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Hello all, we at MathWorks, in collaboration with DrivenData, are excited to
Chimpact: Depth Estimation for Wildlife Conservation

Through this challenge, you would get the real-world experience of workin
skills as well as win some prize money online, while working from home. Y
monitoring species population sizes and population change, which helps t

We encourage you to use MATLAB to train your model by providing **compl**

Your **goal in this challenge** is to automatically estimate the distance betw
camera trap videos. Automated distance estimation can rapidly accelerate
conservation. The primary data consists of camera trap videos from two p
and estimated bounding box coordinates for animals. Check out **this page**

For this **2 blog post series**, we will provide you with detailed resources tha
will talk about monocular depth estimation, working with videos as data s
the problem with lowest error. **Second blog** is be a detailed starter code fo

Monocular Depth Estimation

Monocular depth estimation is an inverse problem – given the resulting im
features that make it up. Further to this, it is an ill-posed problem as there
appears smaller in the image could just be further away, or vice versa. A g

Traditionally depth estimation is achieved through matching features acro
motion and stereo vision matching. However, in this example these appro
in the video, the displacement between frames is not known and so traditi

Despite the difficulties outlined above, monocular depth estimation is a wi
recent years. Hopefully, through this challenge, you can continue this prog

Resources:

Depth Estimation: Basics and Intuition

Working with Data

Video data

Working with videos is an extension of traditional image processing – a vi
arranged in a specific order. Each individual frame provides spatial inform
dynamic nature of video offers an additional, temporal dimension.

The first step to consider is extracting the necessary frames from the vide
These can then be processed before performing machine learning

Resources:

VideoReader

Image processing

Processing Data

Another challenge in working with videos is the large size of the dataset. I
create a repository for collections of data that are too large to fit in memo
stored in multiple files on a disk, a remote location, or a database as a sin

Resources:

Understand the concept of datastore: Getting Started with Datastore

Create different datastore for images, text, audio, file etc. Datastore for different

Use built-in datastores directly as input for a deep learning network: Datastores

Implement a custom datastore for file-based data: Develop Custom Datastore

The data for the challenge will use the data stored in AWS. So, Learn how to ac

Getting started

Once the data is ready, the next step is to think about your approach. As w
possible avenues to take here. The following paper provides a good startii
approaches and gives some ideas for further development: **Monocular De
Overview.** Further to this, we are providing below some starting pointers f

Method 1: Optical Flow + CNN

This first approach uses **optical flow** to detect the animals against the bac
classification network to perform regression.

For each labelled frame in the videos, calculate the flow compared to the p
a stationary background, the optical flow highlights where they are and pr
the signal to noise ratio, the provided bounding boxes is used to generate
place of simply cropping the images to retain spatial context.

This generates a new dataset of image frames to serve as input to the ne
pre-trained image classification CNN with a couple of small adaptations. N
dataset and replacing the last few layers to perform regression down to a

In this method, whilst each input is considered in isolation, the optical flow
video.

Resources:

To learn how to implement Optical flow using algorithms Horn-Schunck method, out this tutorial video: Computer Vision Training, Motion Estimation

Deep Learning with Images

Introduction to Convolutional Neural Networks

Method 2: Importing existing models to MATLAB

In their paper "**Digging Into Self-Supervised Monocular Depth Estimation**" Monodepth2 for depth estimation off a single image. Their depth predictic produces a depth map for the scene. Additionally, they have provided thei can import to MATLAB and retrain to our new scenario.

In order to import the PyTorch model into MATLAB, it first needs to be exp **format**. Fortunately, PyTorch provides a very simple workflow for this proc

You can also run the python script ("pytorchToOnnx.py") we used for testi

Once in ONNX format, these can be easily imported into MATLAB using th functions.

Resources:

Import Pretrained Deep Learning Networks into MATLAB

Deep Learning Import, Export, and Customization

Get Started with Transfer Learning

Next Steps

If you do not have a MATLAB license, start your preparation by requesting

Stay tuned for further updates and in the **next blog** we will expand on the code and suggestions for further development.

Feel free to give your feedback or any questions you have in the comment

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