SDAIA
الهيئة السعودية للبيانات والذكاء الاصطناعي
Saudi Data & AI Authority

SMART PARKING SYSTEM (SPS)

Mohammed Almalki
Yahya Alyoubi
Mohammed Alajmi

Jamilah Alharbi
Ghaliah Maher
Ghadeer Alghamdi

Supervised by: Dr.Mejdal AlQahtani

CONTENTS

01 MOTIVATION

أعلن سمو ولي العهد خلال مشاركته في الدورة الرابعة لمبادرة مستقبل الاستثمار عن خطة المملكة في إعلان إستراتيجية تطوير مدينة الرياض كجزء من خططها لتنويع مصادر الدخل ونمو الاقتصاد.

من تصريحات سموّه

◄ "نستهدف أن تكون الرياض من أكبر عشر مدن اقتصادية في العالم، اليوم هي رقم أربعين، من أكبر أربعين اقتصاد في العالم كمدينة، نستهدف في الرياض أن نصل من 7.5 ملايين نسمة إلى ما بين 15 و 20 مليون نسمة في 2030."

01

PROBLEM DEFINITION

- Parking violations.
- Illegal Parking .
- One in two parking.
- Crowding in exit.

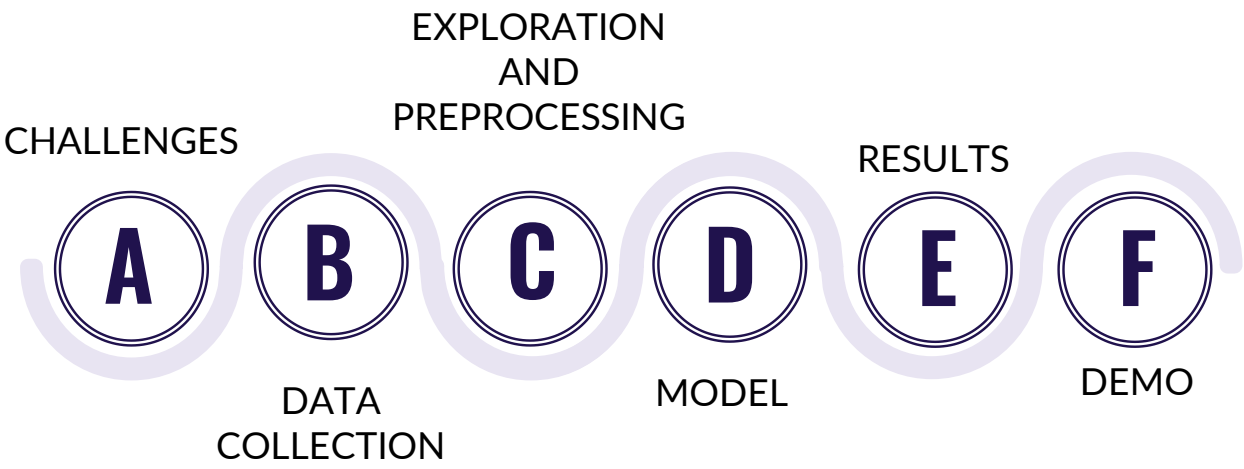
02 OBECTIVE OF PROJECT

SMART PARKING SYSTEM (SPS)

CV BASED ON DEEP LEARNING

ARABIC CHATBOT Q/A

03 ARABIC CHATBOT (NLP)



Challenges A

- Errors in text.
- Morphological Processing and the Dialects
- Domain-specific language.
- Low-resource languages.

DATA COLLECTION B

SURVEYS.

Web scraping from articles and writing data all collected in Excel File.

	text
0	هناك شخص واقف خلف سيارتي
1	هناك شخص متوقف خلف سيارتي
2	في احد موقف ورا سيارتي
3	فيه واحد موقف ورا سيارتي
4	فيه واحد واقف وراي
...	...
607	ما هو مبلغ مخالفاتي
608	وجدت مخالفات جديدة وأودّ الاستفسار عن وقت حدوثها
609	هل علي مخالفات
610	ماهي فواتيري
611	هل لي ان اعرف نوع المخالفة

612 rows × 1 columns

C EXPLORATION AND PR-EPROCESSING

1- Remove number and punctuation.
2- Create stop word dictionary “prepositions and pronouns” and then remove them all from the dataset.
3- Replace the word "وراي" by the word "خلفي"
4- Normalize the following from Camel tool:

