

DAFTAR PUSTAKA

- Al-Maliki, S., Ibrahim, T. I. M., Jakab, G., Masoudi, M., Makki, J. S., & Vekerdy, Z. (2022). An Approach for Monitoring and Classifying Marshlands Using Multispectral Remote Sensing Imagery in Arid and Semi-Arid Regions. *Water (Switzerland)*, 14(10).
<https://doi.org/10.3390/w14101523>
- Allan, T. . (1983). *Satellite Microwave Remote Sensing*. Ellis Horwood.
- Amani, M., Mohseni, F., Layegh, N. F., Nazari, M. E., Fatolazadeh, F., Salehi, A., Ahmadi, S. A., Ebrahimi, H., Ghorbanian, A., Jin, S., Mahdavi, S., & Moghimi, A. (2022). Remote Sensing Systems for Ocean: A Review (Part 2: Active Systems). *IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing*, 15, 1421–1453.
<https://doi.org/10.1109/JSTARS.2022.3141980>
- Anrozi, R., Siagian, A., Restisha, V. A., & Maretta, A. (2019). Biodiversity Study on Segara Anakan Lagoon. *IOP Conference Series: Earth and Environmental Science*, 298(1).
<https://doi.org/10.1088/1755-1315/298/1/012001>
- Ariyantoni, J., & Rokhmana, C. A. (2020). Evaluasi Polarisasi Citra Sar (Syththetic Aperture Radar) Untuk Klasifikasi Obyek Tutupan Lahan. *Elipsoida : Jurnal Geodesi Dan Geomatika*, 3(01), 22–29. <https://doi.org/10.14710/elipsoida.2020.7761>
- Badan Standarisasi Nasional. (2014). *SNI 7645-1 Klasifikasi Penutup Lahan Skala Kecil dan Menengah*. www.bsn.go.id
- Bakker, W. H., Gieske, A. S. M., Gorte, B. G. H., Grabmaier, K. A., Hecker, C. A., Horn, J. A., Huurneman, G. C., Janssen, L. L. F., Kerle, N., Meer, Freek D. van der Parodi, G. N., Pohl, C., Prakash, A., Reeves, C. V., Van, R. F. J., Klaus, T., Weir, M. J. C., & Woldai, T. (2004). *Principles of Remote Sensing*. ITC Educational.
- Bandi, S. R., Anbarasan, M., & Sheela, D. (2022). Fusion of Sar and Optical Images Using Pixel-Based Cnn. *Neural Network World*, 32(4), 197–213.
<https://doi.org/10.14311/NNW.2022.32.012>
- Belgiu, M., & Stein, A. (2019). Spatiotemporal image fusion in remote sensing. *Remote Sensing*, 11(7). <https://doi.org/10.3390/rs11070818>
- Bhatt, D., Patel, C., Talsania, H., Patel, J., Vaghela, R., Pandya, S., Modi, K., & Ghayvat, H. (2021). CNN variants for computer vision: History, architecture, application, challenges and future scope. *Electronics (Switzerland)*, 10(20), 1–28.
<https://doi.org/10.3390/electronics10202470>
- Chang, N. Bin, Bai, K., Imen, S., Chen, C. F., & Gao, W. (2018). Multisensor Satellite Image Fusion and Networking for All-Weather Environmental Monitoring. *IEEE Systems Journal*, 12(2), 1341–1357. <https://doi.org/10.1109/JSYST.2016.2565900>
- Chauhan, S., & Srivastava, H. S. (2016). Comparative Evaluation of the Sensitivity of Multi-Polarised Sar and Optical Data for Various Land Cover Classes. *International Journal of Advancement in Remote Sensing, GIS and Geography (IJARSGG)*, 4(1), 1–14.

- Danoedoro, P. (2012). *Pengantar Penginderaan Jauh Digital*. Penerbit Andi.
- Danoedoro, P. (2016). *Pengaruh Jumlah Dan Metode Pengambilan Titik Sampel Penguji*. May.
