Conference »Program

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2022 IEEE Asia-Pacific Conference on Geoscience, Electronics and Remote Sensing Technology (AGERS) Program

D1S1: The last paper presentation ends before (15:50) the session end time of 17:00.

D1S2: The last paper presentation ends before (15:35) the session end time of 17:00.

D1S3: The last paper presentation ends before (15:20) the session end time of 17:00.

D2S1: The last paper presentation ends before (15:10) the session end time of 17:00.

D2S2: The last paper presentation ends before (15:10) the session end time of 17:00.

D2S3: The last paper presentation ends before (14:50) the session end time of 17:00.

Jakarta time	Wednesday, December 21	Thursday, December 22
9:00 - 9:30	D1: *Opening Session*	
9:30 - 12:30	D1P1: *Plenary Session*	D2P1: *Plenary Session*

12:30 - 13:30		
13:30 - 17:00	D1S1: *General Geoscience and Hazard Modeling* D1S2: *General Remote Sensing & Sensor and Platform* D1S3: *General Remote Sensing & Sensor and Platform*	D2S1: *Remote Sensing for Ocean and Meteorology* D2S2: *Remote Sensing for City Management & Related Topics* D2S3: *Internet of Things and Related Topics*

Wednesday, December 21

Wednesday, December 21 9:00 - 9:30 (Asia/Jakarta)

D1: Opening Session

Room: Main room

Chairs: Oni Bibin Bintoro (Agency for Assessment and Application of Technology (BPPT), Indonesia), Lalu Muhamad Jaelani (Institut Teknologi Sepuluh Nopember, Indonesia)

Speech and remark by:

- Report from Organizing Committee by Prof. Bangun M.S.
- Welcome Speech by IEEE Indonesia Section: Dr Wahyud Hasbi
- Opening by IEEE AESS - GRSS Indonesia Joint Chapter: Dr. Arifin Nugroho

Wednesday, December 21 9:30 - 12:30 (Asia/Jakarta)

D1P1: Plenary Session

Keynote Speaker

Room: Main room

Chair: Oni Bibin Bintoro (Agency for Assessment and Application of Technology (BPPT), Indonesia)

This session represents the state of the art of geoscience and remote sensing. The Keynote speakers are:

1. Prof. Dr. M. Ashari (Rector of the Sepuluh Nopember Institute of Technology)
2. Dr. Ridwan Djamaluddin (Director General of Mineral and Coal, Ministry of Energy and Natural Resources - Republic of Indonesia)
3. Director of PT PAL Indonesia
4. Prof. Shiv Mohan (IEEE Senior Member)
5. Dr. Wiwin Windupranata (Institut Teknologi Bandung)
6. Dr. Hansan PARK, Director of Korea Indonesia Marine Technology Cooperation Research Center (MTCRC)

Wednesday, December 21 13:30 - 17:00 (Asia/Jakarta)

D1S1: General Geoscience and Hazard Modeling

Break Out Room 1

Chairs: Noorlaila Hayati (Institut Teknologi Sepuluh Nopember, Indonesia), Muhammad Razzaaq Al Ghiffari (Mining Technology Research Center & National Research and Innovation Agency (BRIN), Indonesia)

This session discusses about geoscience and hazard modeling in general.

D1S1.1 13:30 *Conceptual Framework of Systems Thinking based Flood Risk Management: A Preliminary Study*

Anisah Anisah, Budi Heru Santosa, M. Sc. and Dionysius Bryan Sencaki (National Research and Innovation Agency, Indonesia)

Flood Risk Management (FRM) is implemented by the government to cope with floods, with mitigation/prevention, preparedness, response, and recovery phases. The occurrence of urban flooding regularly indicates that the applied FRM has not functioned effectively. This study proposes using systems thinking in flood risk management since the interdependence between flood risk components and the programs in the FRM is complex. For this reason, systems thinking in the form of a causal loop diagram can be used to explore the interdependence between programs within the FRM framework and flood risk components. By identifying the pattern of interdependence between flood risk and FRM, FRM programs can be directed to achieve the final target, namely reducing flood risk in an area. Therefore, life in flood-prone areas can occur sustainably and harmoniously.

D1S1.2 13:45 *Optimization of Loop Closure Phase on LiCSBAS for Ground Deformation Monitoring in Southern Sumatra*

Muhammad Razzaaq Al Ghiffari (Mining Technology Research Center & National Research and Innovation Agency (BRIN), Indonesia); Djoko Nugroho (The National Research and Innovation Agency of Indonesia, Indonesia); Afifuddin Afifuddin (The National Research and Innovation Agency of Indonesia (BRIN), Indonesia); Agustan Agustan (Agency for the Assessment and Application of Technology (BPPT) & PTPSW-BPPT, Indonesia); Cipta Endyana and Hendarmawan Hendarmawan (Universitas Padjadjaran, Indonesia)

Indonesian territory has an active tectonic, one of which is Southern Sumatra. This is due to the presence of a subduction zone in the west and the Sumatra fault which is parallel to each other. Such geological condition can lead to disasters (e.g earthquakes and tsunamis) whenever it occurs. Accordingly, monitoring ground deformation is an important analysis to do in this area. LiCSBAS becomes an effective open-source tool for observing time-series of ground deformation using InSAR. One of the stages, the loop closure phase is a critical step in generating the number of interferograms and pixels that will be used. The objective of this study is to observe ground deformation in Southern Sumatra by taking the

optimal value of the loop closure threshold. The data processing results that the threshold value used is 1.6 rad. Meanwhile, the deformation pattern is generally divided into two areas, the western and eastern parts of Southern Sumatra. The western part close to the Sumatra Fault Zone shows a subsidence at a rate ~115 mm/year and the eastern indicates an uplift ~68 mm/year.

D1S1.3 14:00 *Fault Bend Fold Related Thrust Fault Waturanda Formation as Representative of Tectonic Compression as an Asset Geological Heritage of GNKK, Indonesia*

Eko Puswanto (& BRIN, Indonesia); Ardhan Farisan and Dimas Aryo Wibowo (National Research and Innovation Agency, Indonesia); Puguh Dwi Raharjo (Gadjah Mada University & National Research and Innovation Agency, Indonesia)

The volcanic sandstone, well exposed in the Kenteng area, Sempor District, and Kebumen Regency, indicates strongly deformed and complex structural complications. The research area is in the middle of The Karangsambung - Karangbolong National Geopark. Unfortunately, the geological heritage at the research area has not yet become one of geosite at The Karangsambung - Karangbolong National Geopark. This location is interesting to study further. It can be the key to answering geological events related to the older rocks, which is pra-Tersier Luk Ulo Melange Complex or younger rocks. Several parts of volcanic sandstone in the research are associated with thrust fault zones and intensive folding structures accompanied by drag faults. Detailed observations and measurements of geological structural elements well preserved were conducted around the deformation zone. Identifying the type of structure, geometry, and kinematics supported by the interpretation of the damage zone using a drone. Synthesis of a primary and secondary show that the structure developed in this research area is categorized as a fold-thrust system with a fault bend fold type. Intensive deformation of the fault bend fold structure is estimated to involve the entire Waturanda Formation regionally. The geological heritage of the fault bend fold phenomena at the research area can be the basis for creating the master plan that integrates the visual structural morphology of the hills and other geosites, especially in the middle part of the Karangsambung - Karangbolong National Geopark area

D1S1.4 14:15 *The Strategy of GNSS CORS Processing in Southern Sumatera*

Afifuddin Afifuddin (The National Research and Innovation Agency of Indonesia (BRIN), Indonesia); Djoko Nugroho (The National Research and Innovation Agency of Indonesia, Indonesia); Muhammad Razzaaq Al Ghiffari (Mining Technology Research Center & National Research and Innovation Agency (BRIN), Indonesia); Agustan Agustan (Agency for the Assessment and Application of Technology (BPPT) & PTPSW-BPPT, Indonesia); Cipta Endyana and Hendarmawan Hendarmawan (Universitas Padjadjaran, Indonesia)

The establishment of the GNSS Continuously Operating Reference System (CORS) station in Indonesia has made advantage to wider application. From preserving the national spatial reference system, supporting cadastral survey, and observing natural disasters. The trend of CORS application is to monitor crustal deformation, discover active tectonics, and study the earthquake phenomena. The utilization of GAMIT/GLOBK has exceeded other GNSS processing software for many applications. This study will elaborate the strategy and required steps on performing multiyears CORS processing in southern Sumatera. Throughout 19 local CORS stations and 7 IGS stations, alongside with setting up several control

files we have successfully created velocity maps and monitor the deformation of each CORS station in Southern Sumatera.