- All "أ، إ ، آ" with “ ا”
- All “ ى ” to “ ي ”

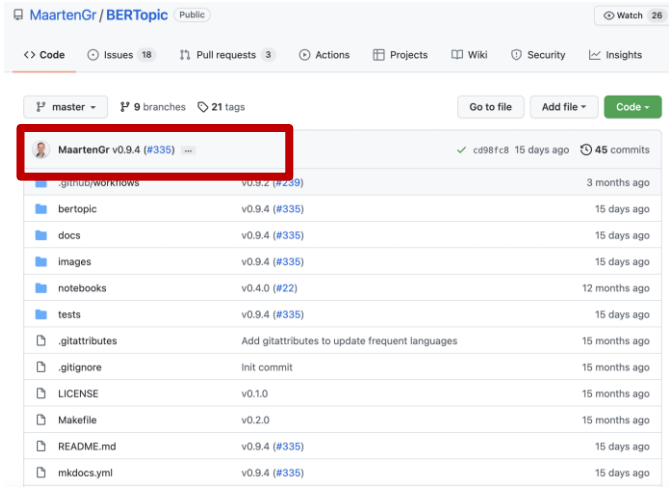
5- Stemming from Farasah library.
6- Part of speech (P.O.S) using Camel tool model CAMeL-Lab/bert-base-arabiccamelbert-mix-pos-glf

لقيت سيارتي مصدومه >>(لقيت) تصنف كفعل

MODEL D

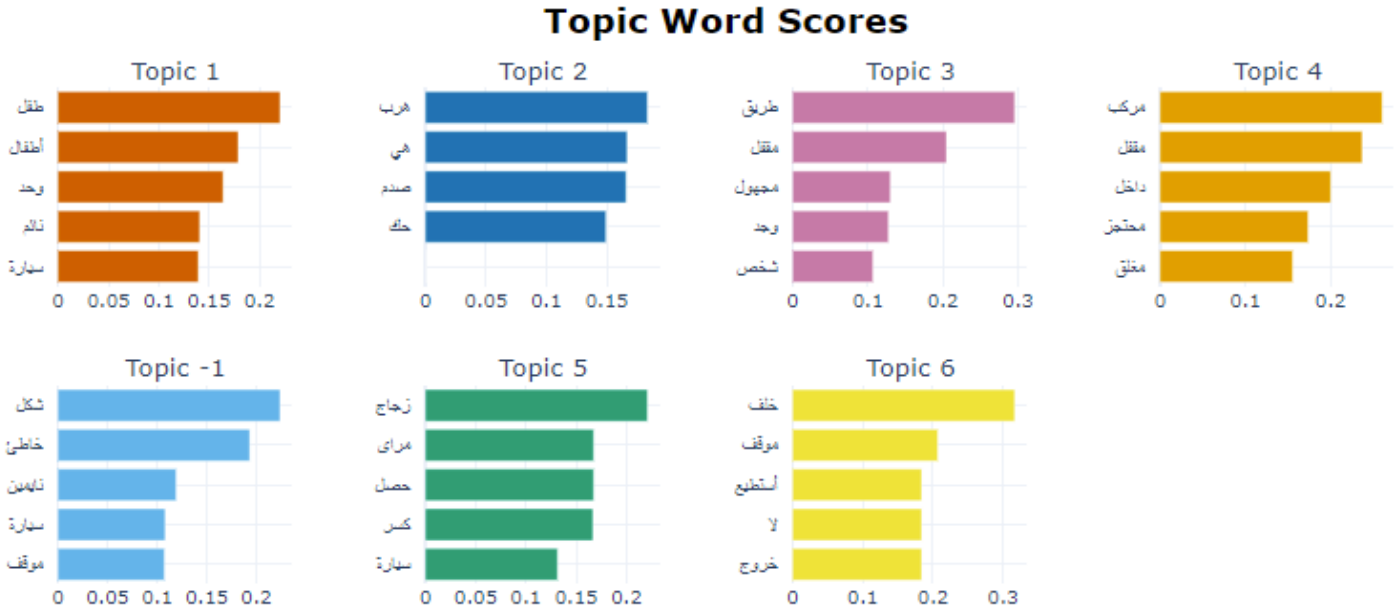
BERT_for_Arabic_Topic_Modeling_ACLing2021

