SHARJAH ACADEMY FOR
ASTRONOMY, SPACE SCIENCES
AND TECHNOLOGY

أكاديمية الشارقة
للفلك وعلوم الفضاء
والتكنولوجيا

جامعة الشارقة
UNIVERSITY OF SHARJAH

Meteorite Hunt
Using Deep Learning

Meteorite Center

Aisha AlOwais

Outline

- Introduction

- UAEMMN

- Objectives

- Dataset

- Deep Learning Algorithms

- Deployment

- Mechanism

- Future outlook

Introduction

Conventional methods

Extreme Conditions

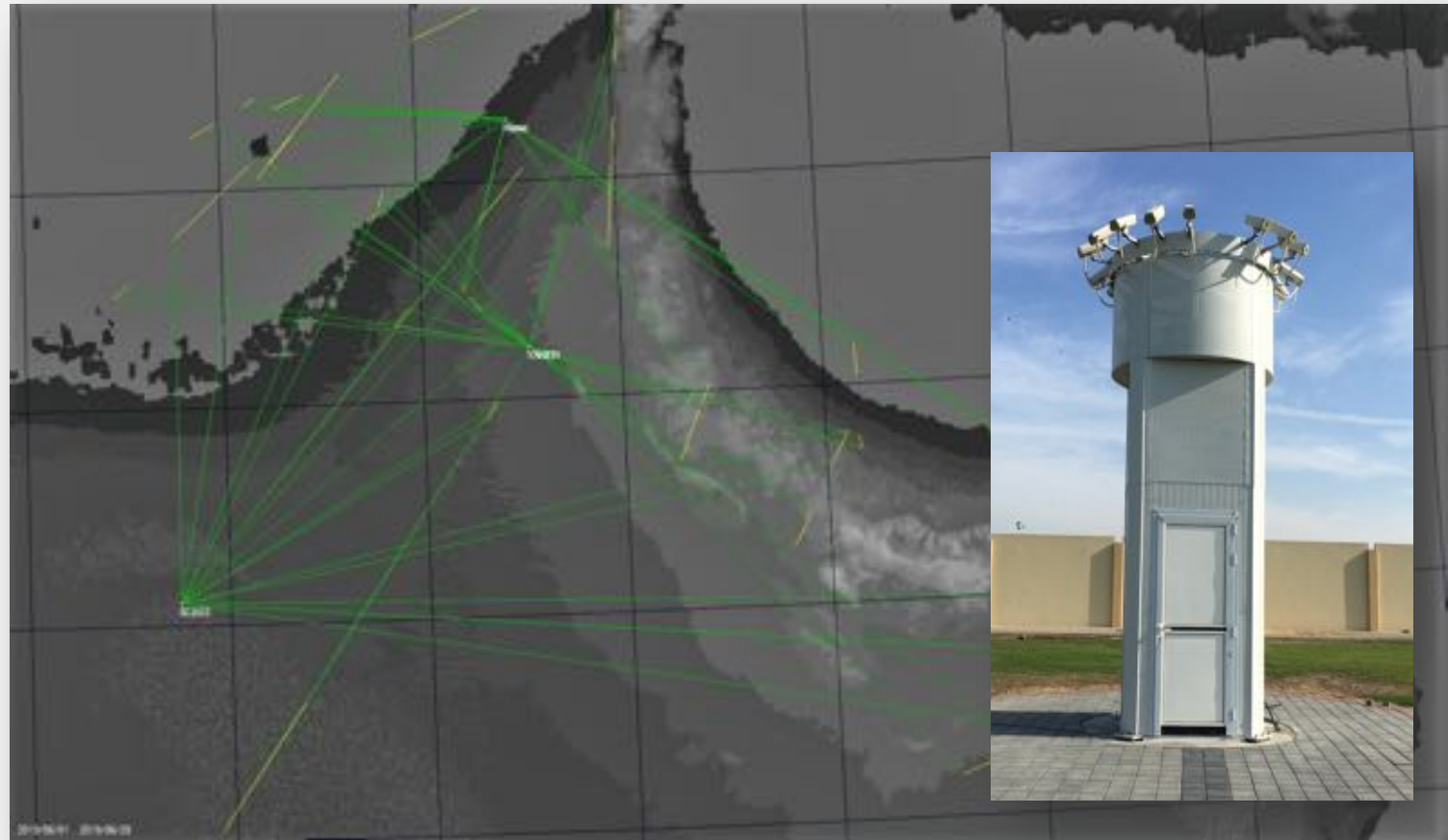Big search parties

Time Consuming

Locating recent falls

o The UAE Meteor

Monitoring

Network

o SonotaCo software

programs

Objectives

- Facilitate the process of meteorite

  hunting using deep learning techniques.

