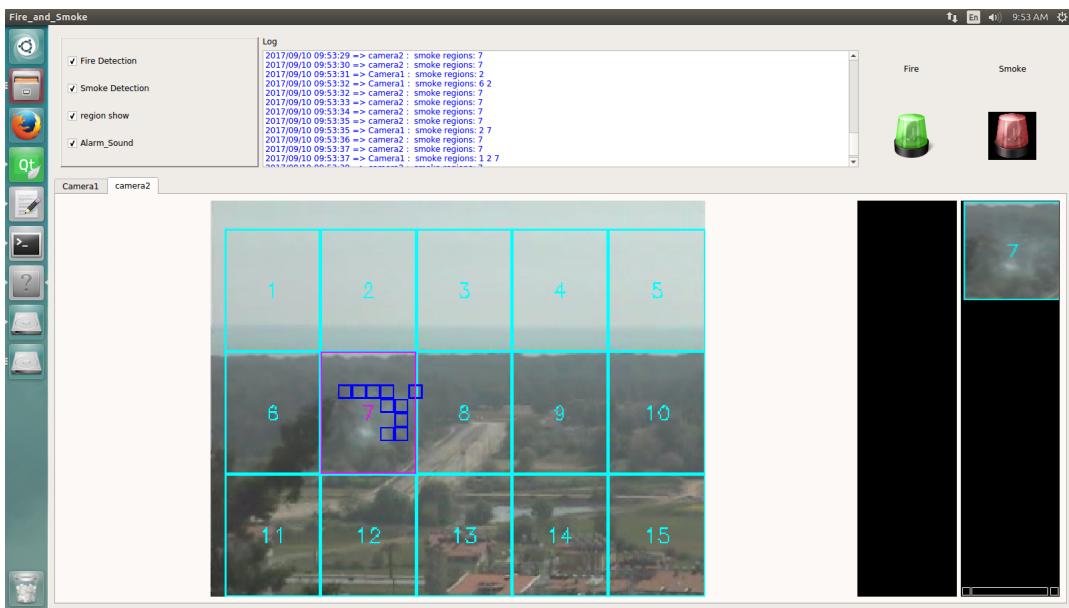
I have been Researcher & Developer at [Faraadid Co](#) since 2014 during in which I've conducted some computer vision applications such as Fire & Smoke Detection, Intrusion Detection, Face Recognition, People Counting, abandoned object, Camera Tampering and had contributed in some project such as Car License Plate Recognition, Anomaly Detection(Network Cyber Security) with C++ & Python. You can visit some of the applications I've developed at [Faraadid Co Surveillance Products website](#)

We were trying to develop industrial software which makes us tackle challenges in the real condition which enriched my experience in machine learning. All of the mentioned computer vision applications receive online stream from IP camera and processes any frame in real time. In the following, I'll give a brief description of each application but not in detail because of company's right.

## Fire & Smoke Detection

This application is developed in multi-threaded to process each camera stream independently. Each thread extracts some features from blocks with specific size and gives them to a classifier with some constraint. After then if number of candidate block for fire and smoke becomes larger than a threshold it Alarms fire or smoke in corresponding regions, shows them in the sidebar, sends SMS alarm using GSM module and reports camera number, event time, region number and event type to the remote database.





This application is successfully tested as fire & smoke detector in real condition at [Department of Environment of Iran](#) fire extinguisher maneuver in Ilam state. The Software was running since 2 hours before maneuver start with no any false alarm, and when smoke started, it began to send an alert in real-time immediately. In following you see two screenshots from software and one short clip related to maneuvering.





