



ViShield

Protects you from unwanted images/videos

Er Jie Yong

The INTERNET



Useful
IMAGES

Useful
VIDEOS

Useful
TEXT

Phobia Triggers

A phobia is an anxiety disorder defined by a persistent and excessive fear of an object or situation

Fear of amphibians



Fear of clowns



Fear of insects

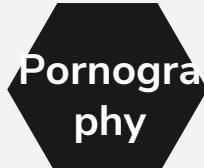


Fear of spiders



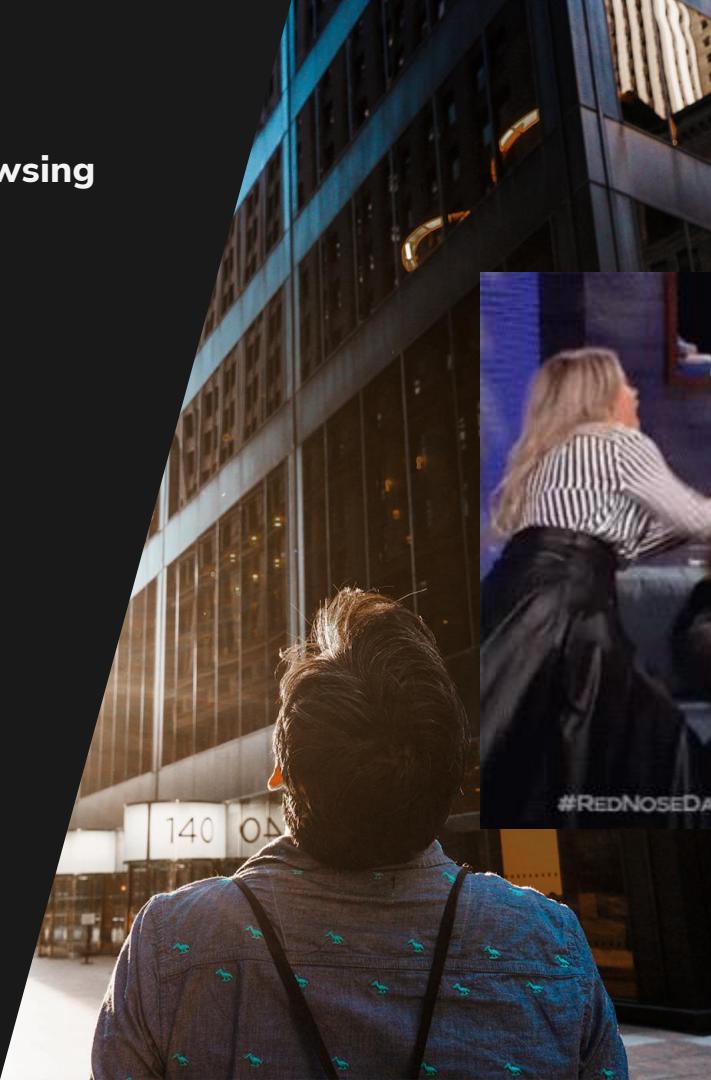
Fear of dogs

Societal Issues



IMAGINE
you are browsing
the internet

Trigger Warning!



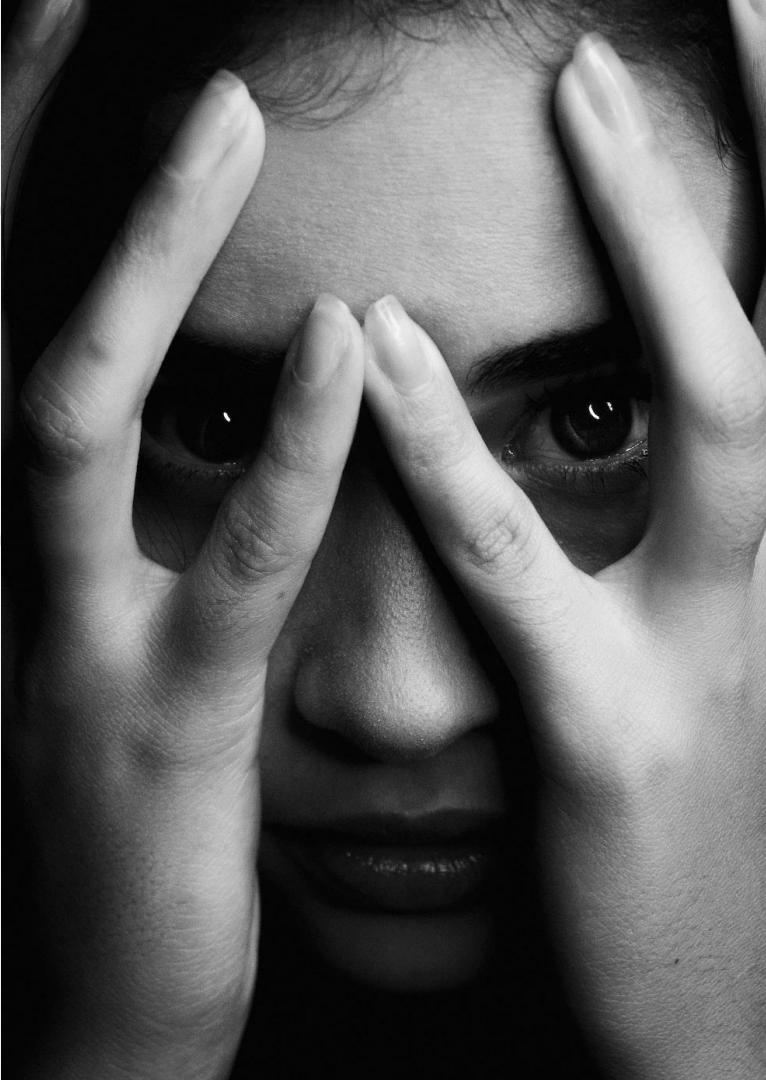
Snakes



Symptoms / Effects

Short term

Sweating
Chills
Shortness of breath
Nausea
Headaches
Numbness
Confusion or disorientation
Loss of appetite



Long Term

Constant Anxiety
Panic Attack
Suicidal (Hate Speech)
Change in Character & Values (Violence and pornography)

Current Solution: URL Blacklist

Government Blacklist

THE STRAIT TIMES TECH LOG IN NS

FOR SUBSCRIBERS

53 piracy websites blocked in battle to curb copyright breach

 The Pirate Bay

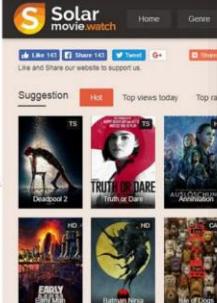
Pirate Search | All | Audio | Video | Applications | Games | Other

Pirate Search | I'm Feeling Lucky | How do I download?