Model	HuggingFace Model Name	Size (MB/Params)	Pre-Segmentation	DataSet (Sentences/Size/nWords)
AraBERTv0.2-base	bert-base-arabertv02	543MB / 136M	No	200M / 77GB / 8.6B
AraBERTv0.2-large	bert-large-arabertv02	1.38G 371M	No	200M / 77GB / 8.6B
AraBERTv2-base	bert-base-arabertv2	543MB 136M	Yes	200M / 77GB / 8.6B
AraBERTv2-large	bert-large-arabertv2	1.38G 371M	Yes	200M / 77GB / 8.6B
AraBERTv0.1-base	bert-base-arabertv01	543MB 136M	No	77M / 23GB / 2.7B
AraBERTv1-base	bert-base-arabert	543MB 136M	Yes	77M / 23GB / 2.7B



MODEL D

BERT_for_Arabic_Topic_Modeling_ACLing2021

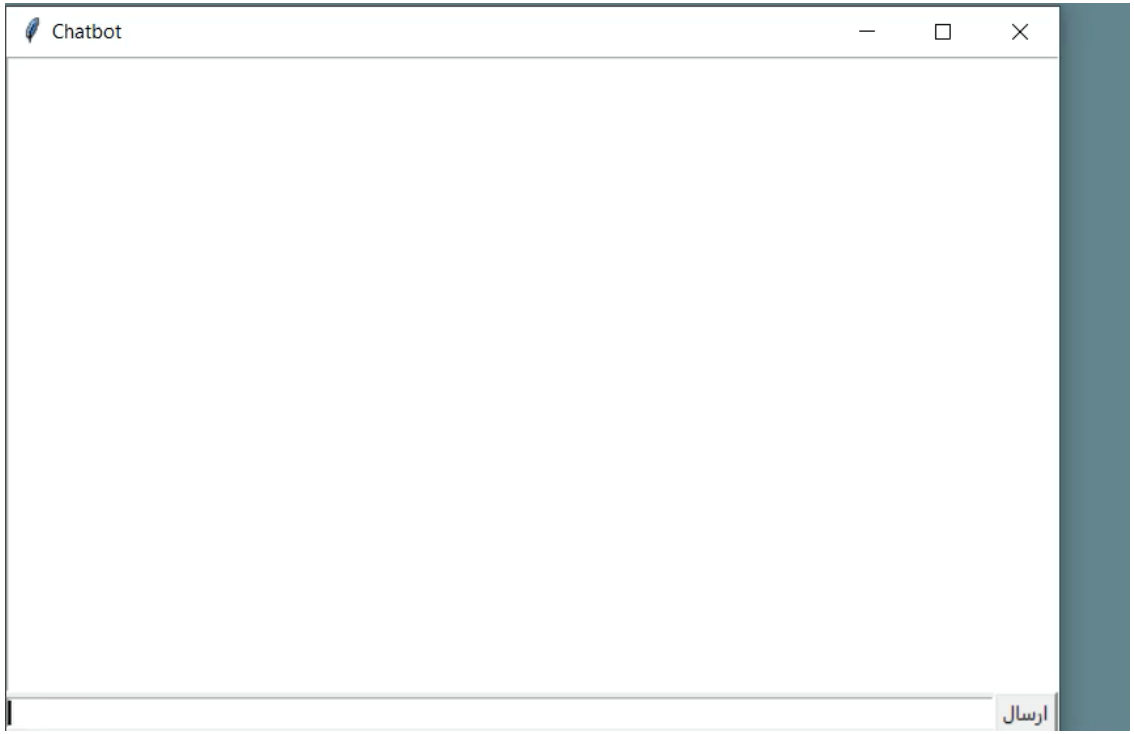


RESULTS

COHERENCE	MODEL NAME
0.376	LDA (Latent Dirichlet Allocation).
0.584	NMF (Non-negative Matrix Factorizatin)
1.000	BERT_for_Arabic_Topic_Modeling_ACLing2021