D1S1.5 14:30 *Modeling of Mount Batur lava flows and ejecta as new approaches in Indonesian short-term volcanic hazard assessment*

Estu Kriswati (Research Center for Geological Disaster, National Research and Innovation Agency); Oktory Prambada (Center for Volcanology and Geological Hazard Mitigation, Indonesia); Devy Kamil Syahbana (Center for Volcanology and Geological Hazard Mitigation & Geological Agency, Indonesia); Wilfridus F. S. Banggur (BRIN, Indonesia); Agustan Agustan (Agency for the Assessment and Application of Technology (BPPT) & PTPSW-BPPT, Indonesia); Yukni Arifianti (National Research and Innovation Agency, Indonesia); Idham Andri Kurniawan (ITB, Indonesia); Riantini Virtriana (Institut of Technology Bandung, Indonesia); Gathot Winarso (BRIN, Indonesia); Bambang Sugiarto (Research Center for Geological Disaster, National Research and Innovation Agency (BRIN), Indonesia); Firman Prawiradisastra and Aditya Pratama (BRIN, Indonesia)

The volcanic eruption provides valuable products and resources, but can also endanger people's lives, property, and activities. This research models the potential hazards from Mount Batur's eruption to mitigate the impacts in the future. Our research focused on numerical models of volcanic hazards with input parameters derived from geology, deformation, seismic, and geochemical data. We acquired high-resolution DEM data obtained from DEMNAS. We compare modelling results with the existing hazard map of Mount Batur.

14:45

D1S1.6 14:50 *Time Series InSAR Analysis over Jakarta Metropolitan Area*

Agustan Agustan (Agency for the Assessment and Application of Technology (BPPT) & PTPSW-BPPT, Indonesia); Takeo Ito (Nagoya University, Japan); Estu Kriswati (Centre for Volcanology and Geological Hazard Mitigation & Geological Agency of Indonesia, Indonesia); Hari Priyadi (National Research and Innovation Agency, Indonesia); Heri Sadmono (Badan Riset dan Inovasi Nasional, Indonesia); Rika Hernawati (Institut Teknologi Nasional Bandung, Indonesia)

Most of previous geoscience studies in Jakarta found that the area is affected by land subsidence. However, it is difficult to understand the spatial distribution since the continuous geodetic observation is not available. The development of SAR satellite-based remote sensing enable ground deformation observation in long period and in regular time. This study presents the ground deformation time series analysis for Jakarta Metropolitan area based on InSAR technique. We construct time series of ground deformation constrained from Sentinel-1 interferograms provided by ASF DAAC Hyp3 using the small baseline subset approach. Mintpy tool is utilized to obtain the time series analysis. It is found that during 7.6 years observation period since late 2014, the land subsidence only locally spotted in certain area. The average velocity of ground deformation in Jakarta Metropolitan area varies from -5.8 cm/year to 1.2 cm/year. It means uplift phenomena also detected in Jakarta metropolitan area. It is also found that time

series of ground deformation is fluctuate in seasonal pattern and may related to ground water recharge during the rainy season.

D1S1.7 15:05 *Deformation Identification Due to the Pasaman Earthquake On February 25 2022, Using the Dinsar Method*

Aprilia Puspita Cahyaningrum (BMKG, Indonesia); Agustya Adi Martha (BRIN, Indonesia); Priyobudi Priyobudi (BMKG, Indonesia); Supriyanto Rohadi (Meteorological Climatological and Geophysical Agency, Indonesia)

The Pasaman earthquake on March 09, 2022, had a magnitude of 6.1 with a depth of 10 km and an epicenter at 0.15 N - 99.98 BT. This earthquake was preceded by a lower magnitude earthquake with a magnitude of 5.2, with an interval of about 4 minutes before the main earthquake. Based on information updates from BMKG until March 7, 2022, there were 279 aftershocks and 10 felt times. Based on information from the Pasaman regency government, the casualties affected as many as 24 people died, 7186 people were displaced and more than 6625 houses were damaged spread across 5 districts, including West Pasaman, Pasaman, Fifty Cities, Agam, and Padang Pariaman districts. This study aims to provide information on the location of deformations caused by this earthquake. Because the impact of the earthquake is quite extensive and destructive, it is very necessary to inform the information that occurs for future mitigation efforts. This research uses the DinSAR method by utilizing data from sentinel 1 type SLC (Single Look Complex) imagery before (11 and 23 February 2022) and after (7 March 2022) the earthquake occurred. In addition, we processed satellite Gravity data from GGMPlus to identify weak structures associated with low anomalies for comparison with the results of the DinSarr Method. The results of the satellite imagery process show that the areas identified as deformation at the time of the earthquake are in zones with low (negative) anomaly residual gravity values.

D1S1.8 15:20 *Identification of the IOC-UNESCO Tsunami Ready Indicator to Improve Coastal Community Preparedness for Tsunami Disaster in Batukaras Village*

Rika Prillya Mustafida and Nikita Veronica (Bandung Institute of Technology, Indonesia); Aufa Qoulan Karima (Institut Teknologi Bandung, Indonesia); Candida A.D.S. Nusantara (Research Group of Hydrography, Indonesia); Wiwin Windupranata (Institut Teknologi Bandung, Indonesia)

Batukaras Village is a located in Cijulang District, in the southern part of Pangandaran Regency, West Java. Batukaras is one of the tourist destinations that have potential to be visited by the tourist because of its beautiful view and potential economic income from the fishery. Beyond the potential for natural beauty, Batukaras Village also has potential for disaster. One of them is the tsunami caused by the earthquake, with a magnitude of 7.7 in 2006. The Pangandaran tsunami on July 17 became a memorable disaster for the local community. It reached a height of 21 meters. It has left more than 300 people dead, 301 seriously injured, 551 slightly injured, and 156 missing, accompanied by huge property losses. Batukaras Village community has implemented 12 tsunami ready indicators IOC-UNESCO. Therefore, this study aims to map 12 tsunami ready IOC-UNESCO indicators in Batukaras Village to evaluate which indicators the government and community of Batukaras Village. The field survey and interviews are done to obtain data to identify the 12 tsunami ready indicators in Batukaras Village. Based on the IOC-UNESCO tsunami indicator mapping results, Batukaras Village has fulfilled 11 of the 12 indicators set. Based on the identification result, the village government has not yet fulfilled indicator five. Therefore the ITB Research and Community Service Institute (LPPM) team assisted in making an evacuation route map to fulfill these

indicators. However, in the future, the Batukaras Village government and their community can be committed to maintaining and improving all existing disaster preparedness assets.