TPB Proxy Bay | About | Blog | Usage policy | Cookies

BTCoin: 1M9rxZPWz3PQHmAYWxaz21Bw4kAWJahbk
Bitcoin: [Proxy Servers] 193VxLjXc187ASyTz259Hrvc5L5enXb

The Pirate Bay and SolarMovie are two out of the 53 piracy websites that have been blocked in Singapore. PHOTOS: THE PIRATE BAY, SOLARMOVIE



Open Sourced / Custom URL Hostlist

Block List

Block site permanently or by schedule

Type Something

twitter.com

facebook.com

netflix.com

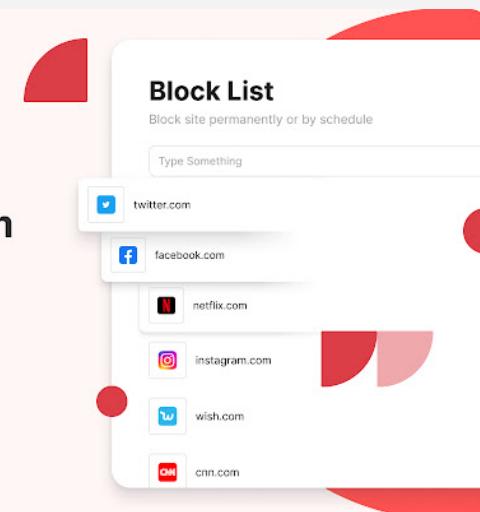
instagram.com

wish.com

cnn.com

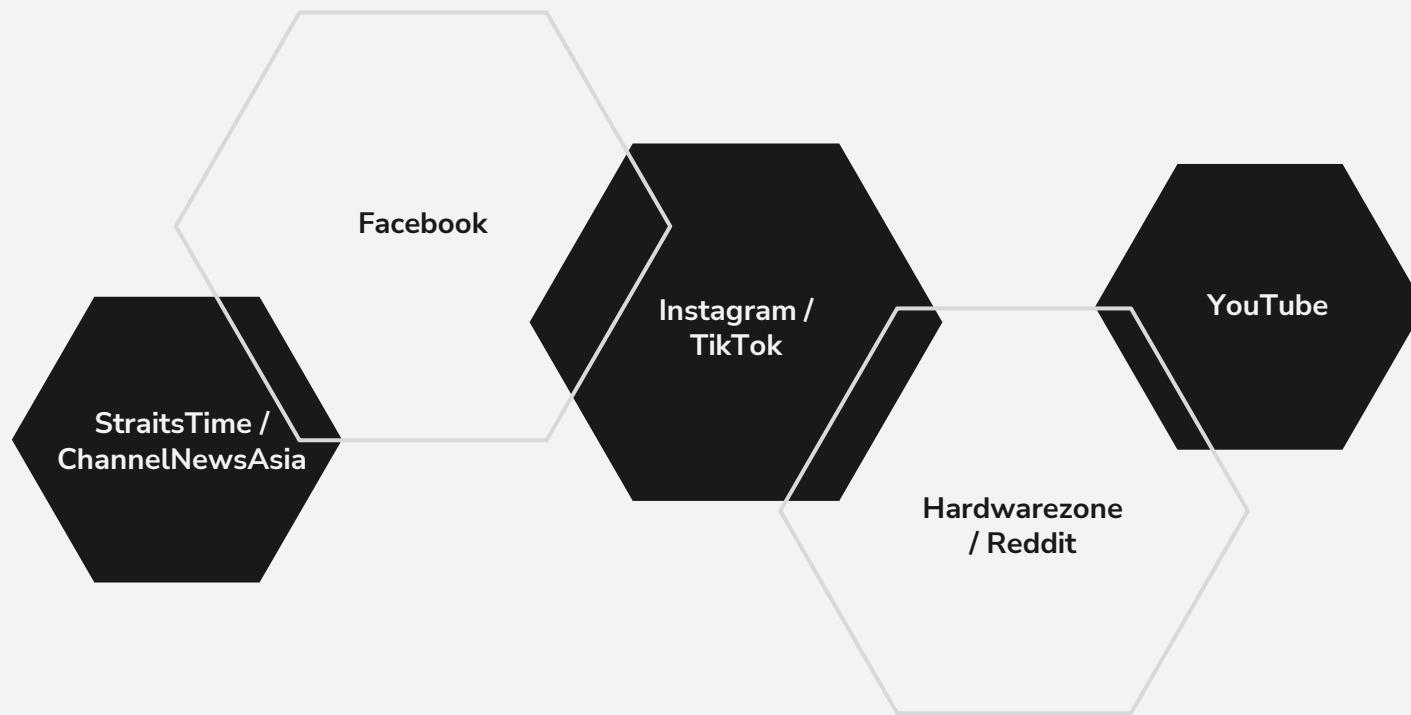
Custom lists

If time-wasting distract you and is needed



Whack-a-mole

What about everyday sites?