- DeLancey, E. R., Simms, J. F., Mahdianpari, M., Brisco, B., Mahoney, C., & Kariyeva, J. (2020). Comparing deep learning and shallow learning for large-scale wetland classification in Alberta, Canada. *Remote Sensing*, *12*(1). <https://doi.org/10.3390/RS12010002>
- Djohan, T. S. (2015). Colonization of Mangrove Forest At Abandoned Shrimp-Pond of Segara Anakan-Cilacap. *Jurnal Teknosains*, *4*(1). <https://doi.org/10.22146/teknosains.6050>
- Dorado-Rojas, S. A., Xu, S., Vanfretti, L., Ayachi, M. I. I., & Ahmed, S. (2022). ML-Based Edge Application for Detection of Forced Oscillations in Power Grids. *IEEE Power and Energy Society General Meeting, 2022-July*(July). <https://doi.org/10.1109/PESGM48719.2022.9917070>
- Eddy, S., & Basyuni, M. (2020). Short communication: The phenomenon of nipah (*nypa fruticans*) invasion in the air telang protected forest, Banyuasin district, south Sumatra, Indonesia. *Biodiversitas*, *21*(11), 5114–5118. <https://doi.org/10.13057/biodiv/d211116>
- ESA. (2013). *Sentinel-1 User Handbook* (Vol. 26, Issue 4). European Space Agency.
- European Space Agency. (2015). *Sentinel-2 User Handbook*.
- Farda, N. M. (2016). *Image Mining in Remote Sensing for Coastal Wetlands Monitoring: an Information-driven Framework Perspective*. 228. http://lib.ugm.ac.id/ind/?page_id=248
- Farda, N. M. (2017). Multi-temporal Land Use Mapping of Coastal Wetlands Area using Machine Learning in Google Earth Engine. *IOP Conference Series: Earth and Environmental Science*, *98*(1). <https://doi.org/10.1088/1755-1315/98/1/012042>
- Fei, J., Zhang, X., Li, C., Hao, F., Guo, Y., & Fu, Y. (2025). A deep data fusion-based reconstruction of water index time series for intermittent rivers and ephemeral streams monitoring. *ISPRS Journal of Photogrammetry and Remote Sensing*, *220*(November 2024), 339–353. <https://doi.org/10.1016/j.isprsjprs.2024.12.015>
- Finlayson, M., Cruz, R. D., Davidson, N., Alder, J., Cork, S., Groot, R. S. de, Lévêque, C., Milton, G. R., Peterson, G., Pritchard, D., Ratner, B. D., Reid, W. V., Revenga, C., Rivera, M., Schutysse, F., Siebentritt, M., Stuij, M., Tharme, R., & Butchard, S. (2005). Ecosystems and human well-being: wetlands and water synthesis. Millennium ecosystem assessment report to the Ramsar Convention. In *Millennium Ecosystem Assessment World Resources Institute, Washington, DC*.
- Ghassemian, H. (2016). A review of remote sensing image fusion methods. *Information Fusion*, *32*, 75–89. <https://doi.org/10.1016/j.inffus.2016.03.003>
- Ghermandi, A., Van Den Bergh, J. C. J. M., Brander, L. M., De Groot, H. L. F., & Nunes, P. A. L. D. (2010). Values of natural and human-made wetlands: A meta-analysis. *Water Resources Research*, *46*(12), 1–12. <https://doi.org/10.1029/2010WR009071>
- Habibie, M. I., Ramadhan, Nurda, N., Sencaki, D. B., Putra, P. K., Prayogi, H., Agustan,

- Sutrisno, D., & Bintoro, O. B. (2024). The development land utilization and cover of the Jambi district are examined and forecasted using Google Earth Engine and CNN1D. *Remote Sensing Applications: Society and Environment*, 34(December 2023), 101175. <https://doi.org/10.1016/j.rsase.2024.101175>
- Haghighat, M. B. A., Aghagolzadeh, A., & Seyedarabi, H. (2011). Multi-focus image fusion for visual sensor networks in DCT domain. *Computers and Electrical Engineering*, 37(5), 789–797. <https://doi.org/10.1016/j.compeleceng.2011.04.016>
- Henderson, F. M., & Lewis, A. J. (2008). Radar detection of wetland ecosystems: A review. *International Journal of Remote Sensing*, 29(20), 5809–5835. <https://doi.org/10.1080/01431160801958405>
- Heryadi, Y., & Irwansyah, E. (2020). *Deep Learning: Aplikasinya di Bidang Geospasial*. AWI Technology Press.