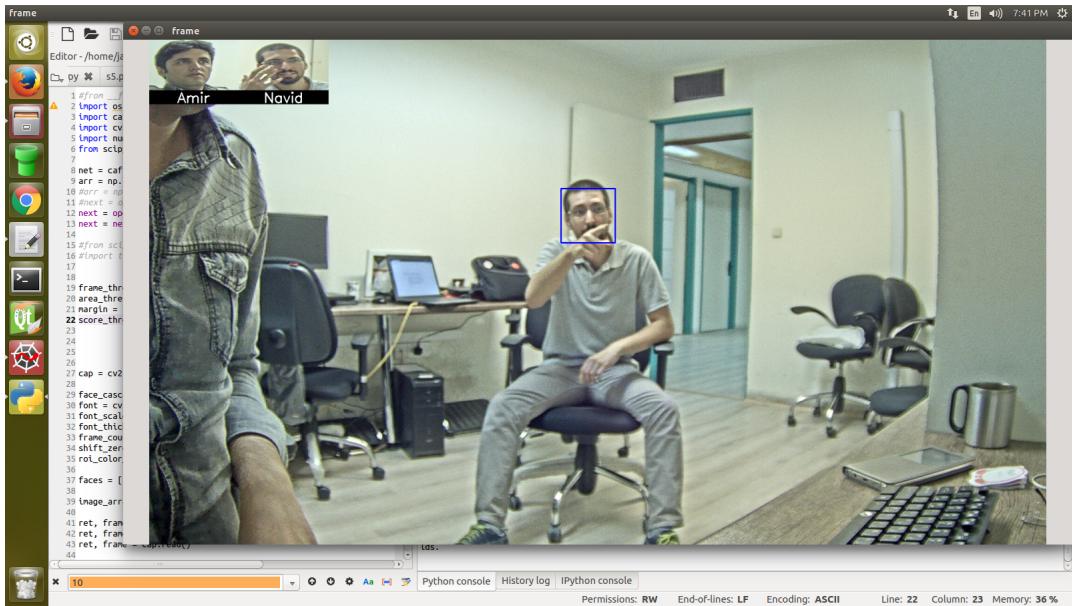
To see a short clip related to maneuvering, please click [Here](#)

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## Face Recognition

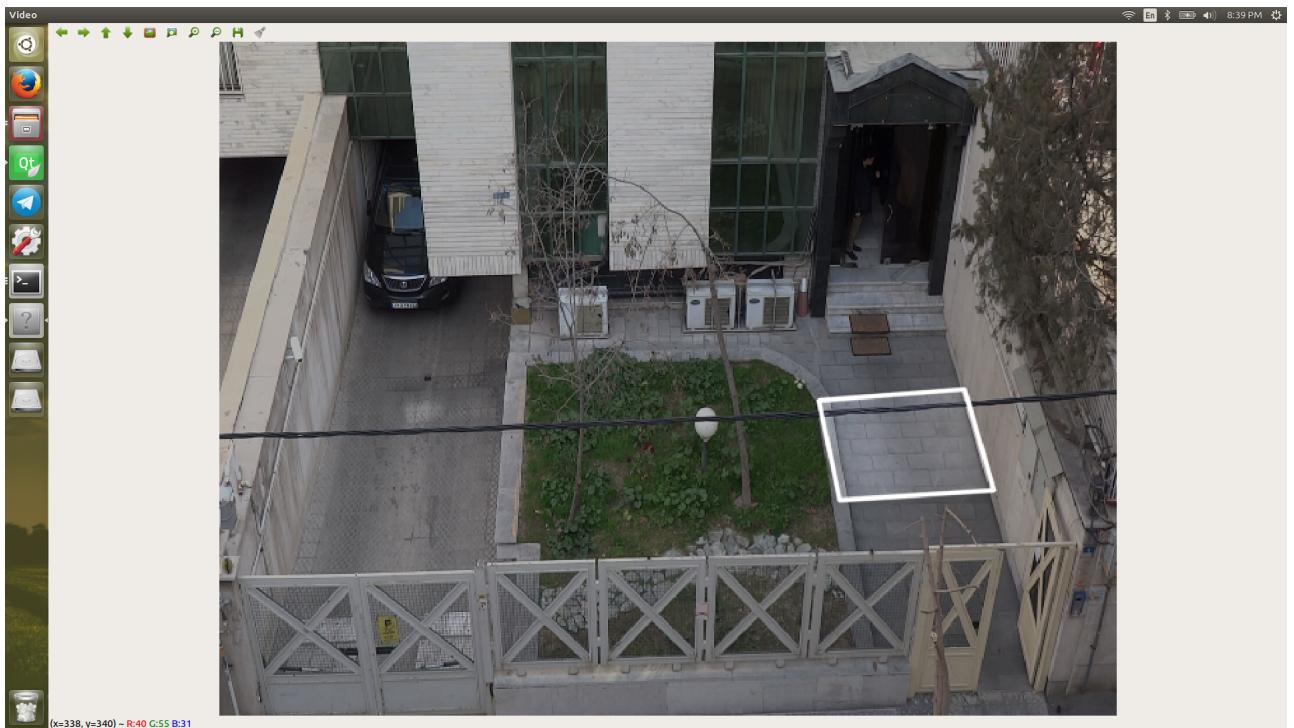
This application uses a Deep Convolutional Neural Network to recognize faces with poses under 30 degree in camera stream which yields the outstanding result in real time on GPU.