Everyday Sites

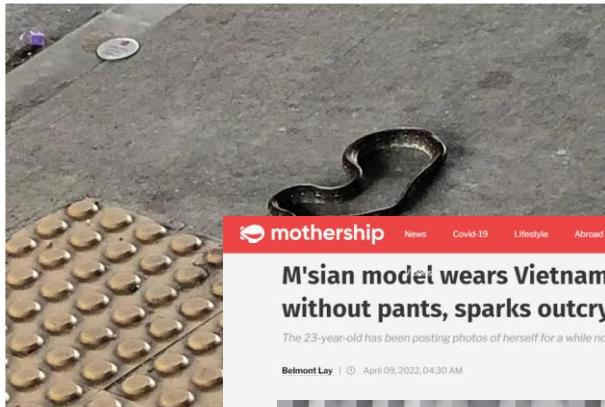
THE STRAITS TIMES

SINGAPORE

LOG IN SUBSCRIBE

PDF

Python removed from traffic junction near Waterway Point in Punggol



mothership

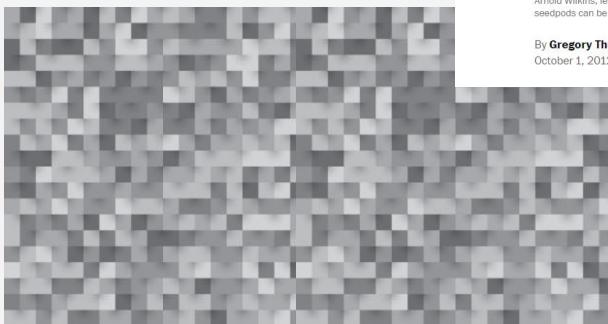
M'sian model wears Vietnamese nation without pants, sparks outcry in Vietnam

The 23-year-old has been posting photos of herself for a while now.

Belmont Lay | April 09, 2022, 04:30 AM



A python was spotted at a traffic junction near W STOMP



Sections

The Washington Post
Democracy Dies in Darkness

Sign In

Health

Health Care

Medical Mysteries

Science

Well+Being

Health & Science

Phobia about holes is not officially recognized, but U.K. scientists look into it

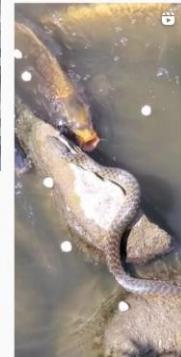
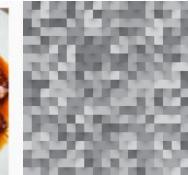


Arnold Wilkins, left, and Geoff Cole, right, hope to show that an aversion to object seedpods can be seen as a phobia with an evolutionary basis. (Roger Keeble)

By Gregory Thomas
October 1, 2012

Most Read National

1 Cows fed hemp produced milk with THC, researchers say



What can we do?

How can we prevent users from getting bombarded by undesirable Images and Videos?