- Hidayat, H., Hoekman, D. H., Vissers, M. A. M., & Hoitink, A. J. F. (2012). Flood occurrence mapping of the middle Mahakam lowland area using satellite radar. *Hydrology and Earth System Sciences*, 16(7), 1805–1816. <https://doi.org/10.5194/hess-16-1805-2012>
- Holtermann, P., Burchard, H., & Jennerjahn, T. (2009). Hydrodynamics of the Segara Anakan lagoon. *Regional Environmental Change*, 9(4), 245–258. <https://doi.org/10.1007/s10113-008-0075-3>
- Hsieh, T. H., & Kiang, J. F. (2020). Comparison of CNN algorithms on hyperspectral image classification in agricultural lands. *Sensors (Switzerland)*, 20(6). <https://doi.org/10.3390/s20061734>
- Isaac Obilor, E., & Chikweru Amadi, E. (2018). Test for Significance of Pearson's Correlation Coefficient (r). *International Journal of Innovative Mathematics, Statistics & Energy Policies*, 6(1), 11–23. www.seahipaj.org
- Jafarzadeh, H., Mahdianpari, M., & Gill, E. W. (2022). Wet-GC: A Novel Multimodel Graph Convolutional Approach for Wetland Classification Using Sentinel-1 and 2 Imagery With Limited Training Samples. *IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing*, 15, 5303–5316. <https://doi.org/10.1109/JSTARS.2022.3177579>
- Jamali, A., Mahdianpari, M., Mohammadimanesh, F., & Homayouni, S. (2022). A deep learning framework based on generative adversarial networks and vision transformer for complex wetland classification using limited training samples. *International Journal of Applied Earth Observation and Geoinformation*, 115(July), 103095. <https://doi.org/10.1016/j.jag.2022.103095>
- Jia, L., Zhou, Z., & Li, B. (2012). Study of SAR image texture feature extraction based on GLCM in Guizhou karst mountainous region. *2012 2nd International Conference on Remote Sensing, Environment and Transportation Engineering, RSETE 2012 - Proceedings, 1*, 3–6. <https://doi.org/10.1109/RSETE.2012.6260741>
- Joshi, P. K., Rashid, H., & Roy, P. S. (2002). Landscape dynamics in hokersar wetland, Jammu & Kashmir- an application of geospatial approach. *Journal of the Indian Society of Remote*

- Khan, A., Sohail, A., Zahoora, U., & Qureshi, A. S. (2020). A survey of the recent architectures of deep convolutional neural networks. In *Artificial Intelligence Review* (Vol. 53, Issue 8). Springer Netherlands. <https://doi.org/10.1007/s10462-020-09825-6>
- Komite Nasional Pengelolaan Ekosistem Lahan Basah. (2004). Strategi Nasional dan Rencana Aksi Pengelolaan Lahan Basah Indonesia. In *Kementerian Lingkungan Hidup*. [http://wetlands.or.id/PDF/buku/Buku NSAP 2004.pdf](http://wetlands.or.id/PDF/buku/Buku_NSAP_2004.pdf)
- Kusumowidagdo, M., Sanjoto, T. B., Banowati, E., & Setyowati, D. L. (2007). *Penginderaan Jauh dan Interpretasi Citra*. Pusat Data Penginderaan Jauh LAPAN.
- Laura, Bourgeois-Chavez, Riordan, K., Powell, R. B., Miller, N., & Nowels, M. (2016). Improving Wetland Characterization with Multi-Sensor, Multi-Temporal SAR and Optical/Infrared Data Fusion. *Advances in Geoscience and Remote Sensing*, 11, 13. <https://www.intechopen.com/books/advanced-biometric-technologies/liveness-detection-in-biometrics>
- Lee, J. Sen, Wen, J. H., Ainsworth, T. L., Chen, K. S., & Chen, A. J. (2009). Improved sigma filter for speckle filtering of SAR imagery. *IEEE Transactions on Geoscience and Remote Sensing*, 47(1), 202–213. <https://doi.org/10.1109/TGRS.2008.2002881>
- Leprieur, C., Kerr, Y. H., Mastorchio, S., & Meunier, J. C. (2000). Monitoring vegetation cover across semi-arid regions: Comparison of remote observations from various scales. *International Journal of Remote Sensing*, 21(2), 281–300. <https://doi.org/10.1080/014311600210830>
- Lillesand, T. M., & Kiefer, R. W. (1979). *Remote Sensing and Image Interpretation*. John Wiley & Sons.