D1S1.9 15:35 *Implementation of Gravity Model into Flight Mechanical Model of Unmanned Aerial Vehicle*

Ardian Rizaldi (Badan Riset dan Inovasi Nasional, Indonesia); Fuad Surastyo Pranoto and Prasetyo Suseno (National Research and Innovation Agency, Indonesia); Angga Septiyana (PRTP ORPA BRIN, Indonesia); Yusuf Giri Wijaya (National Research and Innovation Agency, Indonesia)

Gravitational force is the most essential force when observing the mechanics-related issue of an object near the earth, including in the analysis of the dynamic response of aircraft. To perform this analysis, a flight mechanical model of aircraft was developed which includes a gravitational acceleration component in the environment subsystem. This paper discusses the gravity model which is implemented into the flight mechanical model of an unmanned aerial vehicle. This gravity model was developed based on a simple model, Somigliana - Taylor Series Expansion model, and WGS84 model then implemented into the Matlab Simulink model. Model verification is performed by comparing the model output results with a similar gravity model in the Simulink aerospace blockset. The result shows that the developed model result is close to the aerospace blockset model result. Furthermore, this model is integrated into the flight mechanical model. Sensitivity analysis was conducted by varying parameters of the UAV mass, radius of flight, and altitude based on UAV classification to determine the effect of the gravity model on aircraft response. The analysis results show that the lightweight UAV does not require a complex gravity model. Meanwhile, in terms of the radius of flight, medium-range to long-range UAVs relatively require a more complex gravity model in analyzing UAV dynamic response. In terms of altitude, UAVs with a wider altitude range need an advanced gravity model.

D1S2: General Remote Sensing & Sensor and Platform

Break Out Room 2

Chairs: Dian Nuraini Melati (BRIN, Indonesia), Hartanto Sanjaya (BRIN, Indonesia)

This session will discuss the remote sensing in general, also the development of sensor and platform.

D1S2.1 13:30 *Development of Vegetation Changes Monitoring Application in Kalimantan Island (2000-2021) with MODIS Satellite Imagery using Streamlit Platform*

Megivareza Putri Hanansyah and Amalia Putri Rivani (Institut Teknologi Sepuluh Nopember, Indonesia); Hartanto Sanjaya (BRIN, Indonesia); Lalu Muhamad Jaelani (Institut Teknologi Sepuluh Nopember, Indonesia); Nurdiansyah Nurdiansyah (National and Research Innovation Agency (BRIN), Indonesia)

Kalimantan Island is one of the largest islands in Indonesia, with high natural and mineral resources. Therefore, the mining industry and clearing of forest areas for oil palm plantations cause a decrease in vegetation. However, the existence of vegetation has a positive impact on the sustainability of the ecosystem. For this reason, monitoring the vegetation on the island of Kalimantan regularly using remote sensing data is necessary. This study uses MODIS Nadir BRDF-Adjusted Reflectance Daily 500m (MODIS/006/MCD43A4) satellite imagery consisting of bands 1-7 and 500 meters resolution. Data calculation using the MNDVI algorithm, which can reduce atmospheric effects and, at the same time, adjusts parameters for reflectance data not affected by the atmosphere. Then, data processing was carried out with cloud masking and clipping using the boundaries of Kalimantan, and the results were classified into four classes. The monitoring of vegetation changes will develop into a web-based application. Applications are made using the Streamlit framework and can be accessed by anyone needing data on vegetation changes on the island of Kalimantan from 2000 to 2021.

D1S2.2 13:45 *Application of Hyperspectral Airborne Data for Discriminating Tree Species in Tropical Peat Swamp Forest, Indonesia*

Laju Gandharum (Universitas Indonesia (UI) & National Research and Innovation Agency (BRIN), Indonesia); Heri Sadmono (Badan Riset dan Inovasi Nasional, Indonesia); Dionysius Bryan Sencaki, Azalea Eugenie, Hari Prayogi and Ilvi Fauziyah Cahyaningtyas (National Research and Innovation Agency, Indonesia)

Hyperspectral remote sensing imaging, like HyMAP, offers extremely precise spectrum data. Therefore, by using a spectral angle mapper (SAM) technique, HyMAP was ideal for differentiating tree species in remote places like tropical peat swamp forests in Indonesia. The results showed tree species of Bangka, Gercinia, and Balau were mapped more dominantly than others. At a threshold of 0.2 radians, these three species, in that order, dominated 56.69%, 29.18%, and 4.44% of the study area. The percentage of unclassified pixels was decreased by 3.72% by raising the threshold (from 0.2 to 0.3 radians).

D1S2.3 14:00 *Time Series Classification using Improved Deep Learning Approach for Agriculture Field Mapping*

Dionysius Bryan Sencaki and Mega Novetrishka Putri (National Research and Innovation Agency, Indonesia); Hartanto Sanjaya (BRIN, Indonesia); Hari Prayogi, Nico Anatoly and Afifuddin Afifuddin (National Research and Innovation Agency, Indonesia); Prabu Kresna Putra (National Research and Innovation Agency (BRIN) & Research Center for Geospatial, Indonesia); Muhammad Luthfi Aziz and Tiara Grace (National Research and Innovation Agency, Indonesia)

Agriculture holds an important role in food security management, hence providing the authorities with reliable and updated agriculture field maps from regional to national scale is critical. Unfortunately, conventional digitation on the screen is still dominating the process of mapping production. The recent advancement in remote sensing research has made it possible to optimize the operation of mapping by employing Deep Learning (DL) algorithm to automate the process. This study implemented a novel DL architecture based on multiple blocks of CNN layers which are complemented by a Bi-LSTM and dual FCN layers. Time-series datasets of NDVI were extracted from Landsat 8 OLI (Operational Land Imagery) ranging from May 2013 to September 2021 as the main features. The validation accuracy score of our DL model during the fitting process was 0.9833. MSAVI replaced NDVI as part of the experiments and our model produced a validation accuracy score of 0.9667. In the latter stage of the experiment, we produced the final comparison using IoU metrics between prediction maps of the agriculture field from our model, ResNet, and ESA WorldCover. Prediction maps from our model topped the chart with highest IoU score amongst others for the NDVI and MSAVI datasets

D1S2.4 14:15 *Spatial Analysis of Flora Habitat Characteristics in East Kalimantan*

Aang Gunawan Sutyawan (National Research and Innovation Agency, Indonesia); Yuliana Susilowati, Wawan Hendriawan Nur and Yugo Kumoro (Indonesian Institute of Sciences, Indonesia); Muklisin Muklisin and Taufiq Salman Syabani (Telkom University, Indonesia); Ibnu Maryanto (National Research and Innovation Agency, Indonesia); Bridsta Yudha Permana (Telkom University, Indonesia)

The research aims to produce software for mapping and identifying flora habitat characteristics in East Kalimantan based on remote sensing data. Identifying flora habitat characteristics in East Kalimantan will be very useful for conserving and restoring flora habitat in the region. Data of flora species were obtained from the Herbarium Wanariset file which includes textual attributes, coordinates, and specimen photos. Dipterocarpus, Hopea, Macaranga, Shorea, and Vatica were used for the case study. Geological data and soil type were taken from the Indonesia-geospatial website. Slope and Altitude were obtained from Digital Elevation Model (DEM) data. Rainfall data was downloaded from Meteorological, Climatological, and Geophysical Agency (BMKG). Land Surface Temperature (LST), Normalized Difference Vegetation Index (NDVI) and Normalized Difference Built-Up Index (NDBI), were obtained from Landsat 8 image data digital processing. The result of this research is a plugin function in QGIS that can be used for flora habitat identification. Based on the research result, only Shorea can grow in all places. Dipterocarpus, Hopea, Macaranga, and Vatica have specific characteristics. Dipterocarpus grows in Tanjunggredeb/ Napiku, Sinjin Formation, Telen Formation, Maau Formation. Macaranga and Hopea grows in the same place Aluvium deposits. Vatica only grows in Maau Formation.

