

Memorandum

Subject: MA Internship 2022
Duration: 5 months
Period: February-June 2022
Organization: cosine Remote Sensing B.V., Leiden University, Institute of Archaeology of the Czech Academy of Sciences

Identification of Neolithic Circular Enclosures through Aerial Imagery

cosine is a Dutch company that develops and builds optical and in-situ measurement systems for space, air and ground use. Currently, we are developing the ALART LiDAR altimeter which creates high precision topographic maps of Earth's surface. To demonstrate the capabilities of such technology, we are currently working with archaeologists from Institute of Archaeology of the Czech Academy of the Sciences and the Slovak University of Technology to identify Neolithic Circular Enclosures (NCEs) – mysterious stone hedge like rings scattered through Central/Eastern Europe. Currently, 120-150 of these objects are known, but it is theorized that more exist. Further studies into the distributions of these objects could lead to deeper insights regarding their ancient functionality.

The project started in July 2021. So far, NCEs were located in LiDAR imagery of Slovakia acquired from the Geodesy, Cartography and Cadastre Authority of the Slovak Republic (ÚGKK SR). Various visualization techniques (e.g. Simple Local Relief Model and Contrast Limited Histogram Equalization) were experimented with to emphasize the archaeological features and data augmentation techniques were researched to expand the limit training set. In the upcoming months, LiDAR data and NCE locations in Czechia will also be acquired to expand the search area to two countries. See [CRS-AIARCH-TN01](#) for a more thorough description of the project's current status.

Tasks:

The goal of this project is to detect undiscovered NCEs in LiDAR imagery using computer vision methods. We are especially interested in comparing the results of conventional pattern recognition techniques to those of deep learning networks. A major challenge of this endeavor will be the limited amount of positive training examples. Novel machine learning, data augmentation and/or transfer learning techniques will likely be required to overcome this obstacle and others. Therefore, the ideal candidate would be an independent, fairly experienced, researcher.

Prior experience and knowledge:

- Experience with Python and machine learning libraries (e.g. Tensorflow and/or Pytorch) – required
- Excellent oral and written English communication skills – required
- Some computer vision and GIS software experience – preferred

Experience you will gain:

- Working in an international setting between the worlds of academia and business
- Basic archaeological knowledge – especially involving NCEs
- Experience with GIS software and working with big data

We offer an internship at cosine, which includes an allowance of 200€/month and access to the company's facilities (including high performance computers).

For further information contact John D. Hefele (j.hefele@cosine.nl) or Marlies Bonnet (recruitment@cosine.nl).

Should you wish to apply for this internship, send an email to recruitment@cosine.nl including your CV and a short letter explaining why you are interested in this internship.