- Liu, J., Li, P., Tu, C., Wang, H., Zhou, Z., Feng, Z., Shen, F., & Li, Z. (2022). Spatiotemporal Change Detection of Coastal Wetlands Using Multi-Band SAR Coherence and Synergetic Classification. *Remote Sensing*, 14(11). <https://doi.org/10.3390/rs14112610>
- Liu, Y., Qian, J., & Yue, H. (2021). Comprehensive Evaluation of Sentinel-2 Red Edge and Shortwave-Infrared Bands to Estimate Soil Moisture. *IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing*, 14, 7448–7465. <https://doi.org/10.1109/JSTARS.2021.3098513>
- Marzuki, Arjasakusuma, S., Khakhim, N., Wicaksono, P., Farda, N. M., & Utami, N. L. E. (2025). Spectral-Spatial Deep Learning model for seaweed cultivation mapping using PlanetScope imagery in Pangkajene and Islands Regency. *Maritime Technology and Research*, 7(2). <https://doi.org/10.33175/mtr.2025.273926>
- Mather, P., & Tso, B. (2016). Classification methods for remotely sensed data, second edition. In *Classification Methods for Remotely Sensed Data, Second Edition*.
- McCoy, R. M. (2005). *Field Methods in Remote Sensing*. Guilford Publications. https://books.google.co.id/books?hl=en&lr=&id=jxalSbaxb6QC&oi=fnd&pg=PA1&dq=Field+Methods+in+Remote+Sensing&ots=mOzfJhJ_S4&sig=S53rzzUpC9WyeBfSfHzZ3wEy

- Meyer, F. (2019). Spaceborne Synthetic Aperture Radar: Principles, Data Access, and Basic Processing Techniques. *Astronautics for Peace and Human Progress*, 21–64. <https://doi.org/10.1016/b978-0-08-024732-8.50026-x>
- Mitsch, W. J., & Gosselink, J. G. (1986). *Wetlands*. Van Nostrand Reinhold.
- Nogueira, K., Penatti, O. A. B., & dos Santos, J. A. (2017a). Towards better exploiting convolutional neural networks for remote sensing scene classification. In *Pattern Recognition* (Vol. 61, pp. 539–556). <https://doi.org/10.1016/j.patcog.2016.07.001>
- Nogueira, K., Penatti, O. A. B., & dos Santos, J. A. (2017b). Towards better exploiting convolutional neural networks for remote sensing scene classification. *Pattern Recognition*, 61, 539–556. <https://doi.org/10.1016/j.patcog.2016.07.001>
- Nwobi, C., Williams, M., & Mitchard, E. T. (2020). Rapid Mangrove forest loss and Nipa Palm (*Nypa fruticans*) expansion in the Niger Delta, 2007-2017. *Remote Sensing*, 12(14), 2007–2017. <https://doi.org/10.3390/rs12142344>
- Okpiliya, Effiong, Eni, I., & Eja. (2013). Mangrove Forest Ecosystem Utilization And Depletion: Implication For Occupational Changes In Calabar South, Nigeria. *European Journal of Sustainable Development*, 2(1), 149–162. <https://doi.org/10.14207/ejsd.2013.v2n1p149>
- Pembury Smith, M. Q. R., & Ruxton, G. D. (2020). Effective use of the McNemar test. *Behavioral Ecology and Sociobiology*, 74(11). <https://doi.org/10.1007/s00265-020-02916-y>
- Pratama, B. A. S., Danoedoro, P., & Arjasakusuma, S. (2024). Exploring optimal integration schemes for Sentinel-1 SAR and Sentinel-2 multispectral data in land cover mapping across different atmospheric conditions. *Remote Sensing Applications: Society and Environment*, 34(February), 101185. <https://doi.org/10.1016/j.rsase.2024.101185>
- Prayudha, B., Ulumuddin, Y. I., Siregar, V., Suyarso, Agus, S. B., Prasetyo, L. B., Suyadi, Avianto, P., & Ramadhani, M. R. (2024). Enhanced mangrove index: A spectral index for discrimination understorey, nypa, and mangrove trees. *MethodsX*, 12(February), 102778. <https://doi.org/10.1016/j.mex.2024.102778>