14:30

D1S2.5 14:35 *An Assessment of Object-based Classification Compared to Pixel-based Classification in Google Earth Engine Using Random Forest*

Dian Nuraini Melati, Astisiasari Astisiasari and Trinugroho Trinugroho (BRIN, Indonesia)

Land use is one of the dynamic features that has an impact on environmental conditions. As the study area, the coastal area in the City of Cilegon, Province of Banten is subjected to land use dynamics for its economic development. Accordingly, this study aimed to provide the land use/land cover (LULC) classification within the study area in the year of 2021. The classification was done using Sentinel-2 images and processed on a free, open-access Google Earth Engine (GEE) environment. In generating the LULC classification, this study applied two approaches, i.e., Object-based Classification (OBC) and Pixel-based Classification (PBC), in order to get a better result in providing the LULC data. The predictor variables integrated several spectral indices and bands from the Sentinel-2. For the OBC, image segmentation was performed with a Simple Non-Iterative Clustering (SNIC). And, the classifier used for the OBC and PBC was Random Forest (RF). As a result, the study area consists of heterogeneous landscape including agricultural area, industrial area, settlement and other vegetated areas. Based on the accuracy assessment, the OBC outperformed the PBC with an overall accuracy at 0.95 and 0.731, respectively.

D1S2.6 14:50 *Land Use Land Cover Classification Using Machine Learning*

Harsh Waghela (& NONE, India); Saurin Patel, Pooja Sudesan and Soham Raorane (India); Rohan Appasaheb Borgalli (Shah and Anchor Kutchhi Engineering College, India)

Due to rapid urbanization processes and population exploitation, urban sprawl becomes a challenging task for urban planners. For planning authorities and their decision-making process, particularly in developing nations throughout the late 20th and early 21st centuries, Land Cover Land Use (LULC) is one of the most crucial pieces of information. Instead of doing it manually, the paper's goal is to estimate the LULC Classification using artificial intelligence approaches. The Google Earth Engine (GEE) cloud computing is utilized to easily retrieve satellite photos for this purpose. The suggested approach will make the process of image classification easier so that different land use types may be identified and watched for urbanization. Classification and Regression Trees (CART), a supervised machine learning (ML) technique, is used to perform the classification. Additionally, metrics like classification accuracy, precision and Kappa coefficient are assessed to support the conclusions. The results of the classification revealed a high accuracy of 92.9%. The LULC classification results can be used as a starting point for additional research on a variety of topics, such as river morphology change analysis, ecosystem services analysis, land use policy formulation, management of water resources, management of other natural resources, urbanization, etc.

D1S2.7 15:05 *Palm Trees Counting Using MobileNet Convolutional Neural Network in Very High-Resolution Satellite Images*

Yudhi Prabowo (Research Center for Hydrodynamics Technology, Indonesia); Kuncoro Adi Pradono and Qonita Amriyah (National Research and Innovation Agency, Indonesia); Fadillah Halim Rasyidi (BRIN, Indonesia); Ita C Carolita (National Research and Innovation Agency & Indonesian Aeronautics and Space Institute, Indonesia); Andie Setiyoko (National Research and Innovation Agency, Indonesia);

Danang Surya Candra (BRIN, Indonesia); Musyarofah Musyarofah (National Research and Innovation Agency, Indonesia); Kurnia Ulfa (Research Center for Remote Sensing & National Research and Innovation Agency, Indonesia); Yohanes Fridolin Hestrio (National Research and Innovation Agency, Indonesia)

Indonesia has a large area of oil palm plantation. Information related to the spatial distribution and number of palm trees is essential for oil palm plantation management and monitoring. The common standard of monitoring the number of oil palm trees has been either manually counting at the plantation itself or from the given aerial images. Manual counting requires many workers and has potential problems related to accuracy. This article presents an approach to the extraction and counting of oil palm trees using deep learning approach. We investigate the use of MobileNet-v1 to detect the individual palm trees from very high-resolution satellite images. MobileNet-v1 is a lightweight CNN architecture model that is usually used on smartphones or other devices with limited processing resources. The network was trained with the dataset that contains 3500 small images of size 25×25 pixels. The result shows that this method managed to detect oil palm trees with the precision, recall and F1 score more than 0.9.

D1S2.8 15:20 *Spatial Analysis of Crop Water Demand in Asia Region*

Raka Putra Pratama, Alief Wiraguna Aseran and Anjar Sakti (Institut Teknologi Bandung, Indonesia); Agung Harto (ITB, Indonesia)

Water is the most crucial resource. The need for water use is increasing globally, especially in the agricultural sector, which is the primary driver of the need for water use in many countries. Efficient use of irrigation water can be achieved by good crop management. One of the essential aspects of increasing irrigation efficiency is to perform an Irrigation Water Demand (IWD) analysis. An accurate Crop Water Demand (CWD) assessment is key to good water management. The method used in this study is remote sensing by utilizing NDVI data and Evapotranspiration Potential to determine the value of Kc and CWD. The spatial model analysis results show that Asia's crop coefficient and crop water demand show that, in general, the highest Kc values are found in the Central Asian region and parts of Southeast Asia. The highest CWD accumulation values can be seen in the Central and Southeast Asian areas, especially in India, Pakistan, parts of Indonesia, and Thailand.

D1S3: General Remote Sensing & Sensor and Platform

Break Out Room 3

Chairs: Anggoro Widiawan (PT. Telekomunikasi Indonesia, Tbk., Indonesia), Shintami Chusnul Hidayati (Institut Teknologi Sepuluh Nopember, Indonesia)

This session will discuss the remote sensing in general and platform development.

D1S3.1 13:30 *Estimating rice crop intensity (RCI) using spatial analysis with multi-source satellite sensor data*

Fadhlullah Ramadhani (National Research and Innovation Agency, Indonesia); Tian Mulyaqin (IPB University, Indonesia); Misnawati Misnawati (National Research and Innovation Agency, Indonesia)

Monitoring crops, particularly rice paddy crops, is a vital responsibility for evaluating the performance of the agriculture sector to improve the nation's food security and counteract the adverse effects of climate change. Satellite data monitoring is becoming more prevalent compared to labor-intensive field surveys today. However, the application of multitemporal analysis on several satellite sensors, such as Landsat-8, Landsat-9, and Sentinel-2, has seen very little research on it, especially on the rice intensity index (RCI) estimation. Moreover, the data availability using multi-source satellites was significantly valuable for creating a time series of NDVI values in 16-day periods up to 72.6±30.9%. Based on the integration of three years' worth of multitemporal NDVI calculation from Landsat-8, Landsat-9, and Sentinel-2, this study has an acceptable accuracy level of 71.9% overall in Pandeglang Regency, Banten Province, Indonesia. Based on spatial analysis, the primary RCI index in Pandelang Recency is twice a year for 49,955 ha or 97% of the total rice area. The other RCI is once a year (740 ha) and three times a year (808 ha). This study suggested a novel and straightforward way of identifying and estimating the rice intensity using spatial analysis to identify which region has a minimum performance once in a short period.