DEMO

Interactive Arabic Chatbot



CV OF DEEP LEARNING

01

PROBLEM DEFINITION

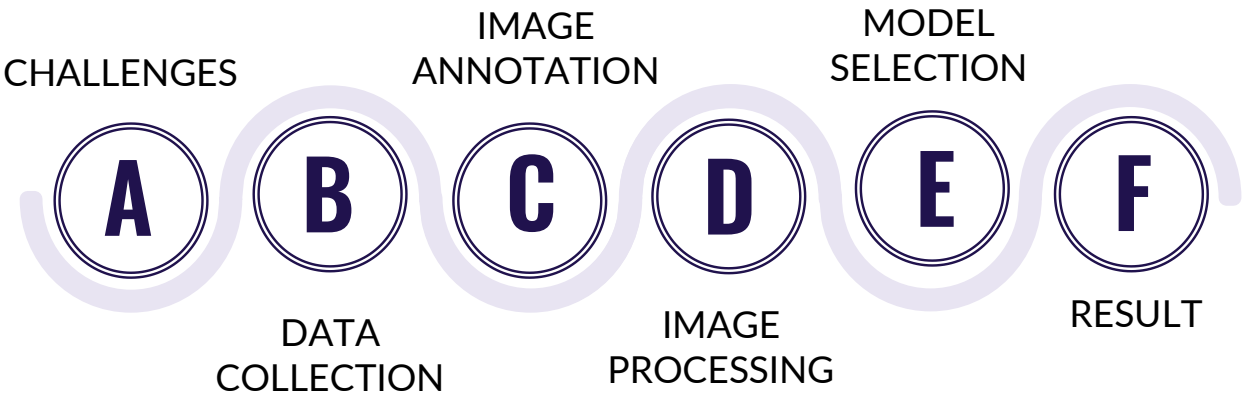
Parking Violations Detection:

1- By line parking detection

2- Object tracking based on limited and object movement

- Occupied parking.
- Available parking.
- Disabled parking.
- Parked in wrong space.
- One in two parking.

04 CV BASED ON DEEP LEARNING



Challenges

- Data collection.
- Selection of the best weight.
- Data-intensive computing.
- Real time detection.

FIRST APPROACH

Object detection with (Drone)

Object detection with (Drone)

1- Collected images from captured frames of videos

2- Annotation labeles by using Roboflow application:
Empty-space , Occupied-space, Wrong-parking

3- Applied Augmentation

4- Applied Generation

We used Yolov5 model (last version of yolo)

Metrics

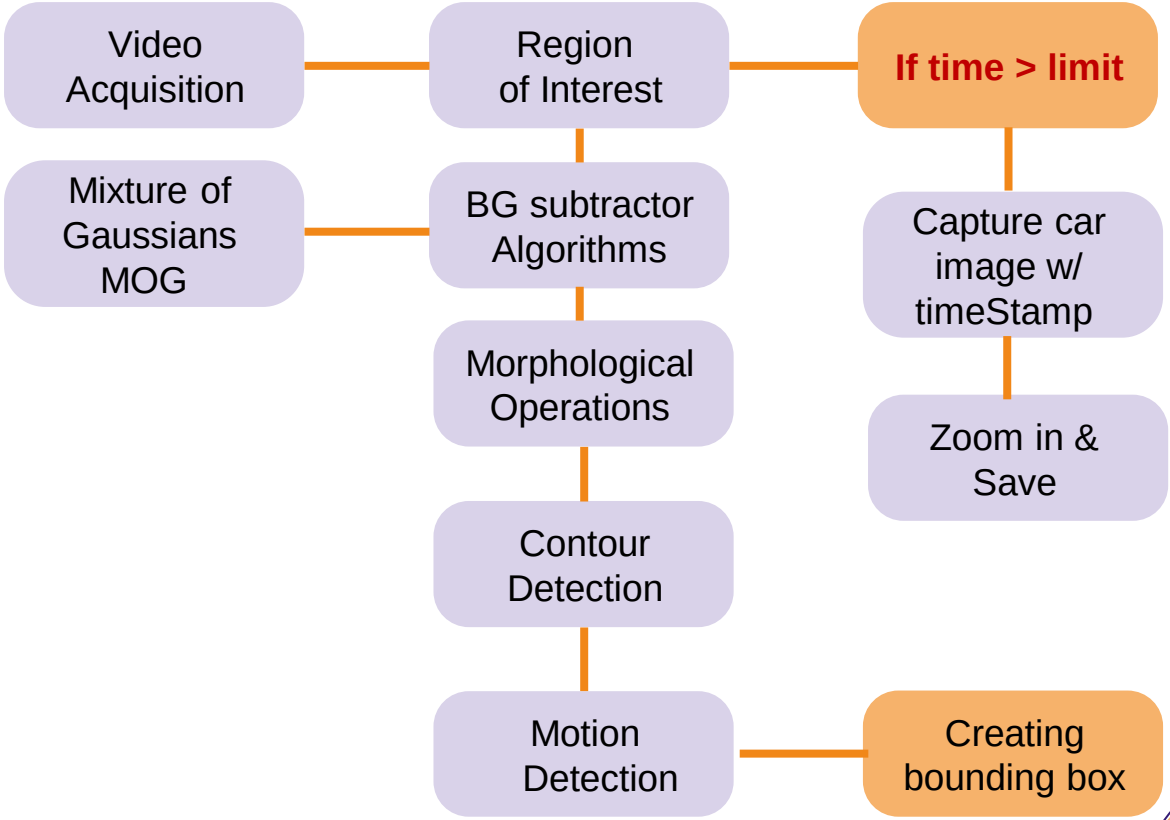
Epoch	gpu_mem	cls	total	targets
4999/4999	1.05G	.00556	0.2554	1312
	Class		P	R
	all		0.986	0.604
	space-acc		1	0.902
	space-empty		0.958	0.911
	wrong-parcking		1	0