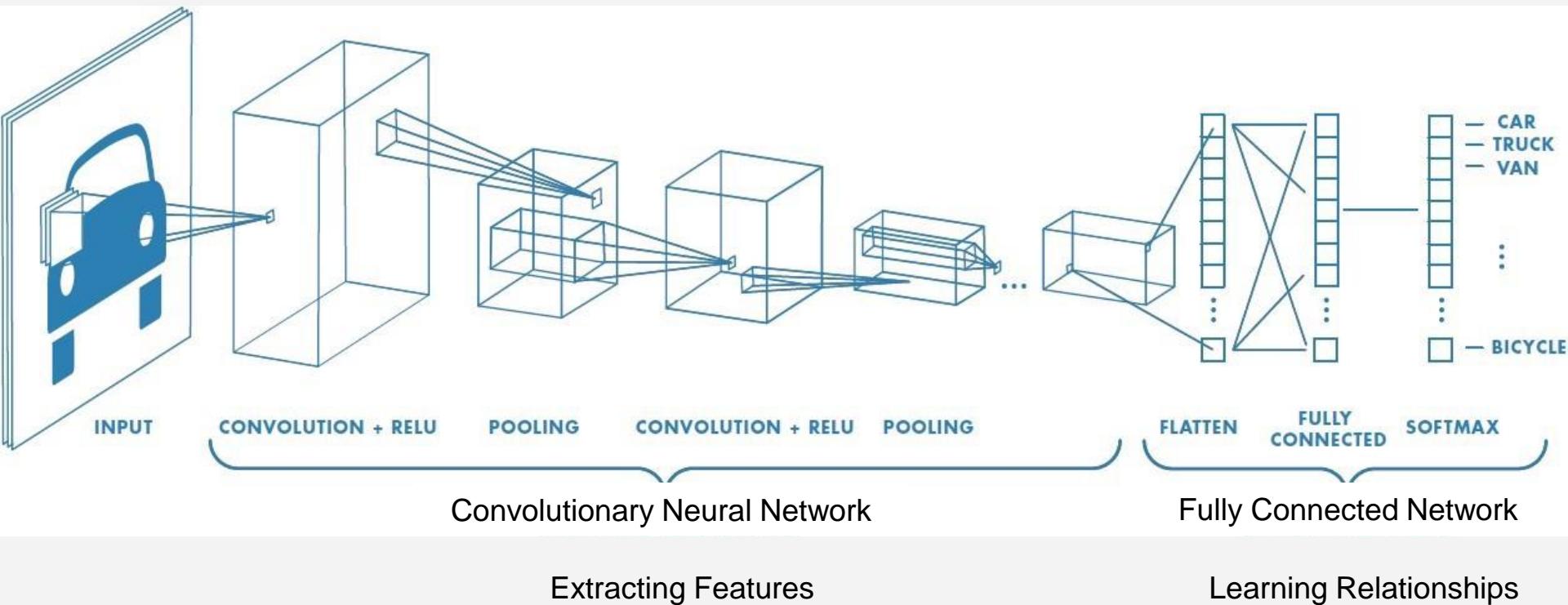


ViShield

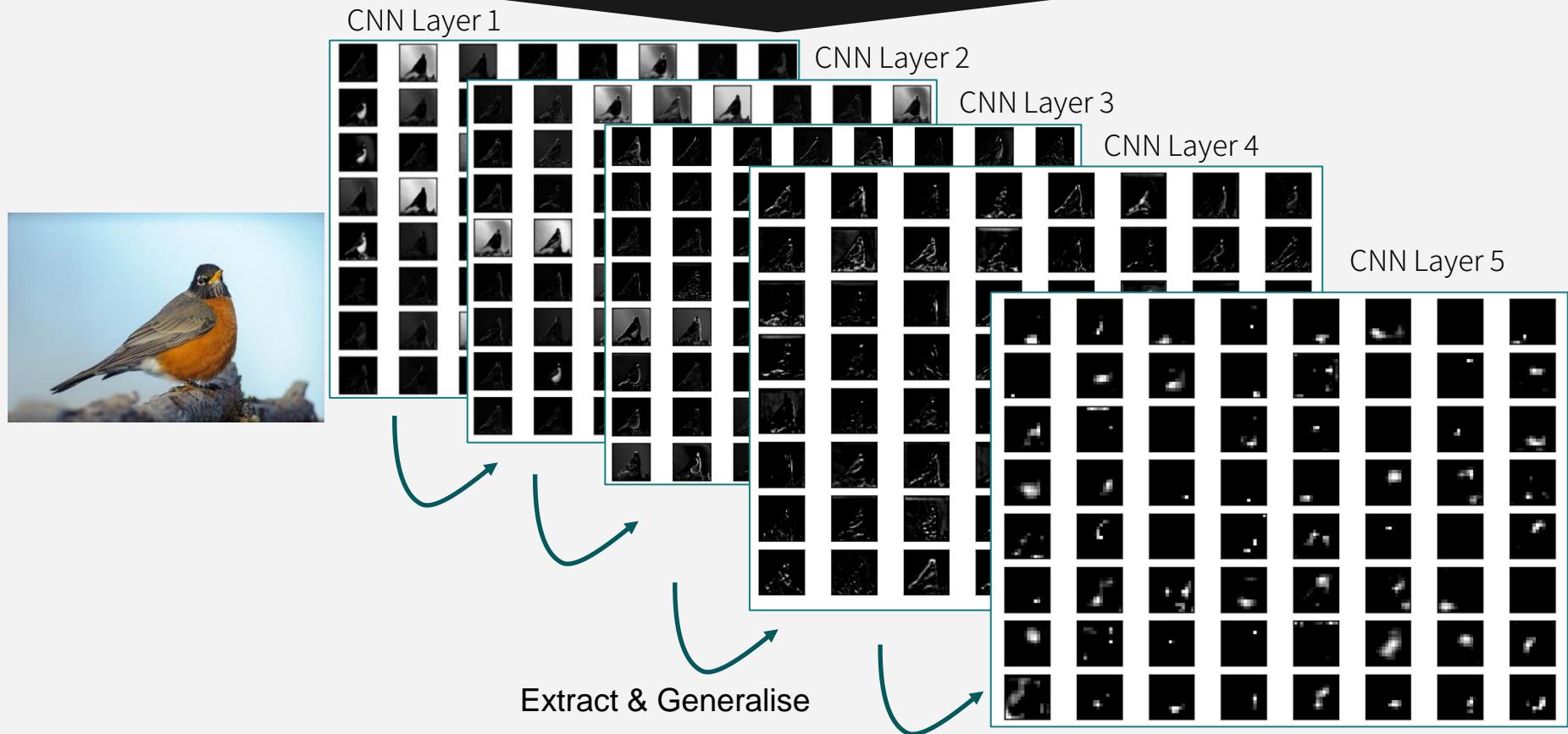
Machine Learning
Incorporated



Computer Vision

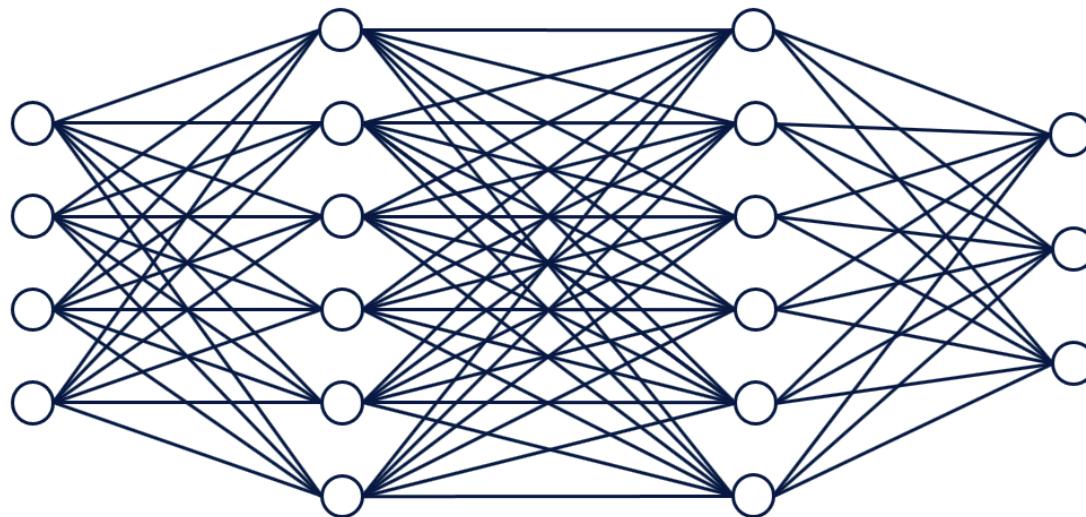


Convolutional Neural Network Feature Selection



Fully Connected Network

Relationship → Classification



Computer Vision

Classification



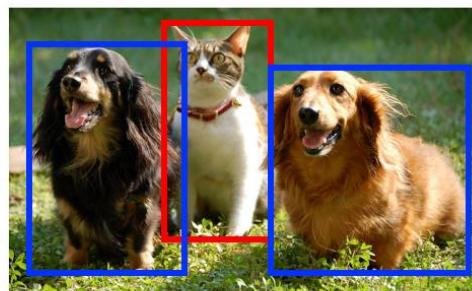
CAT

Classification
+ Localization



CAT

Object Detection



CAT, DOG

Instance Segmentation



CAT, DOG

Single object

Multiple objects





Our Capabilities



Real-time Image Filter

(Image Classification)

Hide images and gif that you choose not to see.