D1S3.2 13:45 *Green Open Space Assessment Using Vegetation Index Analysis (Case study: North Bekasi District)*

Muhammad Rafi Haryayudhanto (Esa Unggul University, Indonesia); Muhammad Iqbal Habibie (National and Research Innovation Agency (BRIN), Indonesia); Dayu Ariesta Kirana sari, Prama Ardha Aryaguna and Ratnawati Yuni Suryandari (Esa Unggul University, Indonesia)

Green open space, which is planned as an arrangement of plants, crops, and vegetation of plant species conditioning, protectors, cover soil, and the other completing the instrument, plays a special role in each area that is in every city's spatial planning and serves a variety of functions, including ecological, social, cultural, and aesthetic/architectural ones, to the best advantage of the general welfare. Bekasi City is one among the locations that is currently working to enhance the amount of green open space. Based on the Bekasi City Spatial Plan (2011-2031). Bekasi must offer 6710 acres of green open space. The purpose of this study is to examine the green open space accessible in the North Bekasi District to satisfy the objectives of the spatial plan Bekasi City, which requires each region to have green open space. Landsat 7 and Landsat 8 satellite images, administrative boundaries North Bekasi were used. The vegetation index and overlay are the analytical methods employed. According to the study's findings, the degree of

vegetation distribution in North Bekasi district in 2020 has reduced for the high category with an area of 185,22 hectares, particularly in the western and northern portion of the areas. The proportion of existing green open space in Bekasi City has likewise reduced by 8% between 2010 and 2020, or 159,66 hectares. The vegetation index shows 83.33% accuracy has the similar distribution of green open space in North Bekasi District for NDVI and SAVI. The Bekasi district can assist in identifying green open spaces that have been constructed with the initial concept of green open space preparation for the district surrounding utilizing from the remote sensing satellite imagery.

D1S3.3 14:00 *A New Modification Approach to Enhance the EM Performance of an S-Band Patch Antenna for Nanosatellite Application*

Raynell Inojosa, Marc Jafet Barbosa, Ron Michael Beato, Princess Lheakyrie Casilao, Mary Joy de la Rosa and Raymond Aries Fernando (Batangas State University, Philippines)

An antenna design capable of providing reliable communication link has been a great research interest in nanosatellite applications. Hence, this study aimed to modify a design of a patch antenna for nanosatellite application operated in S-band, providing an improved antenna performance. The design and electromagnetic simulation of the antenna are carried out using the Ansys® High Frequency Structure Simulator (HFSS). With regard to the improvement of antenna performance, a reference antenna design was adopted and modified by incorporating various modification approach. The proposed patch antenna is designed on an RT Duroid 5870 dielectric substrate and can resonate well at frequencies 2.330 GHz and 2.585 GHz having minimum return loss of below -20 dB, VSWR of less than 1.7, and a maximum gain of around 7 dBi, respectively. Through the aid of MATLAB® Satellite Communication Toolbox, this study was able to test and evaluate the antenna design performance in terms of link margin and free space path loss proving that the proposed antenna provides better performance.

D1S3.4 14:15 *Pyramid Scene Parsing Net Model for Automated Paddy Field Map using SPOT 6 Satellite Images*

Edy Irwansyah, Yaya Heryadi and Eka Miranda (Bina Nusantara University, Indonesia); Haryono Soeparno (Universitas Bina Nusantara, Indonesia); Herlawati Herlawati (Universitas Bhayangkara Jakarta Raya, Indonesia); Kiyota Hashimoto (Prince of Songkhla University, Thailand)

For governments in many countries whose peoples consume rice as their staple food, food self-sufficiency initiatives highly depend on accurate prediction of paddy field map. Mapping paddy field task is a challenging problem that cannot be handled manually especially when the paddy fields are spread out in very wide geographical areas such as those in Indonesia. Fortunately, the wide availability of satellite imagery and the advent of deep learning technology in the past ten years have made it possible to improve the efficiency of most parts of those manual works involving image semantic segmentation tasks. However, satellite image-based semantic segmentation is a challenging task. High object complexity, cloud partial occlusion, and larger image size than a computer memory can store can hinder the accuracy of the image segmentation results. This paper presents a method for paddy field map generating using a semantic image segmentation approach in which Pyramid Scene Parsing Net model is used for segmenting satellite imagery. The generated paddy field map can be used further as a basis, among others, for decision-making in the Agriculture field; and analyzing the land use/land cover dynamic of the area. Experimentation results using SPOT 6 satellite image from Pahung region in Central Kalimantan Province achieved 0.85, 0.86, and 0.89 for average training accuracy, the best training accuracy, and

testing accuracy respectively. These results showed that the semantic segmentation model is prospective to address the same task for different crops

14:30

D1S3.5 14:35 *Synthetic Aperture Radar Signal Processing Algorithm Implementation in Python*

Bambang Setiadi (National Research and Innovation Agency, Indonesia)

In Synthetic Aperture Radar (SAR) system development, signal processing plays an important role in producing a two-dimensional image from raw signals. Understanding the implementation of the SAR signal processing algorithm is essential for researchers and students; however, many references did not come with source code-level explanations, causing a gap between theory and implementation. This paper presents the implementation of the Omega-K algorithm (WKA) for SAR signal processing using Python. By using a freely accessible programming language, we hope to provide a low-cost, simple, and portable way to implement the SAR signal processing algorithm compared to using a commercial software package. We show the implementation details of two WKA variants at the source code level to process Radarsat data. The execution time for various image sizes is tested, and the image results are presented and compared with other reference implementations. The results indicate that Python programming language platforms have considerable potential for SAR signal processing tasks.

D1S3.6 14:50 *The Impact of Preprocessing by Contrast Enhancement on Spatial-temporal Attention Neural Network: An Evaluation in Remote Sensing Change Detection*

Shintami Chusnul Hidayati, Muhammad Izzuddin Al-Islami and Dini Navastara (Institut Teknologi Sepuluh Nopember, Indonesia)

Remote sensing offers considerable advantages in detecting and monitoring the physical features of an area. There are remarkable studies in the literature geared towards developing robust machine learning models to automate area change detection based on remote sensing images. However, to date there lacks a detailed investigation into the impact of image enhancement techniques on machine learning models for remote sensing change detection. Remote sensing data particularly lacks the sufficient quality to support area monitoring. This study, therefore, aims to examine how significantly image contrast enhancement, with a focus on histogram matching and median filter techniques, contribute to the remote sensing classification performance. We utilize spatial-temporal attention neural network as the deep neural network-based detector model and conduct experiments on two benchmark datasets. Precision, recall, and F1-score are reported to evaluate the classification performance of the detector model with and without contrast enhancement as the preprocessing step.

D1S3.7 15:05 *Utilizing a Spectroradiometer to Build a Spectral-Library of Rice Leaves*

Hartanto Sanjaya (BRIN, Indonesia); Bangun Muljo Sukojo and Lalu Muhamad Jaelani (Institut Teknologi Sepuluh Nopember, Indonesia); Agustan Agustan (Agency for the Assessment and Application of Technology (BPPT) & PTPSW-BPPT, Indonesia); Busyairi Latiful Ashar (Pest Forcasting Center, Indonesia); Lena Sumargana (National

Research and Innovation Agency (BRIN), Indonesia); Heri Sadmono (Badan Riset dan Inovasi Nasional, Indonesia); Dewi Nirwati and Ulfah Nuzulullia (Pest Forcasting Center, Indonesia)

Spectroradiometer is a tool to measure both the wavelength and amplitude of the light emitted from a light source. This light measurement identifies wavelengths based on where the light hits the detector array, allowing the entire spectrum to be captured in a single acquisition. How to identify and use a spectrometer correctly so that the acquired wavelength data can form a spectral library. There are many types of spectrometers, but it must be ensured that the reflected wavelengths recorded fall within a certain range. This determines which spectrophotometer should be used. In addition, we also need to know which object will be recorded if its reflectivity. With a known wavelength range, the type of spectrometer can be determined. It is also important to consider the measurement step associated with the existence of the observed object. If measurements have been obtained, the results can be used to construct a spectral library representing each agreed end member. The spectrum library is a very important reference in the processing of remote sensing data. In this study, a portable spectrometer was used with a wavelength range of 0.400 to 0.800 micrometers. Subjects recorded included leaves of rice plants in healthy plant conditions.

