# Interview Brief

## Opportunity for a verbal briefing:

If the candidate would like to discuss this brief or obtain more detail to assist in their preparation, we would be pleased to arrange a short briefing call with them.

## Venue: Face to Face (Preferred) or MS Teams Meeting

## Key coding task:

Demonstrate your knowledge of computer vision and deep learning models, your programming and development capabilities and your ability to act as senior developer, contributing ideas to the development of our solutions by completing the following task.

The software skills demonstration should be your own work and you should be able to explain how it operates and talk us through a code review. Demonstrate you have followed coding and documentation best practises.

## *Task 1:*

* Select an image classification dataset from the wild.
* Develop a data loader class in python that can load batches of training images of a given batch size when you call next(DataLoader).
* Your data loader should be capable of operating **infinitely**, selecting sets of N images from your folder of training images.
* We should be able to call your DataLoader class any number of times and get batches of N images per call.

## *Task 2:*

* Demonstrate how a Transformer model you have selected and trained classifies, localises or segments target objects within images from a test dataset.
* Train the Transformer model using your chosen dataset and a different DataLoader. Think why you need a different DataLoader than the one you wrote above.
* Explain how you would tune the hyper-parameters of this model.
* Your presentation should make use of off the shelf tools and components, data, information and illustrations gathered from online sources and your previous portfolio of work. You should, in your presentation, address our interest in recognising target objects within terrains from a range of viewpoints.
* You may also wish to comment on how the system might be developed if we were asked to detect areas of texture, for example rust or invasive vegetation, affecting installations or processing facilities.

## State of the art awareness:

We would like to give you notice of the following questions which we will ask you in the interview:

* Explain the structure and mechanism of a Transformer block.
* What are attention maps in Transformers? How can you extract them from a pytorch model?
* Why are deep learning networks vulnerable to noise? How might this practically affect intelligence, surveillance and reconnaissance imagery analysis? What, in addition to noise, might have a similar impact in real world settings?
* How would you approach hyperparameter tuning? How might it be automated?
* Please explain model parallelism, data parallelism and pipeline parallelism?
* Explain how GANs might be used to improve synthetic imagery used in training.