Ideation phase

Literature survey

Date	01 OCTOBER 2022
Team id	PNT2022TMID20770
Project name	Digital Naturalist-AI enabled tool for biodiversity researchers.
Maximum marks	4

PAPER 1

Artificial intelligence (AI) will transform business practices and industries and has the potential to address major societal problems, including sustainability. Degradation of the natural environment and the climate crisis are exceedingly complex phenomena requiring the most advanced and innovative solutions. Aiming to spur ground breaking research and practical solutions of AI for environmental sustainability, we argue that AI can support the derivation of culturally appropriate organizational processes and individual practices to reduce the natural resource and energy intensity of human activities. The true value of AI will not be in how it enables society to reduce its energy, water, and land use intensities, but rather, at a higher level, how it facilitates and fosters environmental governance. A comprehensive review of the literature indicates that research regarding AI for sustainability is challenged by (1) overreliance on historical data in machine learning models, (2) uncertain human behavioural responses to AI-based interventions, (3) increased cybersecurity risks, (4) adverse impacts of AI applications, and (5) difficulties in measuring effects of intervention strategies. The review indicates that future studies of AI for sustainability should incorporate (1) multilevel views, (2) systems dynamics approaches, (3) design thinking, (4) psychological and sociological considerations, and (5) economic value considerations to show how AI can deliver immediate solutions without introducing long-term threats to environmental sustainability.
Keywords:
Agenda for practice, AI, Artificial intelligence, Climate change, Environmental governance, Natural environment, Research agenda, Sustainability

PAPER 2

Many industrialised countries have benefited from the advent of twenty-first century technologies, especially automation, that have fundamentally changed manufacturing and industrial production processes. The next step in the evolution of automation is the development of artificial intelligence (AI), i.e. intelligence which is demonstrated by machines and systems, which cannot only perform tasks but also work synergistically with humans and nature. Intelligent systems that can see, analyse situations and respond sensitively to real-time cues, from human gestures and facial expressions to pedestrians

crossing a busy street, will reshape transportation, precision agriculture, biodiversity conservation, environmental modelling, public health, construction and manufacturing, as well as initiatives designed to promote prosperity on Earth. This paper explores the connections between AI systems and sustainable development (SD) research. By means of a literature review, world survey, and case studies, ways in which AI can support research on SD and, inter alia, contribute to a more sustainable and equitable world, are identified.

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PAPER 3

Digitalization provides access to an integrated network of unexploited big data with potential benefits for society and the environment. The development of smart systems connected to the internet of things can generate unique opportunities to strategically address challenges associated with the United Nations Sustainable Development Goals (SDGs) to ensure an equitable, environmentally sustainable, and healthy society. This perspective describes the opportunities that digitalization can provide towards building the sustainable society of the future. Smart technologies are envisioned as game-changing tools, whereby their integration will benefit the three essential elements of the food-water-energy nexus: (i) sustainable food production; (ii) access to clean and safe potable water; and (iii) green energy generation and usage. It then discusses the benefits of digitalization to catalyse the transition towards sustainable manufacturing practices and enhance citizens' health wellbeing by providing digital access to care, particularly for the underserved communities. Finally, the perspective englobes digitalization benefits by providing a holistic view on how it can contribute to address the serious challenges of endangered planet biodiversity and climate change.

PAPER 4

Ungulate Detection and Species Classification from Camera Trap Images Using RetinaNet and Faster R-CNN (2022)

Authors: Gholamreza Anbarjafari, Ilja Pavlovs, Kadir Aktas ,Egils Avots, Jevgenijs Filipovs, Agris Brauns, Gundega Done, Dainis Jakovels, Gholamreza Anbarjafari

This paper presents a new dataset of wild ungulates which was collected in Latvia. It demonstrates two methods, which use RetinaNet and Faster R-CNN as backbones respectively, to detect the animals in the images. Faster R-CNN–ResNet50 network and RetinaNet were trained for 34,850 iterations (10 epochs) on the training dataset with a batch size of 4, learning rate of 0.0001 and Adam optimizer for the weight update. The general structure of the detector involves image embedding, object localization and classification. DNN consisting of convolutional layers which are used for the feature extraction from the input image. Usually,

backbone networks which are pretrained on a natural image dataset such as ImageNet are used. Common networks used as the backbone are ResNet50, VGG160, Inception-ResNetV2 and DarkNet-19. The neck network takes and processes inputs from the different layers of the backbone, harnessing advantages of data pattern distribution over different feature map scales by using FPN (Feature Pyramid Network). A feed-forward neural network which performs the classification or regression task.

PAPER 5

Recognition of Endemic Bird Species Using Deep Learning Models (2021).
Authors:Yo-Ping Huang, Haobijam Basanta
The objective of the paper is identifying the bird species from images. This study developed a transfer learning-based method using Inception-ResNet-v2 to detect and classify bird species. To validate the reliability of the model, it adopted a technique that involves swapping misclassified data between training and validation datasets. The swapped data are retrained until the most suitable result is obtained. Additionally, fivefold cross-validation was performed to verify the predictive performance of the model. The proposed model was tested using 760 images of birds belonging to 29 species that are endemic to Taiwan. The model has achieved an accuracy of 98.39% in the classification of 29 endemic bird species. The model achieved a precision, recall, and F1-score of 98.49%, 97.50%, and 97.90%, respectively, in classifying bird species endemic to Taiwan.

PAPER 6

An Efficient Framework for Animal Breeds Classification Using Semi-Supervised Learning and MultiPart Convolutional Neural Network (MP-CNN) (2019).
Authors: S.Divya Meena, L.Agilandeeswari
The paper focus on classifying 27 classes of animals with 35,992 training images. The proposed model classifies the animals on both generic and fine- grained level. It has built a semi-supervised learning based Multi-part Convolutional Neural Network (MP-CNN) with a hybrid feature extraction framework of Fisher Vector based Stacked Autoencoder. With Semi-supervised learning based pseudo-labels, the model classifies new classes of unlabelled images too. Hellinger Kernel classifier method has been modified and used to re-train the misclassified classes of animals which further enhance the accuracy. Semi-supervised learning based pseudo-labels, the model classifies new classes of unlabelled images too. The testing accuracy increases as the models get trained. The experimental results shows that the overall accuracy is 99.6%.