Thursday, December 22

Thursday, December 22 9:00 - 12:30 (Asia/Jakarta)

D2P1: Plenary Session

Invited Speaker

Room: Main room

Chairs: Agustan Agustan (Agency for the Assessment and Application of Technology (BPPT) & PTPSW-BPPT, Indonesia), Marina Frederik (National Research and Innovation Agency (BRIN) & Former Affiliation: Badan Pengkajian dan Penerapan Teknologi (BPPT), Indonesia)

The invited speakers for plenary session in Day 2 are:

1. Dr. Nani Hendiarti (Marine and Environmental Remote Sensing Expert, Deputy Coordinating Minister for Forestry and Environmental Management - CMMAI)
2. Dr. Soni Darmawan (Institut Teknologi Nasional)
3. Dr. Lalu M. Jaelani (Institut Teknologi Sepuluh Nopember)
4. Dr. Takeo Ito (Nagoya University)
5. Dr. M. Iqbal Habibie, (Expert in IT and Decision Support System)

Thursday, December 22 13:30 - 17:00 (Asia/Jakarta)

D2S1: Remote Sensing for Ocean and Meteorology

Break Out Room 1

Chairs: Reni Sulistyowati (National Research and Innovation Agency (BRIN) & Agency for the Assessment and Application of Technology (BPPT), Indonesia), Pavel Evdokimov (Sevastopol State University, Russia)

This session will discuss the application of remote sensing related to ocean, maritime and meteorology.

D2S1.1 13:30 ***Spatio-Temporal Analysis of SO2 Concentrations Due to Volcanic Eruptions in Indonesia Using Sentinel-5P with Earth Engine Platform*** PDF

Nur Aini Qolbi Fadhilah (Institut Teknologi Sepuluh Nopember, Indonesia); Nurya Ramadhania (Institut Teknologi Sepuluh Nopember & Select, Indonesia); Hartanto

Sanjaya (BRIN, Indonesia); Bangun Muljo Sukojo (Institut Teknologi Sepuluh Nopember, Indonesia); Meuthia Djoharin Poespo (BRIN, Indonesia)

Based on data from MAGMA PVMBG, the Geological Agency of the Ministry of Energy and Mineral Resources, in 2019, about 10 mountains have erupted and some have erupted more than twice. Therefore, a spatiotemporal analysis was carried out on SO2 concentrations due to volcanic eruptions in Indonesia in the 2019-2022 period through Sentinel-5P image data with the help of a cloud-based application, Earth Engine. Analysis was carried out at pre-eruption, during an eruption, and post-eruption to determine the difference. This analysis is performed over a weekly time frame. From the results obtained, the concentration of SO2 in the eruption area increased during the eruption and tended to be high compared to the concentration during pre and post-disaster. The distribution of sulfur dioxide is influenced by wind direction and speed, so the sulfur concentration is not always high near the area around the eruption. The value of SO2 concentration in the volcanic eruption area ranges from 0.00-0.007 mol/m2. Based on the correlation test with BMKG environmental data, the surface temperature parameter is known to be positively correlated with the SO2 value and has a negative correlation with humidity. The data that has been validated is then displayed on the website with a simple and easy-to-understand interface for users.

D2S1.2 13:50 *Large-Extent Mangrove Species Mapping Using Landsat 9 OLI-2: A Subpixel Analysis*

Melinda Meganagatha Rosbella Devy (Universitas Negeri Malang, Indonesia); Hartanto Sanjaya (BRIN, Indonesia); Listyo Yudha Irawan and I Komang Astina (Universitas Negeri Malang, Indonesia); Heri Sadmono (Badan Riset dan Inovasi Nasional, Indonesia); Ariani Andayani (Ministry of Marine Affairs and Fisheries, Indonesia)

Mangroves have the capabilities to both mitigate and adapt to climate change impact. However, it varies between species. Therefore, it is substantial to upscale mangrove explorations and studies to the species level. This study aims to perform a spectral-library-based linear spectral unmixing (LSU) analysis technique on Landsat 9 OLI-2 imagery as an alternative to the conventional mangrove species mapping methods. We used the center wavelength of Landsat 9 OLI-2's B2, B3, B4, and B5 bands to define the spectra of Sonneratia alba, Rhizophora apiculata, and Avicennia marina. We performed the LSU analysis on the Muaragembong mangrove forest area, Bekasi, West Java, Indonesia as the area of interest. The result showed that the mangrove species has a unique spectral signature. The reflectance is slightly higher at around 500-600 nm and lower at 750-770 nm than the typical vegetation spectral signature. Most of Muaragembong is covered with R. apiculata and A. marina. However, there is a distinctive spatial distribution pattern for each species. Based on the RMSE result, the model can produce a ±0.3% error in each pixel. Empirical evidence from the ground truthing helped to validate the distribution pattern. It is associated with environmental factors, such as supporting substrate and water access. This paper concludes that it is possible to perform the LSU analysis using multispectral satellite data for a large-extent mangrove species mapping. However, it is mandatory to validate the result on a ground-truthing process.

D2S1.3 14:10 *Influence of Suspended Hydrometeors on Determination of Dielectric Permittivity of Medium in a Cloudy Atmosphere*

Pavel Evdokimov, Elena I. Shirokova and Igor Borisovich Shirokov (Sevastopol State University, Russia)

The article considers the possibility of using a previously developed mathematical model for calculating the dielectric constant of a cloudy atmosphere medium. For the accounting the influence of suspended hydrometeors on the value of dielectric permittivity, an expression for the electrical susceptibility of the aerosol fraction was determined. The modeling of changes in the dielectric permittivity of the medium depending on meteorological parameters at different liquid water content of atmospheric formations is carried out.

D2S1.4 14:30 *Exploration of CHIRPS Satellite Data as Rainfall Estimation Data in Medan City and Deli Serdang Regency*

Octo Mario Pasaribu (Republic of Indonesia Defense University, Indonesia & Meteorology Climatology and Geophysical Agency of Indonesia, Indonesia); Aris Poniman (Indonesia Defense University, Indonesia); Andrian Andaya Lestari (Universitas Pertahanan RI & Labs247, Indonesia); Yosef Prihanto (National Research and Innovation Agency & Republic Indonesia Defense University, Indonesia); Asep Adang Supriyadi (Republic of Indonesia Defense University, Indonesia); Yahya Darmawan, MSc. (State College of Meteorology Climatology and Geophysics (STMKG), BMKG, Indonesia)

The availability of spatially and temporally consistent rainfall observation data is needed in various fields. Fields of research related to hydrometeorology are no exception. The limitations of rainfall measuring tools and stations encourage the use of alternative rainfall data derived from estimates based on satellite data. The condition of limited tools and stations to measure rainfall is also experienced in Medan City and Deli Serdang Regency. This study aims to test how far the Climate Hazards Group InfraRed Precipitation with Station (CHIRPS) satellite rainfall data can be used as standard rainfall data in Medan City and Deli Serdang Regency. In this study, monthly rainfall forecasts from CHIRPS satellite data are validated by rainfall observations from four station locations. Validation is carried out to determine the level of correlation and the magnitude of the error value from satellite data. The method used is descriptive statistics by calculating the correlation coefficient and error value. The validation results show that the CHIRPS satellite data has a fairly strong correlation greater than 0.6 with observation data from four locations. Therefore, CHIRPS satellite data can be used as an alternative to rainfall data in Medan City and Deli Serdang Regency, especially in areas with the same elevation and topographic conditions as the station location, with the best validation results.