- Dogs
- Cats
- Snakes
- Trypophobia

Chrome Extension



Streamlit Post-Processing Image Filter

(Instance Segmentation)

Identify images of snakes by pixel and filter them out



Streamlit Post-Processing Video Filter

(Instance Segmentation)

Identify images of snakes in a video by pixel and filter them out

Streamlit Web App

Chrome Extension Planning

Business Requirements & Success Factors

Business Requirements

- Javascript compatible model (serverless)
- Speed
- Model pretrained with relevant dataset



Success Factors

- Model accuracy above 70%
- Functioning chrome extension

Fulfilling Business Requirements

MobileNet V2

JavaScript Requirement



TensorFlow.js

Speed

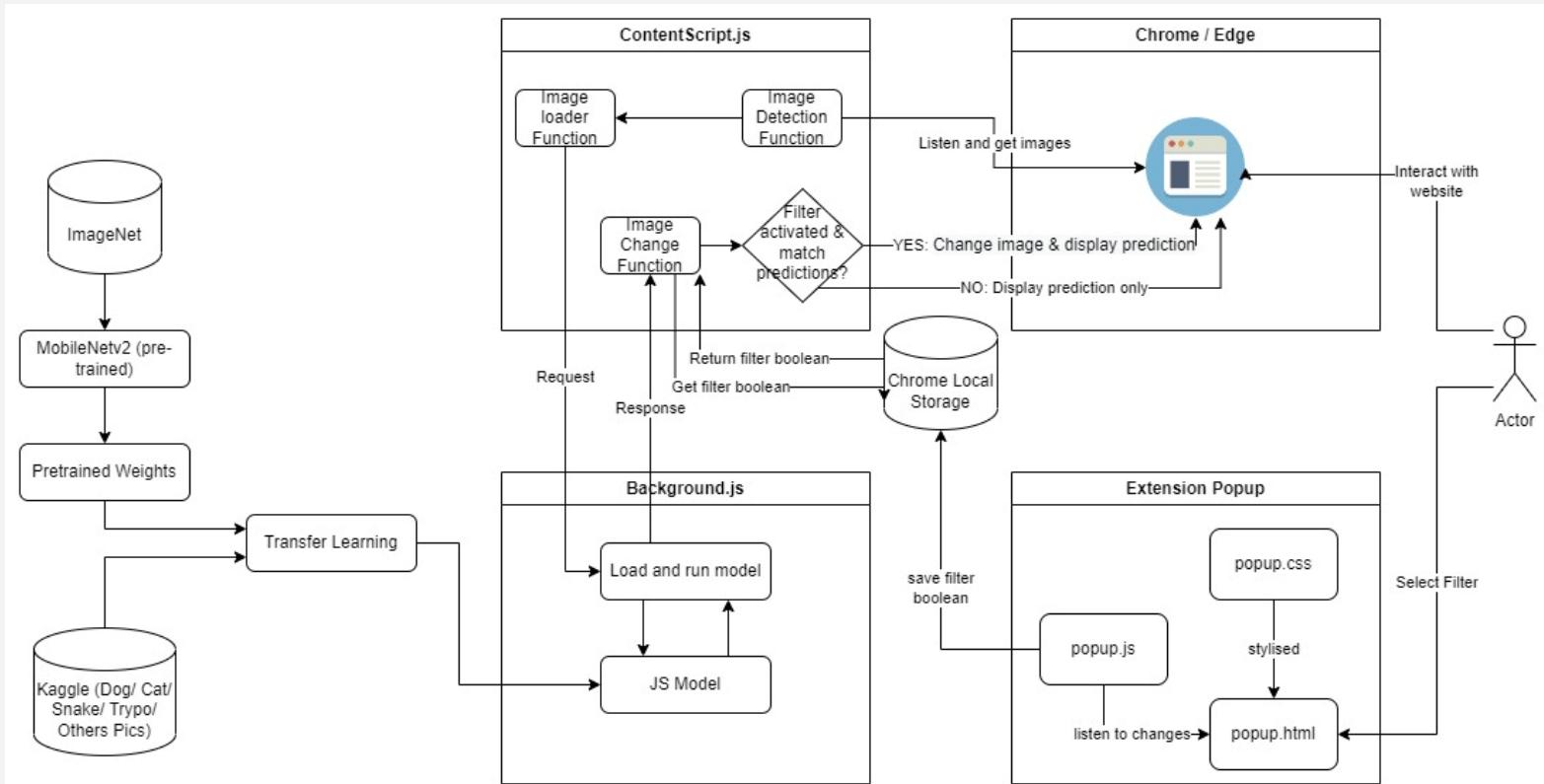
Relevant Pretrained Dataset



shutterstock.com • 1933018322

Model	Model Size (MB)	Inference time (sec)	Testing Accuracy
MobileNetV2	8.54	0.035	0.888
EfficientNet Lite-0	12.58	0.042	0.924
EfficientNet Lite-1	15.8	0.064	0.913
EfficientNet Lite-2	18.37	0.085	0.907
EfficientNet Lite-3	26.38	0.128	0.907
EfficientNet Lite-4	44.69	0.221	0.891

Model Architecture



Metrics

Hidden Layers	Regularisation	Validation Loss*	Validation Accuracy
1	None	0.1402	0.9586
1	EarlyStopping	0.1570	0.9603
2	EarlyStopping, Dropout	0.1533	0.9522

* Loss Function: categorical_crossentropy

Chrome Extension

Showcase





CHROME / EDGE EXTENTION



Capability

- Allow user selection of picture categories to hide
- Works with asynchronous loaded pictures

