Domande Serie 1

- Il candidato parli della propria esperienza maturata nell'ambito delle tematiche del concorso;
- Il candidato illustri le metodologie e le potenzialità delle tecnologie satellitari SAR per la conoscenza e il monitoraggio del patrimonio culturale;
- Il candidato illustri le metodologie di Big data analysis con il supporto Google Earth Engine nel campo del monitoraggio dei beni culturali;
- Lettura e traduzione dalla lingua inglese del seguente brano tratto da: Marco Fiorucci, Wouter B. Verschoof-van der Vaar , Paolo Soleni, Bertrand Le Saux and Arianna Traviglia (2022) – *Deep Learning for Archaeological Object Detection on LiDAR: New Evaluation Measures and Insights*. Remote Sens. 2022, 14, 1694. https://doi.org/10.3390/rs14071694:
  "Archaeological research has been quick to introduce Machine Learning-based work-flows for the automatic detection of archaeological objects on remote sensing data over the last five years [1– 7]. While initial applications of Machine Learning (ML) techniques have mainly used object detection-based approaches [1, 5,6], more recent studies have moved toward finer-grained ones based on semantic segmentation-based techniques [2,3]. These include different variations of the VGG-19 CNN [8], U-Net [9] and Mask-RCNN [10] architectures, which demand an additional effort in the training set preparation as they require pixel-level labels.
  Although such works demonstrated the effectiveness of Deep Learning for automatically identifying archaeological objects, they often evaluate the detection performance either using customised semi-automatic measures [6], which requires the archaeological domain knowledge to be used, or applying a range of different performance evaluation procedures [1 – 5] that prevent the comparison between different workflows [11– 13]".

Domande Serie 2

- Il candidato parli della propria esperienza maturata nell'ambito delle tematiche del concorso;
- Il candidato illustri le metodologie e le potenzialità di tecnologie satellitari ottiche multispettrali per l'archeologia preventiva e l'archeologia del paesaggio;
- Il candidato illustri le metodologie di Big data analysis con il supporto Google Earth Engine nel campo dell'archeologia del paesaggio;
- Lettura e traduzione dalla lingua inglese del seguente brano tratto da: Marco Fiorucci, Wouter B. Verschoof-van der Vaart, Paolo Soleni, Bertrand Le Saux and Arianna Traviglia (2022) – Deep Learning for Archaeological Object Detection on LiDAR: New Evaluation Measures and Insights. Remote Sens. 2022, 14, 1694. https://doi.org/10.3390/rs14071694:
  "*The archaeological and LiDAR data used in this research derive from a region known locally as the Veluwe, in the western part of the province of Gelderland in the Netherlands (Figure 1). This region (ca. 2200 km2) consists of multiple north–south orientated icepushed ridges, separated by relatively flat valleys originating from the Saale glacial period (ca. 350,000 to 130,000 BCE). In later periods, the area was partially covered with cover sand and drift-sand (i.e., aeolian sand) deposits [21,22]. Nowadays, the Veluwe is predominantly covered with forest and heath, interspersed with agricultural fields, variously sized areas of habitation and major and minor roads. The area holds one of the largest clusters of known archaeological objects in the Netherlands. The majority of the extant objects can be found in heathland or under forest cover [11]. While their location has certainly contributed to their present-day preservation, it also limits the detailed investigation of known sites and the survey of their surrounding landscape for potential new archaeological objects [23]*".

Domande Serie 3

- Il candidato parli della propria esperienza maturata nell'ambito delle tematiche del concorso;
- Il candidato illustri le metodologie e le potenzialità del remote sensing basato sull'uso di sensori ottici e LiDAR su drone nel campo dell'archeologia e della documentazione del patrimonio culturale;
- Il candidato illustri le metodologie di Big data analysis con il supporto di Google Earth Engine per l'analisi del fenomeno della dispersione insediativa come elemento di pericolosità del patrimonio culturale;
- Lettura e traduzione dalla lingua inglese del seguente brano tratto da: Marco Fiorucci, Wouter B. Verschoof-van der Vaart, Paolo Soleni, Bertrand Le Saux and Arianna Traviglia (2022) – Deep Learning for Archaeological Object Detection on LiDAR: New Evaluation Measures and Insights. Remote Sens. 2022, 14, 1694. https://doi.org/10.3390/rs14071694:
  "*In both discrete objects and landscape patterns cases, these two types of validation have been developed to address specific archaeological goals by developing the GIS-based measure [6]. First, the GIS-based measure converts the predicted bounding boxes into geospatial vectors. Specifically, in the case of discrete objects, the detections are converted into points by taking the central coordinate (or centroid) of the bounding box. These points are then overlaid to a spatial layer of the test area previously divided into cells with sizes based on the average size of the archaeological objects in question. In this perspective, a detection has to be close enough to a ground truth, i.e., within the ground truth annotation, to be considered as a True Positive (TP), while the coverage of the produced bounding box is of less importance (see Figure 3). Subsequently, the number of TPs and False Positives (FPs) is determined by selecting all 'positive' and 'negative' grid cells that contain a detection by means of a GIS software (such as QGIS). Multiple detections in the same grid cell are*
  individually counted. Finally, False Negatives (FNs) are computed (total number of barrows in the dataset minus TP) and True Negatives (TNs) (total negative grid cells minus FPs)."