D2S1.5 14:50 *Analysis of Weather Change Using Himawari-8 Satellite Image with 24-Hours Microphysics RGB and Convective Available Potential Energy Method*

Adifa Anafiatun Nisa, Bangun Muljo Sukojo and Nurwatik Nurwatik (Institut Teknologi Sepuluh Nopember, Indonesia)

Rain with light to heavy intensity hit Central Kalimantan Province starting on Thursday (19/8/2021), and submerged 13 sub-districts in Katingan Regency, Central Kalimantan. The study analyzed the weather during heavy rains using reanalyzed data from Copernicus ECMWF, namely CAPE and supported by data from the Himawari-8 satellite to analyze Streamline, Time series, 24-Hours Microphysics RGB starting on the 18th-24 August 2021. On 18 August 2021 Cumulonimbus clouds were detected, with cloud top temperature reaching -67°C whereas when the temperature was above -60°C, the highest CAPE value is 1001-1500J/kg. On August 19, 2021, Cumulonimbus clouds were detected, cloud top temperature reached -70 °C , the CAPE value was 1501-2100J/kg. On August 20, 2021, Cumulonimbus clouds were

detected, cloud top temperature reached -78 °C, the CAPE value was 2101-3545.6J/kg. On August 21, there were thin Cumulonimbus clouds that did not spread evenly, cloud top temperature reached -38°C, the CAPE value was 200-400J/kg. On August 22, 2021, Cumulonimbus clouds were detected, cloud top temperature reached -77 °C , the CAPE value was 701-1400J/kg. On August 23, there were no Cumulonimbus clouds, cloud top temperature reached -37 °C, and the CAPE value was 0-600J/kg. On August 24, 2021, Cumulonimbus clouds were detected in the Katingan Regency area, cloud top temperature reached -78 °C , the CAPE value was 2102-3474.5J/kg. Streamline analysis dated 18,19,20,22,24 in the 850mb, there is a Shearline. Meanwhile, on 21,23 August 2021, the wind looked straight and there were no very significant turns so on 21,23 August 2021 there was no formation or formation of very thin convective clouds.

D2S2: Remote Sensing for City Management & Related Topics

Break Out Room 2

Chairs: Lena Sumargana (BPPT, Indonesia), Ilvi Fauziyah Cahyaningtyas (National Research and Innovation Agency, Indonesia)

This session will discuss the application of Remote Sensing for City Management

D2S2.1 13:30 *Implementation of Cloud-Based Drone Navigation for Swarm Robot Coordination*

Jafar Shadiq Alatas and Karlisa Priandana (IPB University, Indonesia); Medria Hardhienata and Wulandari Wulandari (Bogor Agricultural University, Indonesia)

Smart agriculture 4.0 has recently been implemented in Indonesia to enhance agricultural productivity through the use of advance technology. Unmanned Autonomous Vehicle (UAVs) is one of the technologies that have been utilized in the agricultural sector to improve production quality and quantity. Although some advanced technology has been used, currently there are some challenges that remain to be solved to implement multi-UAV in the real environment. Some of these challenges include battery limitations in UAV and the long duration to queue at the charging station. To address this issue, a previous study has proposed Cloud Based Drone Navigation (CBDN) algorithm that can be employed to optimize multi-UAV coordination by selecting the best flight path for the UAV to reach a charging station. Such an approach has resulted in reducing the waiting time of UAVs to be charged. However, the algorithm has not considered swarm robot parameters. This study aims to analyze the use of CBDN algorithm with parameters derived from swarm robots. The performance of the CBDN algorithm will then be evaluated and compared to the Shortest Flight Time (SFT) and Individual Reservation Navigation System (IRN) algorithms as two benchmark algorithms, in terms of the total travel time. By considering real swarm robot parameters, the CBDN algorithm has resulted in an average total travel time of 17.44% less than the average total travel time of SFT and 17.25% less than the average total travel time of IRN.

D2S2.2 13:50 *Preliminary Study on the Rainfall-Runoff Inundation and Its Economic Lost at Bekasi River Basin, West Jawa*

Ilvi Fauziyah Cahyaningtyas (National Research and Innovation Agency, Indonesia); Meuthia Puspo (Agency for the Assessment and Application of Technology, Indonesia); Tiara Grace, Azalea Eugenie, Evie Avianti, Rizki Amaliyah and Elenora Gita Alamanda Sapan (National Research and Innovation Agency, Indonesia); Fanny Meliani (Agency for the Assessment and Application of Technology (BPPT), Indonesia); Reni Sulistyowati (National Research and Innovation Agency (BRIN) & Agency for the Assessment and Application of Technology (BPPT), Indonesia); Hari Priyadi (National Research and Innovation Agency, Indonesia); Sopia Lestari (BRIN OR BPPT, Indonesia); Doni Fernando (BRIN, Indonesia)

Flood disasters in Bekasi City almost occur every year, especially during high rainfall with a fairly long duration. Repeated flooding events due to extreme rainfall in Bekasi River Basin can be simulated using a distributed hydrological model. Rainfall-Runoff Inundation (RRI) model is a two-dimensional hydrological

model capable of simulating rainfall-runoff and flood inundation simultaneously. The input data used in this study is extreme rainfall data derived from GSMaP satellite rainfall data, topography, and land derived from satellite remote sensing data. In this paper, we analyze the flood simulation in the Kali Bekasi watershed when extreme rainfall occurred on July 14, 15 and 16, 2022. On that date we found flooding in several areas including the Bekasi River Basin. From the results of the flood simulation data processing, it is then calculated how much economic loss due to the flood disaster occurred.

D2S2.3 14:10 *Identification of Socio-economic Activities as Urban Growth based on Nighttime Light Data (Study on Kendal District - Indonesia)*

Muhammad Iqbal Habibie (National and Research Innovation Agency (BRIN), Indonesia); Nugroho Purwono (National Research and Innovation Agency, Indonesia)

Indonesia's urban growth is accelerating due to improvements in infrastructure, utilities, and transportation networks. The activity of individuals over a longer period of time might indicate urbanity activity. The higher the amount of urbanization, the longer the communal activities lasted, even until late at night. Nighttime community activities need the use of an electric light in a public place or settlement. The usage of light at night signified urban community activity. The intercalibration model is used in this research to correct and use the long time series of VIIRS/DNB data. This article estimates the pattern of urban growth based on nighttime light (NTL) illumination from 2014 to 2022. This research combined current geo-referenced population growth rate information, the proportion of poor people, land and building tax revenue for the rural sector, and it as our measurement to calculate the socio-economic activities and examine city coverage dispersion. Geographic Weighted Regression (GWR) was used to evaluate the role of socio-economic determinants of urban growth in Kendal. The results found that urban activities are related to population growth, the proportion of poor people, and land and building tax revenue. Identification of urban growth in Kendal District can be known by applying remote sensing satellite imagery, using the concept of nighttime lights on the brightness of the lights.

D2S2.4 14:30 *Evaluating population and infrastructure exposure to Mount Batur volcanic risk*

Riantini Virtriana (Institut of Technology Bandung, Indonesia)

The Mount Batur volcanic activity provides fertile soil and useful eruption products, but the concentration of the population can also increases the risk factors for being affected by the eruption. Mount Batur in Bangli Regency, Bali Province, attracts sand miners and tourists due to its attractiveness. Its fertility supports the local farming community. The high number of tourists and sand mining activities cause the level of risk in a volcanic eruption scenario to be higher. This research analyzes the social and infrastructures as element at risk to mitigate the impacts. We acquired high-resolution land cover data obtained from drone mapping. We analyzed social exposure through interviews and filling out questionnaires. We combined existing hazard zone and exposure analysis. The results of this research are an exposure map and the amount of possible risk of a zone to potential eruption materials. In the volcanic hazard zone of Mount Batur, it is estimated that there are 17,461 people distributed in 15,917 building polygons of the settlement area, or around 16.01% of the total Kintamani District population. For the public facilities identified in this study, there are 8 schools, 1 hospital, and 1 public health center in the volcanic hazard zone of Mount Batur. The types of vegetation that are mostly exposed to the volcanic hazard zone of Mount Batur are fields (±6442.14 hectares) and plantations (±5577.17 hectares).