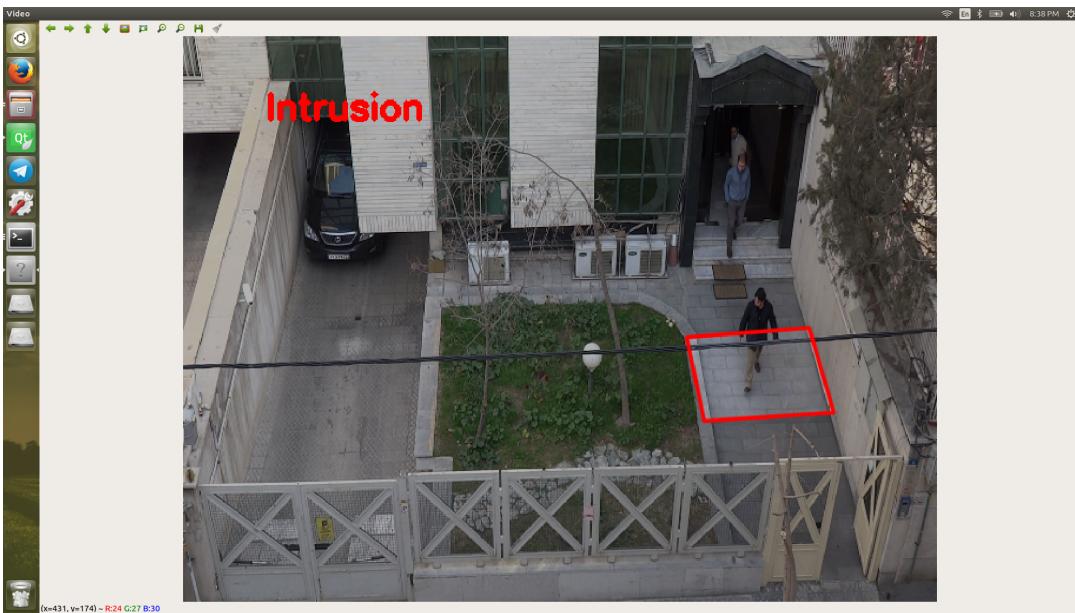


## Intrusion Detection

This application Alarms any human entrance into a forbidden area(<sup>1</sup>ROI) which is given by the user.