- Puspita, L., Ratnawati, E., Suryadipura, I. N. N., & Meutia, A. A. (2005). *Lahan Basah Buatan di Indonesia*. Wetland International. www.wetlands.or.id
- Rajah, P., Odindi, J., & Mutanga, O. (2018). Feature level image fusion of optical imagery and Synthetic Aperture Radar (SAR) for invasive alien plant species detection and mapping. *Remote Sensing Applications: Society and Environment*, 10(April), 198–208. <https://doi.org/10.1016/j.rsase.2018.04.007>
- Ramsar Convention Secretariat. (2010). Designating Ramsar Sites: Strategic Framework and guidelines for the future development of the List of Wetlands of International Importance. *Ramsar Handbooks for the Wise Use of Wetlands*, 17, 616. <http://www.ramsar.org/pdf/lib/hbk4-17.pdf>
- Reiche, J., Verbesselt, J., Hoekman, D., & Herold, M. (2015). Fusing Landsat and SAR time

- series to detect deforestation in the tropics. In *Remote Sensing of Environment* (Vol. 156, pp. 276–293). <https://doi.org/10.1016/j.rse.2014.10.001>
- Rezaee, M., Mahdianpari, M., Zhang, Y., & Salehi, B. (2018). Deep Convolutional Neural Network for Complex Wetland Classification Using Optical Remote Sensing Imagery. *IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing*, 11(9), 3030–3039. <https://doi.org/10.1109/JSTARS.2018.2846178>
- Ronneberger, O., Fischer, P., & Brox, T. (2015). U-Net: Convolutional Networks for Biomedical Image Segmentation. *Medical Image Computing and Computer-Assisted Intervention*, 9351(Cvd), 12–20. <https://doi.org/10.1007/978-3-319-24574-4>
- Salas, E. A. L., & Kumaran, S. S. (2023). Hyperspectral Bare Soil Index (HBSI): Mapping Soil Using an Ensemble of Spectral Indices in Machine Learning Environment. *Land*, 12(7). <https://doi.org/10.3390/land12071375>
- Sarode, K., Savdekar, R., & Chaudhari, T. (2022). *Texture Feature Analysis of an Image Using Gray Level Co-Occurrence Matrix*. 7(2), 139. www.ijnrd.org
- Semeniuk, C. ., & Semeniuk, V. (1995). *A Geomorphic Approach to Global Classification for Inland Wetlands*. 118(1), 103–124.
- Shao, Z., & Cai, J. (2018). Remote Sensing Image Fusion with Deep Convolutional Neural Network. *IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing*, 11(5), 1656–1669. <https://doi.org/10.1109/JSTARS.2018.2805923>
- Singh, S., Singh, H., Bueno, G., Deniz, O., Singh, S., Monga, H., Hrisheeksha, P. N., & Pedraza, A. (2023). A review of image fusion: Methods, applications and performance metrics. *Digital Signal Processing: A Review Journal*, 137, 104020. <https://doi.org/10.1016/j.dsp.2023.104020>
- Soendjoto, M. A., & Dharmono. (2015). Potensi, Peluang dan Tantangan Pengelolaan Lingkungan Lahan Basah Secara Berkelanjutan. *Prosiding Seminar Universitas Lambung Mangkurat 2015, September 2016*. <https://www.researchgate.net/publication/317212119>
- Sorabatake. (2020). *Structural Classifications Using SAR Polarimetry (Polarimetric Decomposition)*. <https://sorabatake.jp/en/15097/>
- Sowmya, A., & Trinder, J. (2000). Modelling and representation issues in automated feature extraction from aerial and satellite images. *ISPRS Journal of Photogrammetry and Remote Sensing*, 55(1), 34–47. [https://doi.org/10.1016/S0924-2716\(99\)00040-4](https://doi.org/10.1016/S0924-2716(99)00040-4)
- Sutanto. (2016). *Metode Penelitian Penginderaan Jauh*. Penerbit Ombak.