- Train a UAV on how to distinguish

  between meteorites & terrestrial rocks.

Building the dataset

- o Iron meteorite class

- o Tektites class

- o Not-meteorite class

- o Feature extraction
  - Fusion crust
  - Metallic
  - Regmaglypts

- o On-going additions from the collection
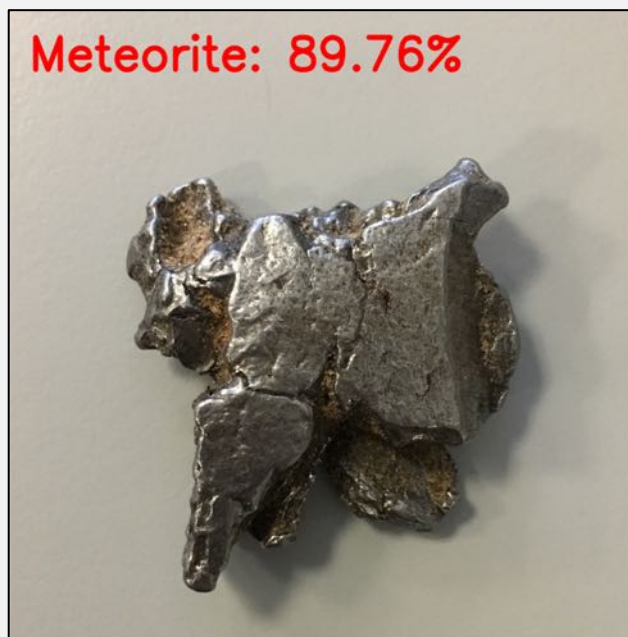
Pre-trained architectures

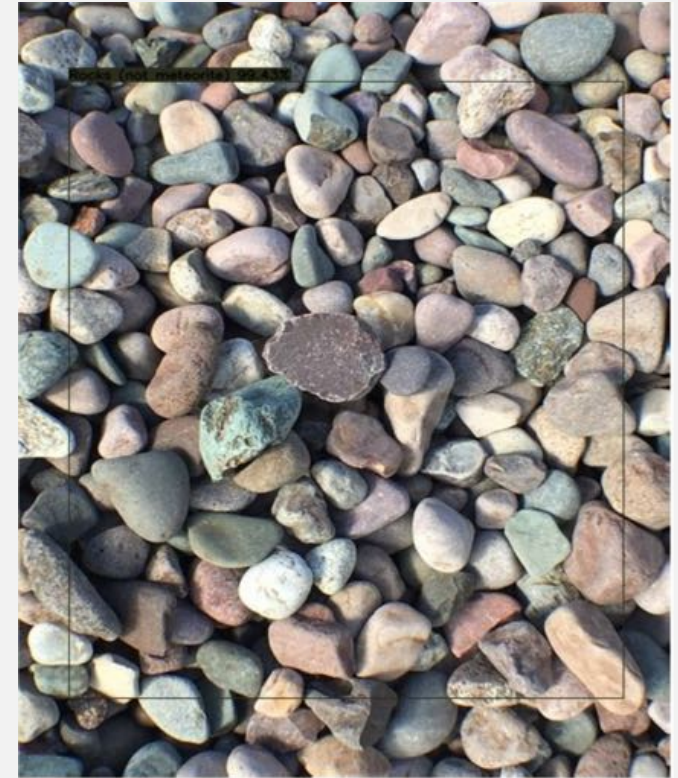|	LeNet	InceptionV3	MobileNetV2	VGG16 (Trained from scratch)
Hidden layers	9	48	8	16
Learning rate	10e−3	10e−3	4.5×10e−2	10e−3
Epochs	25	30	50	100
Batch Size	32	32	32	32
Time	2-3 hrs	2-3 hrs	2-3 hrs	10-12 hrs
Drawback	Accuracy	Heavy	Heavy	Heavy

