18/11 :
Option 1: Compression of Video from Space
– or –
Option 2: Research the ability to detect wind turbine activity from space

Company: Earth-I Ltd

Supervisor: Mr. John Linwood, Chief Technology Officer

Location: Guildford, UK

Company Description:
Earth-i is launching a constellation of high resolution, video capable, colour, Earth observation LEO satellites. We are building a data analytics platform and insights capabilities on top of our image and video data from space. Our technology demonstrator satellite was launched in early January 2018 and we expect to start producing video from space very shortly

Project Description:
Option 1.
We would like to take high resolution, full colour video from our satellite and investigate the various compression algorithms and codecs to determine the optimal compression achievable without loss to the quality of the video. As our satellite uses forward motion compensation it can stare at a 25 square km area of interest on the ground while passing over. This allow capture of video where much of the frame is the same and only moving objects change. That said, because the angle of the view changes as the satellite rotates with forward motion compensation the resolution of sections of the frame changes, initially from a wider area at the front as the satellite points forward, to a wider area at the back of the image as the satellite points backward. This means that there is apparent "movement" of the ground features which may confuse some video compression algorithms.
We would like to carry out a project to investigate the best solutions for compression as well as to look at video processing techniques (or frame level image processing techniques) that may improve the ability to compress the video in a lossless manner.

Option 2.
We would like to take high resolution, full colour video from our satellite and investigate the potential to detect the movement of sections of static, ground based objects like wind turbines and cranes. Unlike moving objects such as vehicles or aircraft, which we know we can detect and extract vector and speed information on, static ground objects that have moving elements are more difficult to discern. We believe that we can achieve <1m resolution on our video by using super resolution techniques along with image enhancement processes on the individual frames of the video (such as pan sharpening).
We would like the applicant to investigate what enhancements and manipulation can be done both in terms of the video and frame level imagery that makes up the video to see to what degree we can detect movement within the static objects. For example, does a wind turbine create a flash of white as the turbine rotates? This is particularly interesting as it

would open up the possibility to determine which turbines or cranes are active as the satellite passes overhead.

This could inform activity analytics and insights that could be valuable to government, NGOs and commercial organisations.

Applicant Specification:
Option 1.
We would like the applicant to have knowledge of image and video formats and codecs. Ideally, the candidate would have an educational background that has included working with video data formats.

Option 2.
We would like the applicant to have knowledge of image and video enhancement and analysis and, if possible, some exposure to machine learning techniques.

Further details:
8 weeks minimum fixed term contract to be agreed with successful candidate but nominally with a start date on or before 7 March, 2018. Salary is £2,300 for the 8 weeks, travel and subsistence up to £400, Codec licences £300 (for option 1).

Closing Date for Applications: 15th February, 2018
Applications will be through the online form attaching a CV, before the closing date. They will be checked for eligibility and forwarded to the employer.

Please return to the Catapult SPIN page to apply: https://sa.catapult.org.uk/people/space-placements-industry-spin/