<sup>1</sup>Region Of Interest



## Car License Plate Recognition

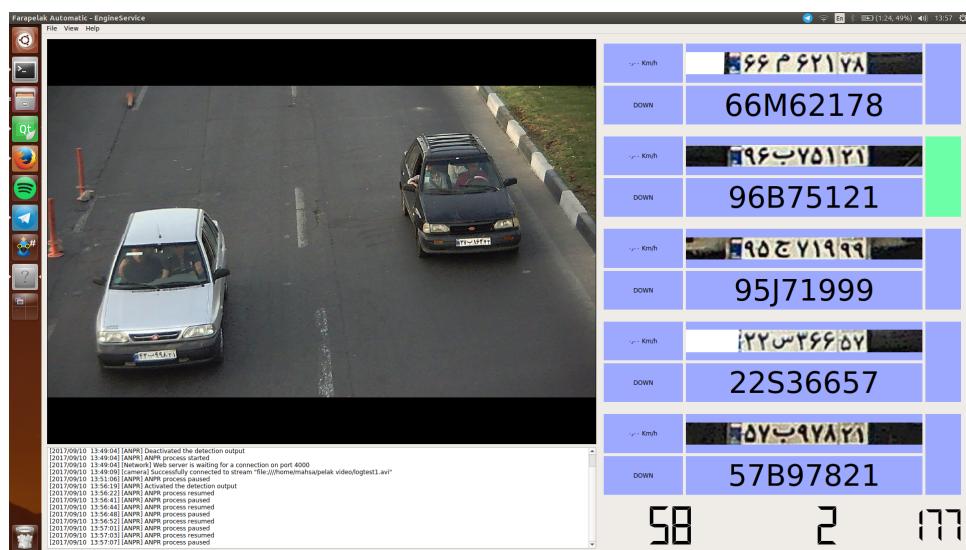
This application uses a Deep Convolutional Neural Network to recognize license plate. It is developed in two forms:

### Fix IP Camera

- For road, highways or parking entrance

### Mobile Ip Camera

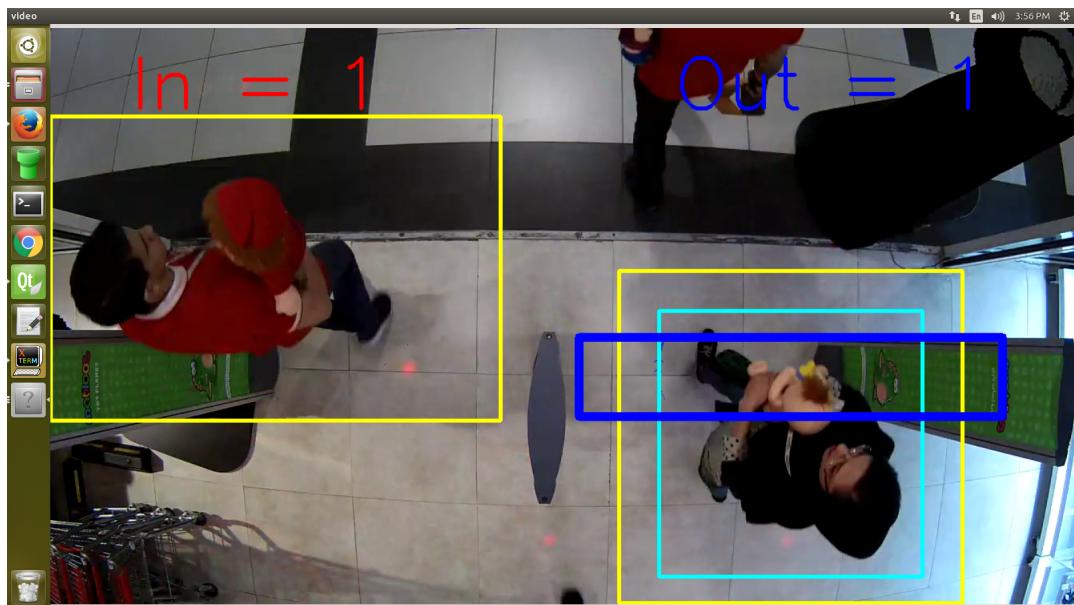
- In this case, the camera is located on a traffic police car which moves through street and alleys in the city and application reports breaking rule car plate number, and it's GPS position(by serial GPS receiver) to the remote database.



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## People Counting

In this application camera is located at the top of entrance and application counts number of people who come in or out.



## Camera Tampering

This application is developed to protect surveillance cameras from tampering, and it alarms when someone moves or occludes camera.