Showcase

- Dogs: <https://www.instagram.com/spcasgadopt/>
- Snake: <https://www.straitstimes.com/singapore/environment/python-removed-from-traffic-junction-near-waterway-point-in-punggol>
- Trypophobia: https://dangerousminds.net/comments/apparently_trypophobia_a_fear_of_tiny_clusters_of_holes_isnt_a_phobia_but_a

Limitations

- Only work with images bigger than 128 * 128
- Only process image after they are loaded
- Do not work with multioutput per picture



Our Capabilities



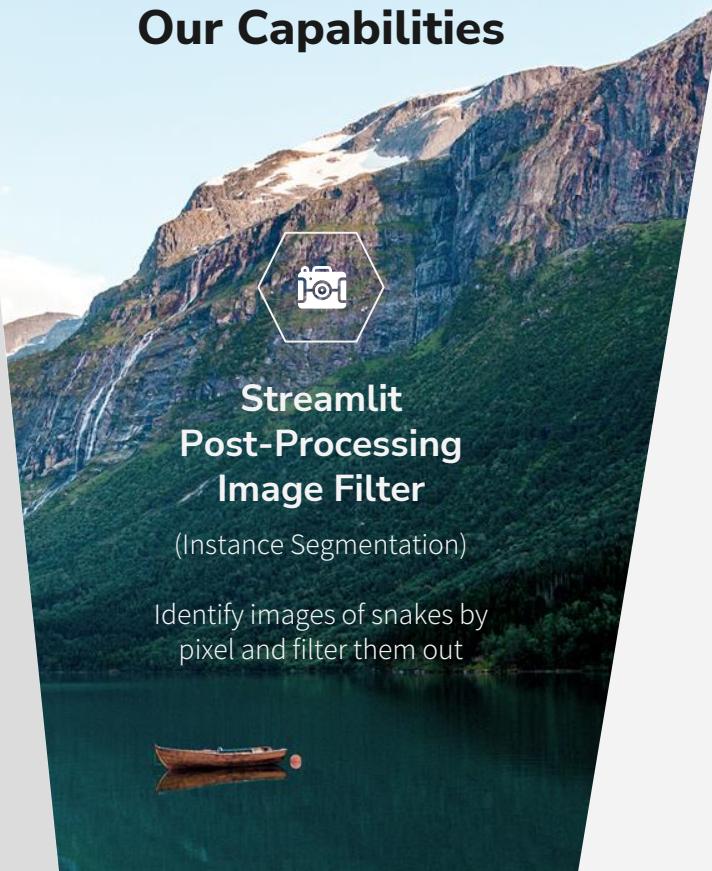
Chrome Extension

(Image Classification)

Hide images and gif that you choose not to see.

- Dogs
- Cats
- Snakes
- Trypophobia

Chrome Extension



Streamlit Post-Processing Video Filter

(Instance Segmentation)

Identify images of snakes in a video by pixel and filter them out

Streamlit Web App

Streamlit Planning

Business Requirements & Success Factors

Business Requirements

- Balance between Speed and Accuracy
- Model should work on both images and videos



Success Factors

- Bounding Box Precision > 0.7
- Mask Precision > 0.7
- Functioning Streamlit

Fulfilling Business Requirements

YOLOv7

Works on Images & Videos



Speed & Accuracy

PWC Categories	Model	FPS	Mask AP
Real-time Instance Segmentation	SparselInst-608	40	37.9
Video Instance Segmentation	IDOL	17.6	64.3
Real-Time Object Detection	YOLOv7-E6E	36	64.0

Data Preparation

roboflow



Example of mask segmentation annotation.
Green border denotes polygon coordinates

Output Label (YOLOv7 format)

```
0 0.459375 0.57777778125 0.44375 0.5611111109375 0.44  
0 0.3453125 0.3333333328125 0.3515625 0.3166666671875  
0 0.48887583125 0.601851853125 0.493214325 0.611111110  
0 0.425 0.46944444374999994 0.42206302500000004 0.4907
```