D2S2.5 14:50 *Is the Mangrove Restoration and Rehabilitation Program Successful in Riau Province, Indonesia?*

Arief Darmawan (Center for Climate and Atmospheric Research, National Research and Innovation Agency's Indonesia, Indonesia); Nugraheni Setyaningrum (National Research and Innovation Agency (BRIN), Indonesia); Siti Arfah (National Research and Innovation Agency, Indonesia); Afifuddin Afifuddin (The National Research and Innovation Agency of Indonesia (BRIN), Indonesia); Muhammad Iqbal Habibie (National and Research Innovation Agency (BRIN), Indonesia)

Mangroves not only function as carbon sinks but also as food sources, wildlife habitats, and coastal protection. However, behind the enormous benefits, the information and data are still relatively minimal. In the context of the mangrove restoration and rehabilitation program in Indonesia, it is necessary to study the progress that has been achieved so far. One of the indicators assessed is the estimation of mangrove density in an area over a certain period. This study will calculate the density of mangroves in Riau Province, which is 1 of 9 priority provinces using Sentinel 2 satellite data for 2016 and 2021. Estimation of mangrove density is carried out using vegetation indices approach, namely Modified Soil-Adjusted Vegetation Index-2 (MSAVI2), Soil-Adjusted Vegetation Index 2 (SAVI2), and Green Normalized Difference Vegetation Index-2 (GNDVI2). This vegetation index is an empirical mathematical model algorithm of the reflection of electromagnetic, visible, and near-infrared (NIR) waves. From the results of this study, the mangrove restoration and rehabilitation program in Riau Province is going as expected and it can be seen from the change in the density level. The algorithm shows that the change in mangrove density in 2021 is about 20% for the very dense type compared to 2016.

D2S3: Internet of Things and Related Topics

Break Out Room 3

Chairs: Muhammad Iqbal Habibie (National and Research Innovation Agency (BRIN), Indonesia), Babu Chinta (Guindy & Anna University, India)

This session will discuss the internet of things related to geoscience applications.

D2S3.1 13:30 *A survey of skin cancer detection and classification from skin lesion images using deep learning*

Joseph George, Anne Kotteswara Roa and Majjari Sudhakar (Kalasalingam Academy of Research and Education, India)

Skin cancer is one among them and its detection relies on the skin biopsy outputs and the expertise of the doctors but it consumes more time and some inaccurate results. At the early stage, skin cancer detection is a challenging task and it easily spread to the whole body and leads to an increase in the mortality rate. Skin cancer is curable when it is detected at an early stage. In order to classify correct and accurate skin cancer, the critical task is skin cancer identification and classification and it is more based on the cancer disease features such as shape, size, color, symmetry and etc. More similar characteristics are present in many skin diseases hence it makes it a challenging issue to select important features from a skin cancer dataset images. Hence, the skin cancer diagnostic accuracy is improved by requiring an automated skin cancer detection and classification framework thereby the human expert's scarcity is handled. Recently, the deep learning techniques like Convolutional neural network, Deep belief neural network, Artificial neural network, Recurrent neural network and Long and short term memory are widely used for the identification and classification of skin cancers. This survey reviews different DL techniques for skin cancer identification and classification. The performance metrics such as precision, recall, accuracy, sensitivity, specificity, and F-measures are used to evaluate the effectiveness of SC identification using DL techniques. By using these DL techniques, the classification accuracy increases along with the mitigation of computational complexities and time consumption.

D2S3.2 13:50 *Human Visual System Algorithm for Medical Images Recovery*

Ali Abdul Kadhim Ruhaima (Al-Nisour University College, Iraq); Dunya Mohee Hayder (Madent El Elm University College, Iraq); Jamal Kamil Kh. Abbas (Al-Nisour University College, Iraq)

The human body is such a complicated structure full of fine details, small and big details, some diseases affect the small parts of the body, so a doctor has to use every tool to diagnose the disease like Lab testing and imaging (Imaging means sending the patient to do X-Ray, MRI, CT scan, etc.). So, receiving a clear image with no noise is important to reach a precise diagnosis rather than a different one. Thus, finding a program to find the lost data due to noise is the dream of every physician. A nonlinear two-dimensional image restoration filter structure is introduced in this work. A nonlinear prediction structure is proposed using nonlinear elements depending on the eye's visual phenomena of noise detection. Filter stability is demanded in this structure. Impulse noise recovery is guaranteed in this filter. An advantage of the filter is in reserving textures and keeping fine details. Median-based filters are proposed for noise

recovery. The filter structure shows a superior method for noise detection and precise location determination.

D2S3.3 14:10 *Development of Crescent Slotted Patch Antenna at 3.7 GHz for 5G Wireless Communication System*

Mohd Azlishah Othman (Universiti Teknikal Malaysia Melaka (UTeM) & Microwave Research Group (MRG), Centre for Telecommunication Research and Innovation (CeTRI), Malaysia); Shadia Suhaimi (Multimedia University, Malaysia)

In this paper, an analysis of Cresent Slotted antennas at 3.7 GHz for the proposed 5G communications system. The concept of 3D antenna manufacturing has been used in this project as it can save the cost of antenna production and antenna manufacturing process. The elliptical slotted circular shape is a joint antenna between 2 circular slots where an elliptical shape joins the circular and cuts the circle at the top end of the circle to form a crescent moon and fractal. The proposed antenna is designed to be elliptical slotted circular with a frequency range at 3.7 GHz. The shape of the elliptical antenna is widely used in cell phone towers due to some of their advantages such as lowering the frequency cutoff, increase bandwidth, and nominal gain between 12 and 17 dBi and 3db beam width between 20 degrees and 43 degrees. Proposed antennas for analysis with simulations located at frequencies of 3.7 GHz to prove design reliability. The performance of the designed antenna will be analyzed in terms of gain loss VSWR and radiation pattern at 3.7 GHz frequency.

D2S3.4 14:30 *Optimizing Deep Learning Neural Networks: Brain to Computer Interface EEG-Based Imagined Word Prediction*

Babu Chinta (Guindy & Anna University, India)

This idea starts with vowel recognition and then designs a vowel GUI. EEG devices sample at 128Hz. Five One Versus Rest (OVR) classifiers are created in the next step. QSVM had 91.1% accuracy over 10 trials and 10 patients. The suggested method collects 128Hz data from an EEG device. The enhanced sampling rate will reduce the number of samples per recording, reducing the amount of computing work and time to train and test classifiers. QSVM is the most accurate classifier of the five, with 91.1% accuracy across 10 trials and 10 subjects. PCA can improve classifier quality. This upgrade boosts performance by 20%, which is significant. Doctors monitor brain activity with the EEG device. To meet this requirement, the deep learning CNN model is used. Alexie and training a BCI with EEG-based imagined word prediction, since they can distinguish up, down, right, left, and up to ten words from visual inputs. Morlet Continuous wavelet transform preprocessing restores seven features for enhanced performance indicators (mean, standard deviation, skewness, kurtosis, band power, root mean square, and Shannon entropy). Alex Net outperformed Google Net in transfer learning. It had a higher accuracy (91.3%), recall (92.4%), precision (91.0%), and F1 score (91.7%) for the seven features. Reducing the number of recoverable attributes from seven to four decreased performance ratings from 85.4% to 84.8%, then 84.9% to 83.6%.