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## Anomaly Detection(Network Cyber Security)

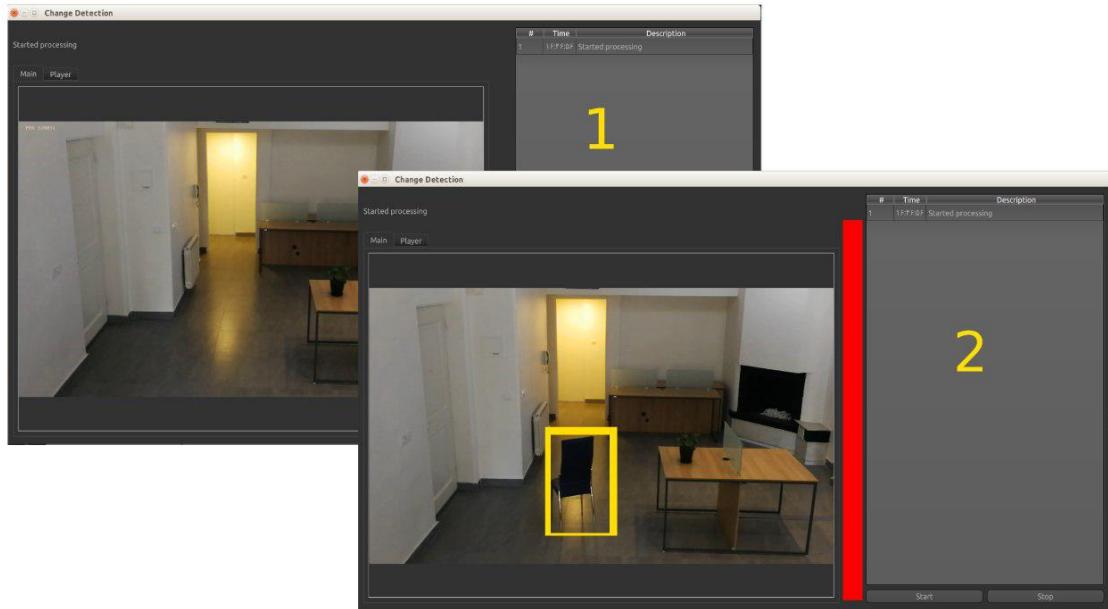
This application presents a prototype for anomaly detection in network flow(ipfix data). It trains model of the traffic behavior of each IP on each day of the week, so the traffic behavior excluded from that considered as anomaly behavior. The following image is an example report of this application. A higher score(redder)in that specifies more anomaly.

	srcip	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23				
0	192.168.11.242	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	45.25	25.66	48.43	144...	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00					
1	192.168.11.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	90.72	90.72	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00					
2	192.168.11.48	0.00	3.10	2.13	53.04	2.04	0.00	2.18	2.18	0.00	2.16	0.00	0.00	2.15	2.10	2.55	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00				
3	192.168.11.249	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	46.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00				
4	192.168.11.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	40.12	9.89	0.00	2.20	6.46	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
5	192.168.11.24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	32.88	7.52	35.10	0.00	11.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
6	192.168.11.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.28	0.00	25.89	0.00	3.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
7	192.168.11.7	20.41	20.83	21.07	21.07	16.81	18.95	20.71	20.45	21.53	18.26	20.56	20.41	19.94	18.94	18.82	18.82	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
8	192.168.11.1	0.00	0.00	0.00	2.41	0.00	3.56	8.51	0.00	0.00	2.06	0.00	0.00	20.59	3.48	5.59	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
9	192.168.11.207	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.25	11.79	4.30	5.41	3.47	16.08	7.32	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
10	192.168.11.4	0.00	0.00	4.60	0.00	0.00	0.00	0.00	5.40	0.00	0.00	0.00	0.00	0.00	11.22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
11	192.168.11.148	8.52	0.00	0.00	0.00	0.00	0.00	8.52	0.00	0.00	7.90	0.00	8.48	0.00	0.00	8.51	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
12	192.168.11.201	3.31	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
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## Abandon Object Detection

This application alerts in the case that someone leaves something behind in an area after specific time



Last updated: October 16, 2017 By Amir Jamali