Class

Polygon Coordinates

MLOps Workflow



3. Deployment

Deployment on streamlit

1. EDA / Data Preparation

- Ensure minimum image size
- Data Annotation using Roboflow

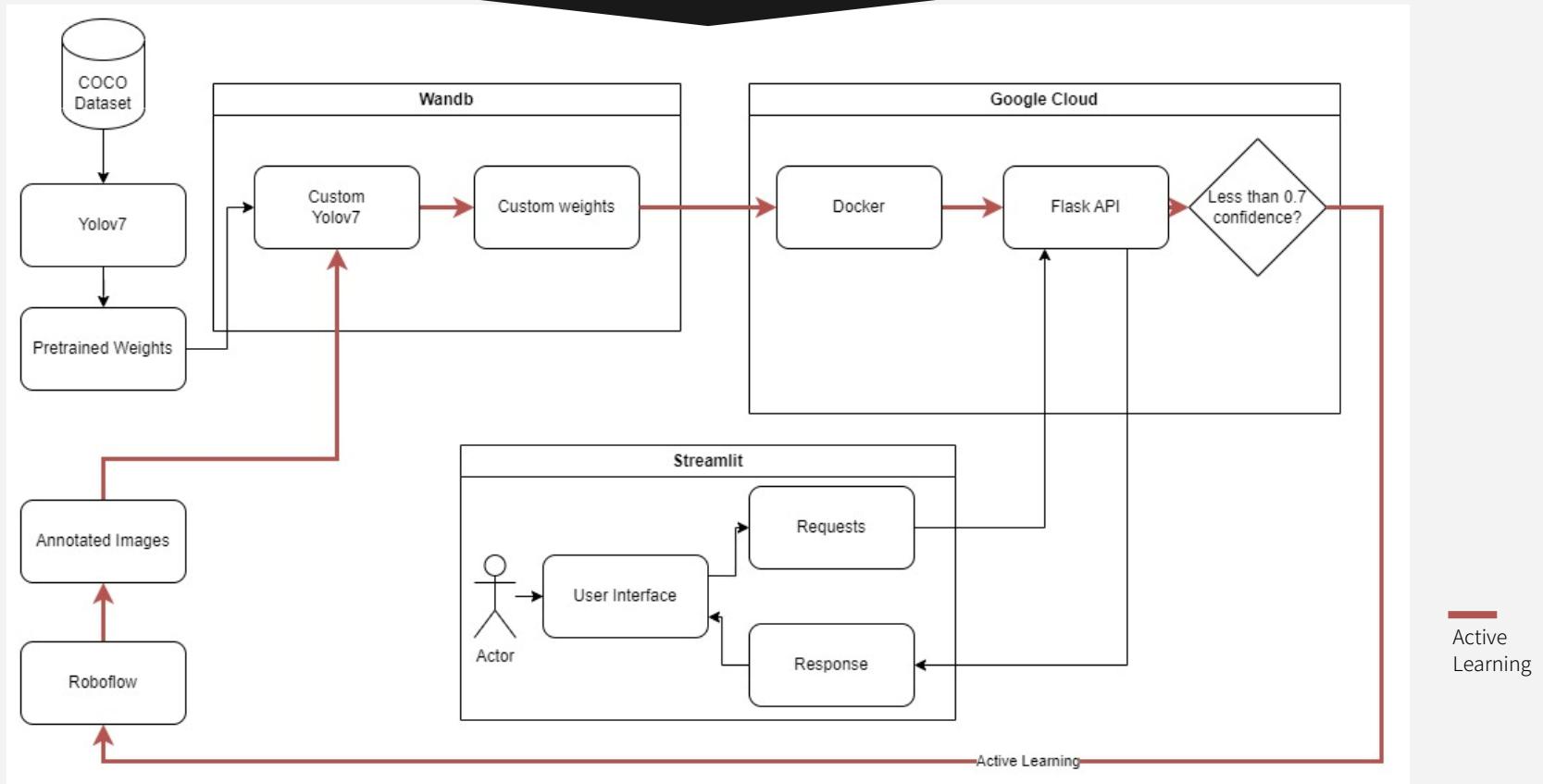
4. Active Learning

- Images less than threshold would be sent back to Roboflow for human annotation
- Retraining with updated dataset

2. Training / Testing

- Setting up environment on Kaggle
- Utilising pre-trained YOLOv7 weights
- Train using custom annotated dataset
- Logged result on Wandb

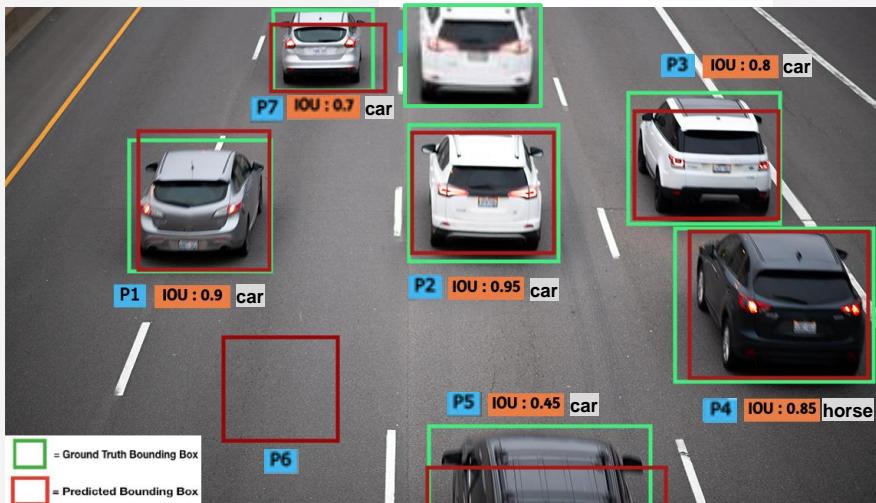
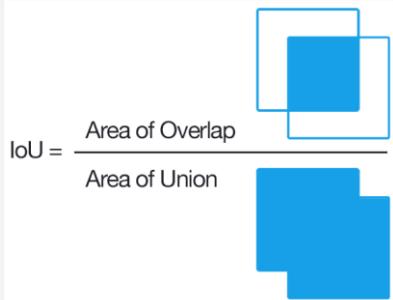
Model Architecture



Metric Explanation

AP

Intersection over Union



$$p_{\text{interp}}(r) = \max_{\tilde{r}: \tilde{r} \geq r} p(\tilde{r})$$

Interpolated Precision for a given Recall Value (r)

No	TP/FP/FN @ IoU 0.5	Precision TP/(TP+FP))	Recall TP/(TP+FN))	Precision_interp
P1	TP	1/1 = 1	1/4 = 0.25	1
P2	TP	2/2 = 1	2/5 = 0.4	1
P3	TP	3/3 = 1	3/6 = 0.5	1
P4	FN	3/3 = 1	3/6 = 0.5	1
P5	FP	3/4 = 0.75	3/6 = 0.5	1
P6	FP	3/5 = 0.6	3/6 = 0.5	1
P7	TP	4/6 = 0.67	4/7 = 0.57	0.67

FN: Wrong class or no predictions

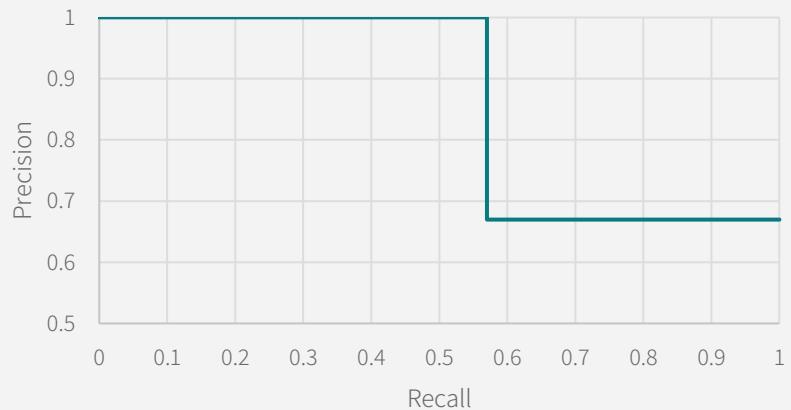
Metric Explanation AP

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P1	TP	1/1 = 1	1/4 = 0.25	1
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P5	FP	3/4 = 0.75	3/6 = 0.5	1
P6	FP	3/5 = 0.6	3/6 = 0.5	1
P7	TP	4/6 = 0.67	4/7 = 0.57	0.67

$$p_{\text{interp}}(r) = \max_{\tilde{r}: \tilde{r} \geq r} p(\tilde{r})$$

Interpolated Precision for a given Recall Value (r)