Preliminary Results

YOLOv3 - DarkNet

- 40k iterations or 10 epochs

- LR=0.00025 -> divided among 4 GPUs

- Batch = 64

- Training: ~2 day

- Training images: 637

YOLOv3 - TensorFlow

o Layers=106

o Epochs = 30

o Training = 2.5 days

Tiny YOLO

o Layers=24

o Epochs=100
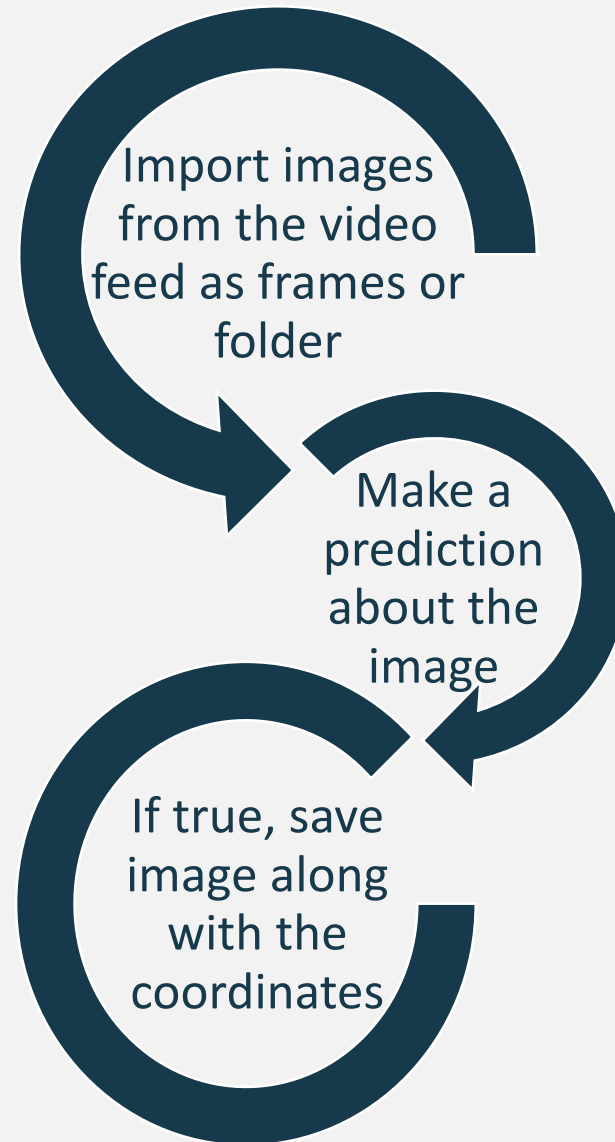
o Training = 6-7 hours

Deployment

o DJI Phantom Pro

o DJI Matrice 600
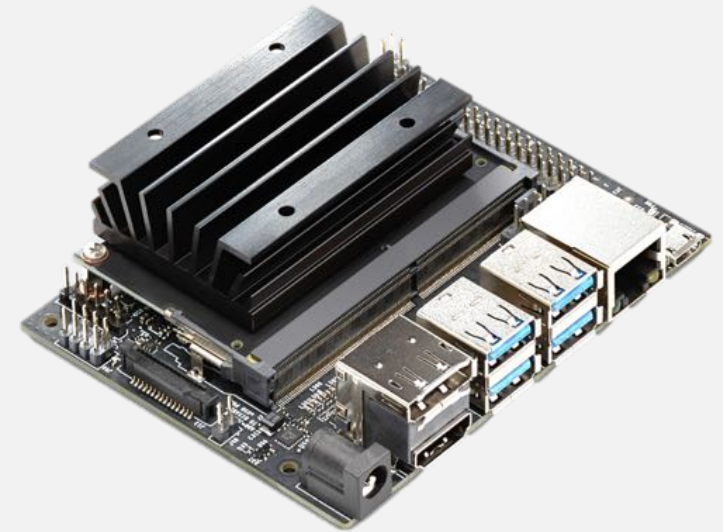
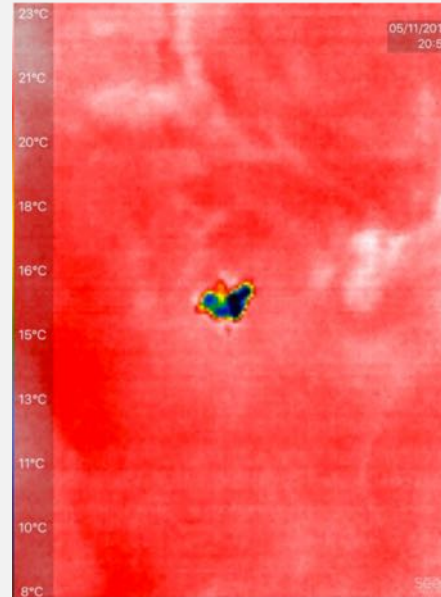o Raspberry Pi + essential accessories