Domande Serie 4 (NON ESTRATTA)

- Il candidato parli della propria esperienza maturata nell'ambito delle tematiche del concorso;
- Approcci multiscala basati sul remote sensing per l'archeologia e lo studio dei paesaggi antichi;
- Machine learning e big data analysis per la valutazione dei rischi che minacciano il patrimonio culturale;
- Lettura e traduzione dalla lingua inglese del seguente brano tratto da: Marco Fiorucci, Wouter B. Verschoof-van der Vaart, Paolo Soleni, Bertrand Le Saux and Arianna Traviglia (2022) – Deep Learning for Archaeological Object Detection on LiDAR: New Evaluation Measures and Insights. Remote Sens. 2022, 14, 1694. https://doi.org/10.3390/rs14071694:
  "The pixel-based measure, suited for landscape patterns [29, 30] such as Celtic fields, considers the object detection task as the classification of each pixel of an image. Specifically, as shown in Algorithm 2, for each class, a binary mask is calculated of both the ground truth annotations and predicted objects. The mask has the same width and height of the original image and represents the presence (or absence) of all the objects of the given class, as it assumes for each corresponding position the binary value 1 if in that position an object instance is present, or conversely the binary 0 whenever it is not. Then, the ground truth mask and the prediction mask are compared on a pixel-wise level, using an AND (bit-wise) operator: each pixel where both masks contain the binary value 1 (presence of an archaeological object) is considered as a TP, while pixels with binary value 1

ground truth mask and binary value 0 in the prediction mask are considered as an FN, and conversely pixels with binary value 0 in the ground truth mask and binary value 1 in the prediction mask are considered as FPs."

Domande Serie 5

- Il candidato parli della propria esperienza maturata nell'ambito delle tematiche del concorso;
- Il candidato illustri le metodologie di remote sensing dal satellite al drone per l'osservazione e il monitoraggio delle attività di scavo clandestino;
- Il candidato illustri le potenzialità dell'analisi di Big data telerilevati con il supporto Google Earth Engine di supporto alla gestione del patrimonio culturale e dei paesaggi;
- Lettura e traduzione dalla lingua inglese del seguente brano tratto da: Marco Fiorucci, Wouter B. Verschoof-van der Vaart, Paolo Soleni, Bertrand Le Saux and Arianna Traviglia (2022) – Deep Learning for Archaeological Object Detection on LiDAR: New Evaluation Measures and Insights. Remote Sens. 2022, 14, 1694. https://doi.org/10.3390/rs14071694:
  "Object detection is a popular and fast evolving field within Deep Learning research. Consequently, original, potentially ground-breaking research is published regularly and comparing all developed networks and architectures is out of the scope of this research. Furthermore, developing a network from scratch is regarded as unnecessary and inefficient. Therefore, Detectron2 [38], a Pytorch-based library developed by Facebook AI Research (FAIR), is used in this research. This library aims towards an enhanced flexibility and extensibility through a proper re-factored modular design and the ability to provide fast training on single or multiple GPU servers. Moreover, it fills the gap between research
  (development) and industry (use) by providing different implementations of state-of-the-art object detection networks and algorithms. Detectron2 was initially used to rapidly construct and explore different architectures and combinations of pre-trained models. Preliminary experiments with different approaches (e.g., RetinaNet-based single-shot detection models) did not result in any significant gain, and eventually the choice was made to settle on a single, state-of-the-art object detection network, Faster R-CNN [39], to test the proposed measures".