- Syakti, A. D., Ahmed, M. M., Hidayati, N. V., Hilmi, E., Sulystyo, I., Piram, A., & Doumenq, P. (2013). Screening of Emerging Pollutants in the Mangrove of Segara Anakan Nature Reserve, Indonesia. *IERI Procedia*, 5, 216–222. <https://doi.org/10.1016/j.ieri.2013.11.095>
- Tiner, R. W., Lang, M. W., & Klemas, V. V. (2015). Remote Sensing of Wetlands Application and Advances. In *Remote Sensing of Wetlands: Applications and Advances*. CRC Press. <https://doi.org/10.1201/b18210>

- Van Zuidam, R. A., Farifteh, J., Eleveld, M. A., & Tao, C. (1998). Developments in remote sensing, dynamic modelling and GIS applications for integrated coastal zone management. *Journal of Coastal Conservation*, 4(2), 191–202. <https://doi.org/10.1007/BF02806511>
- Wald, L. (1999). Some terms of reference in data fusion. *IEEE Transactions on Geoscience and Remote Sensing*, 37(3 I), 1190–1193. <https://doi.org/10.1109/36.763269>
- Wald, L. (2000). A conceptual approach to the fusion of earth observation data. *Surveys in Geophysics*, 21(2–3), 177–186. <https://doi.org/10.1023/A:1006760101519>
- Wetlands International Indonesia. (2022). *Lahan Basah untuk Manusia dan Alam*.
- Yang, Y., Zhang, Y., Cheng, Y., Lei, Z., Gao, X., Huang, Y., & Ma, Y. (2023). Using one-dimensional convolutional neural networks and data augmentation to predict thermal production in geothermal fields. *Journal of Cleaner Production*, 387(August 2022), 135879. <https://doi.org/10.1016/j.jclepro.2023.135879>
- Yuan, Y., Meng, X., Sun, W., Yang, G., Wang, L., Peng, J., & Wang, Y. (2022). Multi-Resolution Collaborative Fusion of SAR, Multispectral and Hyperspectral Images for Coastal Wetlands Mapping. *Remote Sensing*, 14(14), 1–27. <https://doi.org/10.3390/rs14143492>
- Zeng, Y., Zhang, Y. X., & Van Genderen, J. L. (2006). Comparison and Analysis of Remote Sensing Data Fusion Techniques. *Proceedings of the ISPRS Commission VII Symposium 'Remote Sensing: From Pixels to Processes*, 36, 5. <http://www.isprs.org/proceedings/XXXVI/part7/PDF/014.pdf>
- Zhang, R., Tang, X., You, S., Duan, K., Xiang, H., & Luo, H. (2020). A novel feature-level fusion framework using optical and SAR remote sensing images for land use/land cover (LULC) classification in cloudy mountainous area. *Applied Sciences (Switzerland)*, 10(8), 1–24. <https://doi.org/10.3390/APP10082928>
- Zhao, X., Hong, D., Gao, L., Zhang, B., & Chanussot, J. (2021). Transferable deep learning from time series of landsat data for national land-cover mapping with noisy labels: A case study of China. *Remote Sensing*, 13(21). <https://doi.org/10.3390/rs13214194>
- Zhaoha, Q., Bai, J., Huang, L., Gub, B., Lua, Q., & Gao, Z. (2016). A review of methodologies and success indicators for coastal wetland. *Ecological Indicators*, 60, 442–452.
- Zhu, L., Suomalainen, J., Liu, J., Hyypä, J., Kaartinen, H., & Haggren, H. (2018). A Review: Remote Sensing Sensors. *Multi-Purposeful Application of Geospatial Data*, 109–127. <https://doi.org/http://dx.doi.org/10.5772/intechopen.71049>
- Zoran, L. F. (2009). Quality evaluation of multiresolution remote sensing images fusion. *UPB Scientific Bulletin, Series C: Electrical Engineering*, 71(3), 37–52.
- Zulkarnain, M., & Marsisno, W. (2022). Penerapan Pembelajaran Mesin Untuk Estimasi Luas Lahan Bawang Merah Berdasarkan Data Citra Satelit Resolusi Menengah. *Seminar Nasional Official Statistics*, 2022(1), 1005–1016. <https://doi.org/10.34123/semnasoffstat.v2022i1.1307>