o RPi Camera

Mechanism

Import images from the video feed as frames or folder

Make a prediction about the image
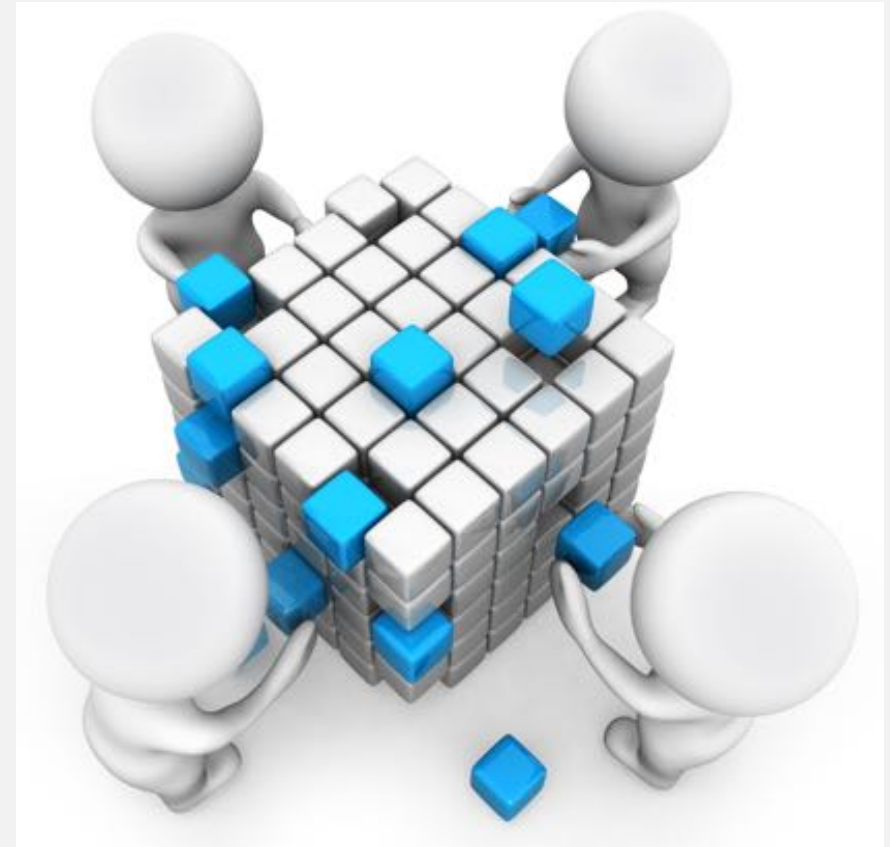
If true, save image along with the coordinates

Conclusion &Future outlook

o YOLO architectures are more likely to be relied on

o Crossing out rocks instead of detecting meteorites

o Thermal Imaging

o NVIDIA Jetson Nano

The team!

o Supervisor: Dr.Ilias Fernini

o Safa Naseem – Physicist

o Omar Ghulam – Chemist

o Anas Adwan – Electric Eng.

o Takwa Dawdi – Electric Eng.

o Yusra Elkalyoubi – Electric Eng.

o Mariam Abdisalam – Computer science major

o Khawla Ibrahim – Mathematics major

o Mark Sukaiti – Mathematics major

o Ahmad Faghihi – Computer science major

o Nora Yahya - Computer science major

o Donthi Sankalpa - Computer science major

Questions?