

Illegal Mine Identification using Space and AI technologies

Project Code

19/10

Department Name

CTO

Context

Illegal mining is a global problem, with an adverse impact on local communities and the environment. The Catapult is working with the latest satellite and analytics technologies to monitor the extent of illegal mining activities, assess their impact and help direct on the ground support.

The space industry is currently undergoing a revolution. Over the last 10 years, the cost and size of electronics has plummeted, leading to the development of constellations of small satellites. Whereas a single spacecraft used to cost £100m+, it is now possible to launch so called “nano-satellites” for £0.1-0.2m. As a consequence, several constellation of 100s of such satellites have been launched, continuously monitoring the planet and producing a deluge of data. Artificial Intelligence technologies (AI, specifically Computer Vision) is making it possible to rapidly process this flow of information and provide meaningful insights.

It is expected that these innovations will provide a breakthrough for applications related to the fight against illegal mining. Novel ubiquitous and continuous monitoring schemes, key to an efficient tackling of the issue, are being set-up. The extent and location of temporary housing, indicative of illegal mining activity, is one example of the type of information captured.

Once the areas of interest have been identified it is then possible to carryout additional analysis and identify the presence of commonly expected pollutants and justify mitigation actions.

Project Description

The applicant will explore the applications of ML to the challenges of linked to illegal mining. A key objective will be to develop a computer vision model utilising open frameworks to automatically identify one or more key mining activity indicators within satellite imagery. Depending on the background and skills of the applicant this could involve a simple classification of whether a specific target (e.g. temporary housing) is in the imagery all the way to more complex segmentation of the data. This activity will be carried out in parallel to close engagement with in country stakeholders (specific country details will be provided

open project initiation) to refine high level user requirements and better appreciate the challenges facing the country and industry.

Applicant Specification

Applicants will preferably have

- a background in Computer Science, Mathematics, Physics, Geography, Environmental Sciences, Remote Sensing
- experience with machine learning technologies, including working with scientific libraries relevant to the field, e.g. PyTorch, TensorFlow, NumPy, Pandas, R's Hadleyverse, etc.
- a knowledge of one of the following programming languages: Python, R, C/C++

The applicant will also be enthusiastic about space applications, and should have an aptitude and interest in engaging with a wide variety of stakeholders.

Further Details

Through working in a very dynamic and diverse environment within the Catapult and as part of the Emerging Technologies and Extractive Industries teams the successful candidate will gain a variety of soft and technical skills. This are expected to include:

1. Familiarisation with processing of satellite imagery and other satellite datasets.
2. Familiarisation with stakeholder and client interactions.
3. User centred design and requirements gathering.
4. Communication skills of dealing with a diverse set of technical, operational.
5. Report writing. Presentation skills.

Application Closing Date

Friday 8 March 2019

Interviews

Week commencing 25 March 2019

Start Date

The Induction Day will be held at Harwell on Monday 18 June, it is intended this will also be the start date.

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8 weeks fixed term contract to be agreed with successful candidate but nominally with a start date around Monday 18 June which is also the SPIN Induction day at Harwell.

Salary

£1,500 per calendar month.