Result

SECOND APPROACH

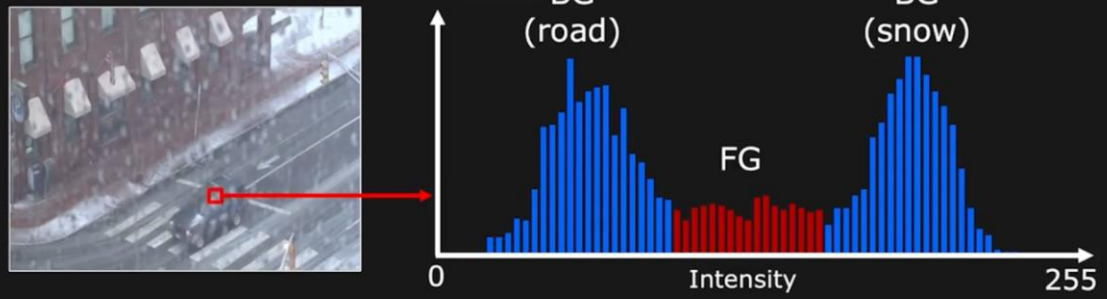
Real time detection and object tracking .

Parking Violation Workflow



Mixture of Gaussians MOG

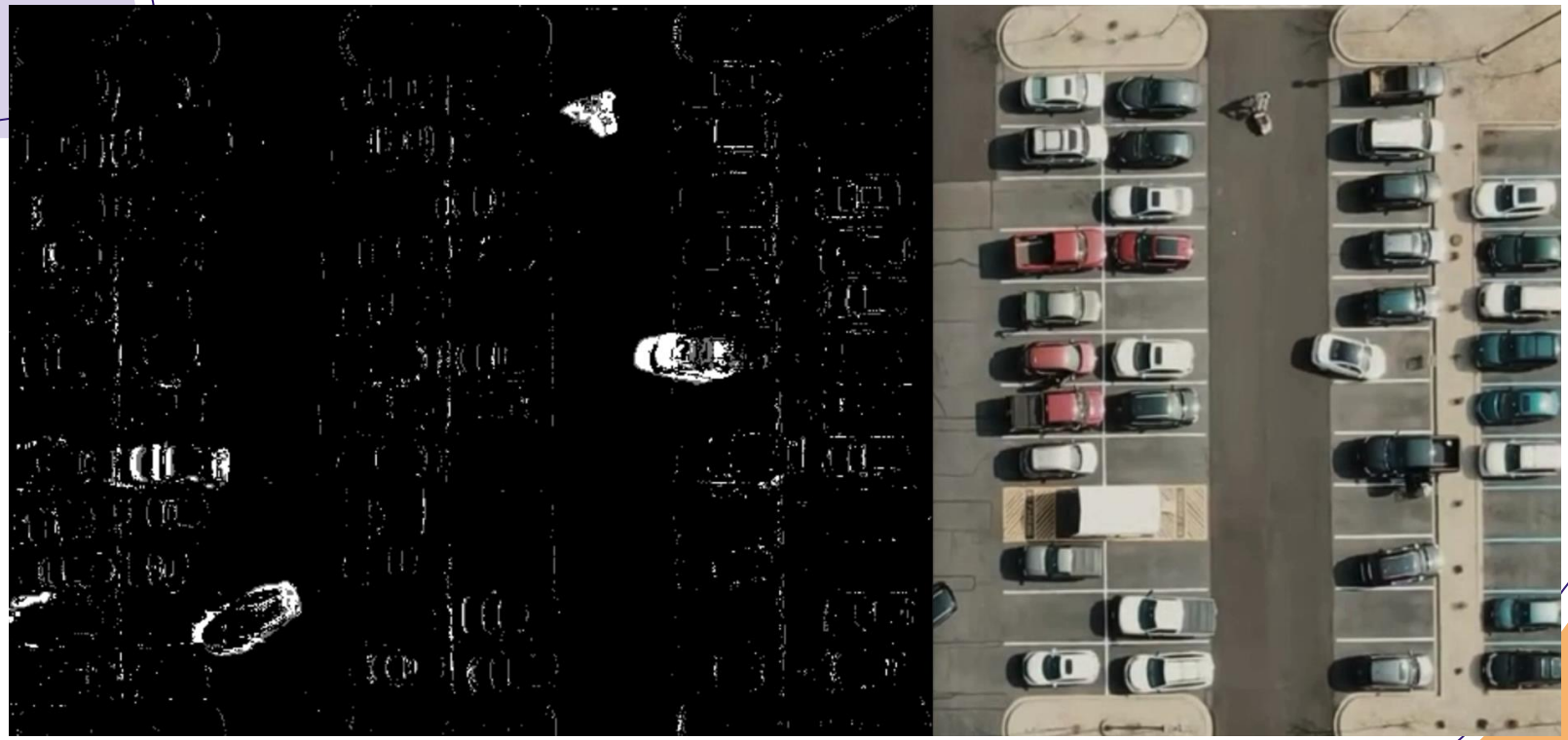
Intensity distribution at each pixel over time:



Input video sequence

Intensity histogram for a pixel over time

Intensity variations due to static scene (road), noise (snow), and occasional moving objects (vehicles).