11 Points Interpolated Precision-Recall Curve



$$AP = \frac{1}{11} \sum_{r \in \{0, 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 1\}} p_{\text{interp}}(r)$$

$$= \frac{1}{11} (1 + 1 + 1 + 1 + 1 + 1 + 0.67 + 0.67 + 0.67 + 0.67 + 0.67)$$

$$AP \approx 0.85$$

mAP: Average AP for all classes and images

Active Learning Metrics



Round	No of Training Images*	No of Validation Images	Weights	mAP_0.5 (B)	mAP_0.5 (M)	Precision	No of Testing Images	No of Testing Images send for annotate below 70% confidence *
1	543	55	Yolov7 weight	0.4436	0.4127	0.7289	1000	100
2	843	55	Yolov7 weight	0.4389	0.4504	0.7891	1000	100
3	1196	55	weight from R2	0.4535	0.4602	0.7558	1000	100
4	1413	75	weight from R3	0.5372	0.5396	0.8639	1000	100

*Only the first 100 images are annotated

Active Learning Metrics



Round	No of Training Images*	No of Validation Images	Weights	Box Precision	Mask Precision	No of Testing Images	No of Testing Images send for annotate below 70% confidence *
1	543	55	Yolov7 weight	0.7168	0.7289	1000	100
2	843	55	Yolov7 weight	0.7891	0.8334	1000	100
3	1196	55	weight from R2	0.7255	0.7558	1000	100
4	1413	75	weight from R3	0.8312	0.8639	1000	100

*Only the first 100 images are annotated

Streamlit

SHOWCASE



<https://bit.ly/3g96L3J>



Showcase

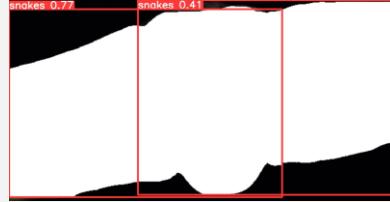


Streamlit

Before



After



Limitations

- mAP needs to be improved to include more training images
- Slow processing due to no GPU and no saved instance activated for GCP
- Instance Segmentation is done frame by frame without consideration of previous and next frames
- Allow real time streaming of output logs from model to Streamlit

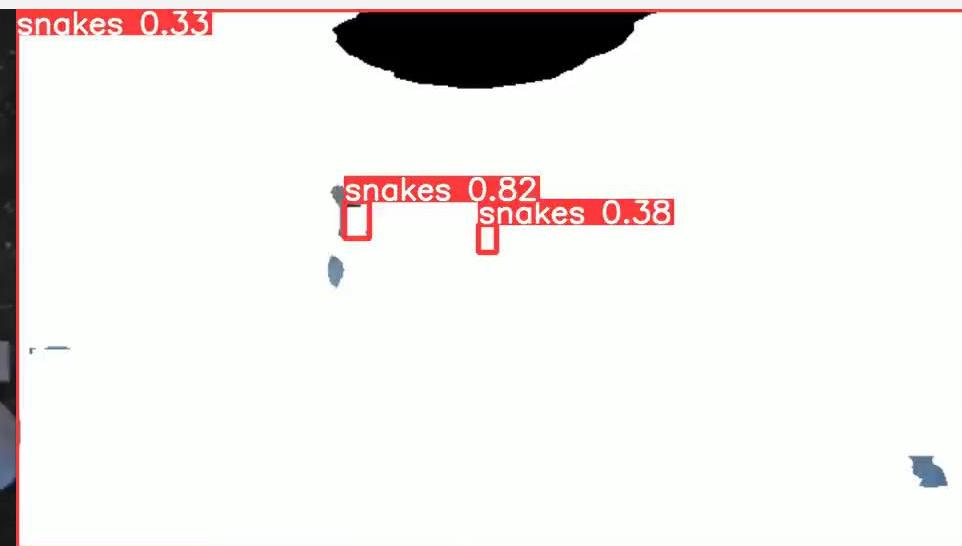


Video Segmentation Example

Before



After



Source: [Deadliest Job in America - Snake Milker! - YouTube](#)

CONCLUSION



Success Factors Evaluation

Tasks	Factors	Outcomes
Image Classification	Validation Image Accuracy > 70%	0.9586
Image Classification	Functioning Chrome Extension	Yes
Instance Segmentation	Precision(B)	0.8312
Instance Segmentation	Precision(M)	0.8639
Instance Segmentation	Functioning Streamlit App	Yes

3 Prong Approach

Government
Regulations
through laws
and ISP blacklist

Opensource
URL blacklist
([GitHub](#))



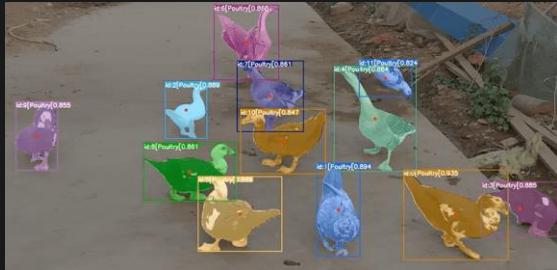
ViShield

Recommendations

Always rely on multiple redundancies to perform our task reliably and effectively

Future Steps

- Continue to improve on Instance Segmentation results
- Explore deeper on video instance segmentation such as IDOL
- Expand feature to allow segmentation on YouTube or Live Stream
- Expand filters to include negative sentiment texts, car plates, road sign





THANKS

Er Jie Yong
erjieyong@gmail.com

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