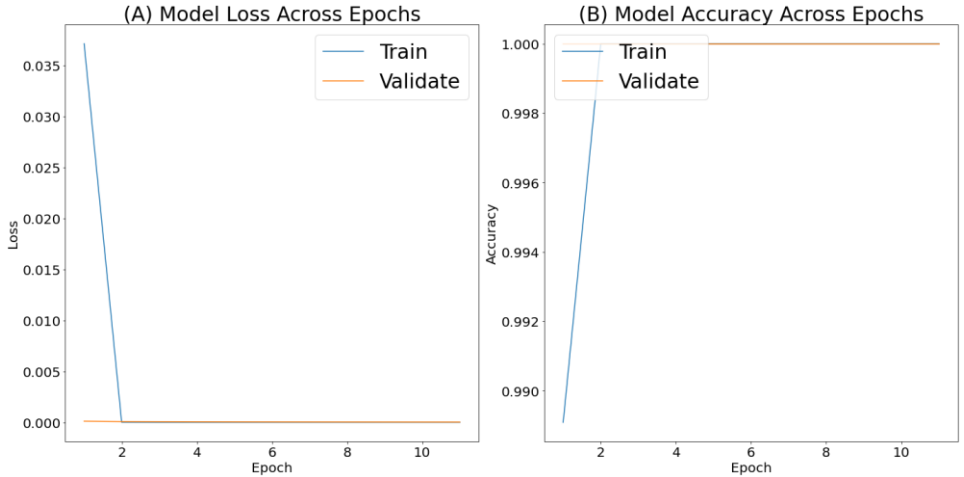


THIRD APPROACH

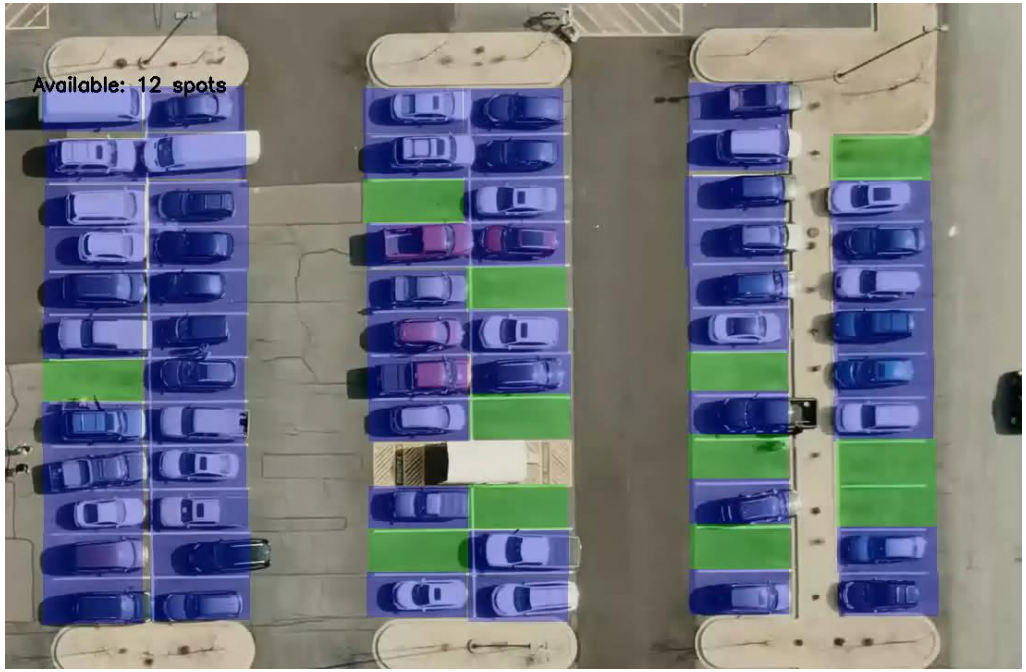
Combining two models.

RESNET50

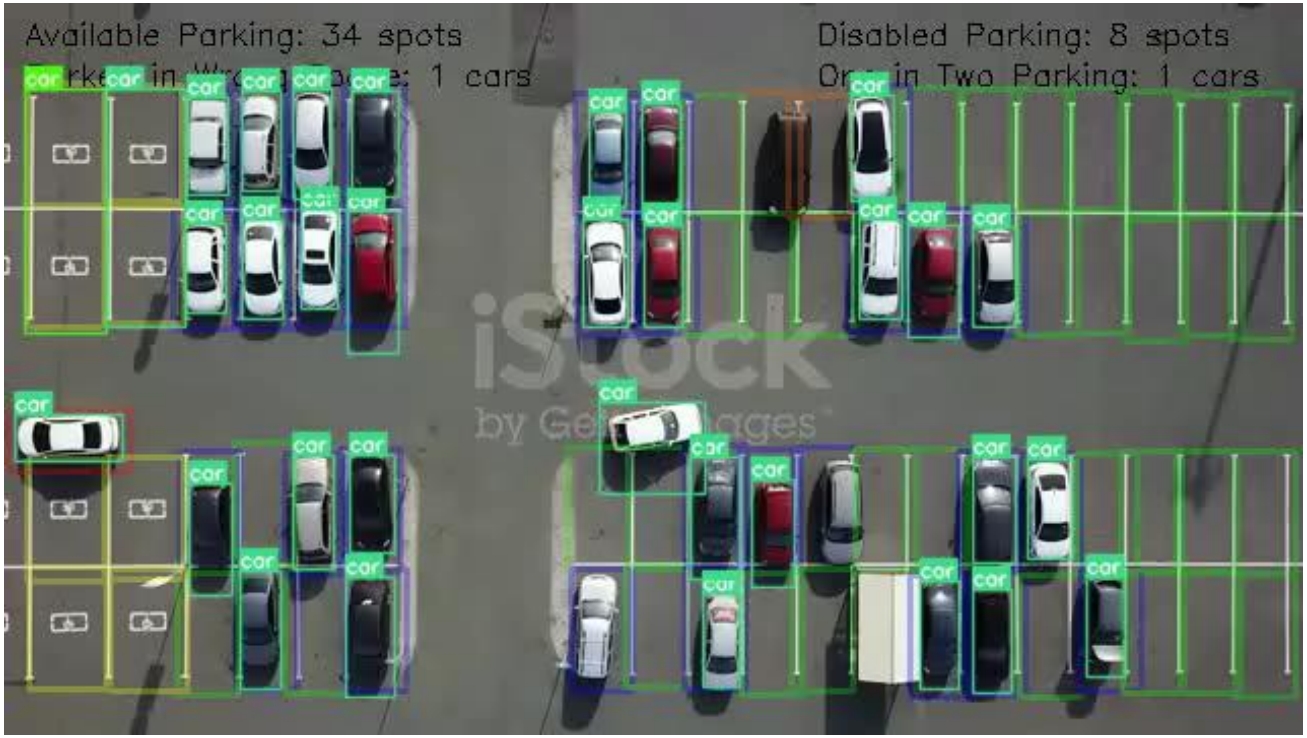

Available: 12 spots

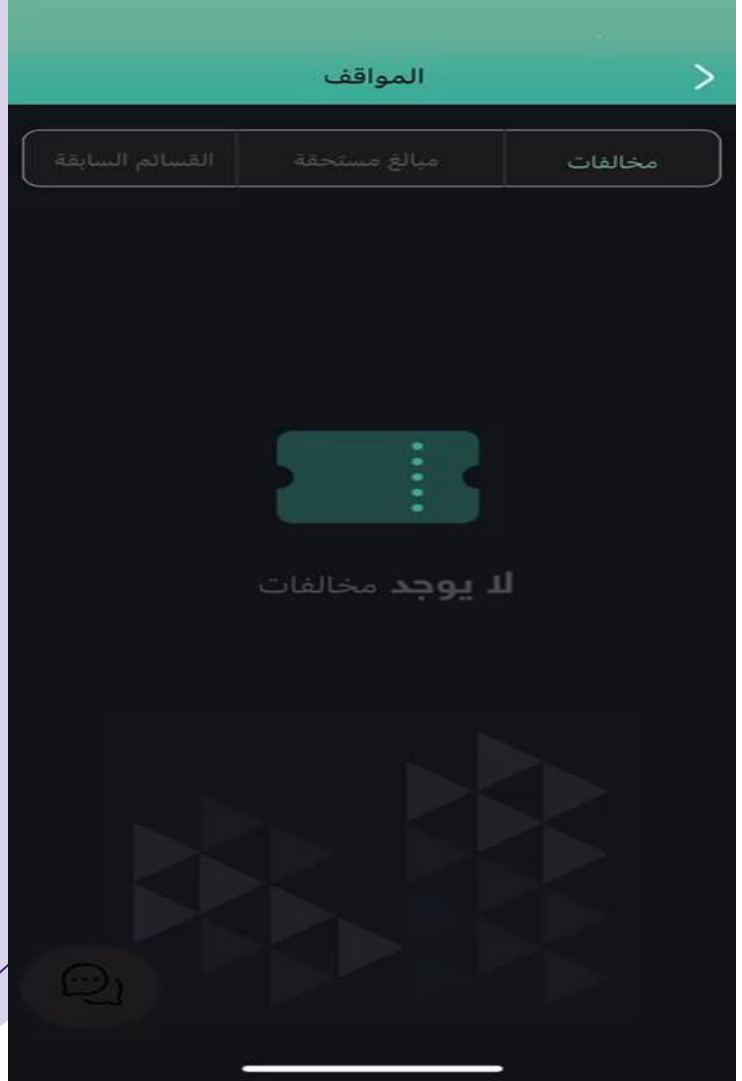

(A) Model Loss Across Epochs
Train
Validate
Loss
0.035
0.030
0.025
0.020
0.015
0.010
0.005
0.000
2
4
6
8
10
Epoch
(B) Model Accuracy Across Epochs
Train
Validate
Accuracy
1.000
0.998
0.996
0.994
0.992
0.990
2
4
6
8
10
Epoch

RESNET50 – Before Updating



Combine 2 Models (RESNET50 and YOLOv5)




المواقف
مخالفات
مبالغ مستحقة
القسائم السابقة
لا يوجد مخالفات

FUTURE WORK

01

Integrate the system with Tawakkalna.

توكلنا
Tawakkalna
وَعَلَى ٱللَّهِ فَلْيَتَوَكَّلِ ٱلْمُتَوَكِّلُونَ

02

Using callbot

03

Detect the car plate so it will be known when car accident happened.

THANK YOU...