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DAFTAR PUSTAKA

Abderrahim, N.Y.Q., Abderrahim, S. and Rida, A., 2020. Road Segmentation using U-Net architecture. In: *2020 IEEE International conference of Moroccan Geomatics (Morgeo)*. [online] 2020 IEEE International conference of Moroccan Geomatics (Morgeo). pp.1–4. https://doi.org/10.1109/Morgeo49228.2020.9121887.

Abdollahi, A., Pradhan, B., Sharma, G., Maulud, K.N.A. and Alamri, A., 2021. Improving Road Semantic Segmentation Using Generative Adversarial Network. *IEEE Access*, [online] 9, pp.64381–64392. https://doi.org/10.1109/ACCESS.2021.3075951.

Alomar, K., Aysel, H.I. and Cai, X., 2023. Data Augmentation in Classification and Segmentation: A Survey and New Strategies. *Journal of Imaging*, [online] 9(2), p.46. https://doi.org/10.3390/jimaging9020046.

Bernal, J., Sánchez, F.J., Fernández-Esparrach, G., Gil, D., Rodríguez, C. and Vilariño, F., 2015. WM-DOVA maps for accurate polyp highlighting in colonoscopy: Validation vs. saliency maps from physicians. *Computerized Medical Imaging and Graphics*, [online] 43, pp.99–111. https://doi.org/10.1016/j.compmedimag.2015.02.007.

Boesch, G., 2024. Precision vs. Recall - Full Guide to Understanding Model Output. [online] viso.ai. Available at: <https://viso.ai/computer-vision/precision-recall/> [Accessed 24 May 2024].

Charles, R.Q., Su, H., Kaichun, M. and Guibas, L.J., 2017. PointNet: Deep Learning on Point Sets for 3D Classification and Segmentation. [online] 2017 IEEE Conference on Computer Vision and Pattern Recognition (CVPR). IEEE Computer Society. pp.77–85. https://doi.org/10.1109/CVPR.2017.16.

Chen, L.-C., Zhu, Y., Papandreou, G., Schroff, F. and Adam, H., 2018. Encoder-Decoder with Atrous Separable Convolution for Semantic Image Segmentation. [online] Proceedings of the European Conference on Computer Vision (ECCV). pp.801–818. Available at: <https://openaccess.thecvf.com/content_ECCV_2018/html/Liang-Chieh_Chen_Encoder-Decoder_with_Atrous_ECCV_2018_paper.html> [Accessed 2 December 2023].

Çiçek, Ö., Abdulkadir, A., Lienkamp, S.S., Brox, T. and Ronneberger, O., 2016. 3D U-Net: Learning Dense Volumetric Segmentation from Sparse Annotation. In: S. Ourselin, L. Joskowicz, M.R. Sabuncu, G. Unal and W. Wells, eds. *Medical Image Computing and Computer-Assisted Intervention – MICCAI 2016*, Lecture Notes in Computer Science.

UNIVERSITAS GADJAH MADA
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Universitas Gadjah Mada, 2024 | Diunduh dari http://etd.repository.ugm.ac.id/

Cham: Springer International Publishing. pp.424–432. https://doi.org/10.1007/978-3-319-46723-8_49.

Demir, I., Koperski, K., Lindenbaum, D., Pang, G., Huang, J., Basu, S., Hughes, F., Tuia, D. and Raskar, R., 2018. DeepGlobe 2018: A Challenge to Parse the Earth through Satellite Images. [online] 2018 IEEE/CVF Conference on Computer Vision and Pattern Recognition Workshops (CVPRW). IEEE Computer Society. pp.172–17209. https://doi.org/10.1109/CVPRW.2018.00031.

Dong, J., Wang, N., Fang, H., Hu, Q., Zhang, C., Ma, B., Ma, D. and Hu, H., 2022. Innovative method for pavement multiple damages segmentation and measurement by the Road-Seg-CapsNet of feature fusion. *Construction and Building Materials*, [online] 324, p.126719. https://doi.org/10.1016/j.conbuildmat.2022.126719.

Elgendi, M., Nasir, M.U., Tang, Q., Smith, D., Grenier, J.-P., Batte, C., Spieler, B., Leslie, W.D., Menon, C., Fletcher, R.R., Howard, N., Ward, R., Parker, W. and Nicolaou, S., 2021. The Effectiveness of Image Augmentation in Deep Learning Networks for Detecting COVID-19: A Geometric Transformation Perspective. *Frontiers in Medicine*, [online] 8. Available at: <https://www.frontiersin.org/articles/10.3389/fmed.2021.629134> [Accessed 2 December 2023].

Gupta, K. and Singh, H., 2012. Edge Enhancement and Its Applications. *IOSR journal of VLSI and Signal Processing*, [online] 1(2), pp.30–34. https://doi.org/10.9790/4200-0123034.

Hu, J., Shen, L. and Sun, G., 2018. Squeeze-and-Excitation Networks. In: 2018 IEEE/CVF Conference on Computer Vision and Pattern Recognition. [online] 2018 IEEE/CVF Conference on Computer Vision and Pattern Recognition. pp.7132–7141. https://doi.org/10.1109/CVPR.2018.00745.

Huang, A., Shen, R., Li, Y., Han, H., Di, W. and Hagan, D.F., 2022. A Methodology to Generate Integrated Land Cover Data for Land Surface Model by Improving Dempster-Shafer Theory. *Remote Sensing*, 14(4). https://doi.org/10.3390/rs14040972.

Hussain, A., Bhalla, P. and Palria, S., 2014. Remote Sensing Based Analysis of the Role of Land Use/Land Cover on Surface Temperature and Temporal Changes in Temperature; a Case Study of Ajmer District, Rajasthan. *The International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences*, [online] XL–8, pp.1447–1454. https://doi.org/10.5194/isprsarchives-XL-8-1447-2014.

UNIVERSITAS GADJAH MADA
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Universitas Gadjah Mada, 2024 | Diunduh dari http://etd.repository.ugm.ac.id/

Jha, D., Riegler, M.A., Johansen, D., Halvorsen, P. and Johansen, H.D., 2020. DoubleU-Net: A Deep Convolutional Neural Network for Medical Image Segmentation. [online] 2020 IEEE 33rd International Symposium on Computer-Based Medical Systems (CBMS). IEEE Computer Society. pp.558–564. https://doi.org/10.1109/CBMS49503.2020.00111.

Jha, D., Smedsrud, P.H., Riegler, M.A., Johansen, D., Lange, T.D., Halvorsen, P. and D. Johansen, H., 2019. ResUNet++: An Advanced Architecture for Medical Image Segmentation. In: *2019 IEEE International Symposium on Multimedia (ISM)*. [online] 2019 IEEE International Symposium on Multimedia (ISM). pp.225–2255. https://doi.org/10.1109/ISM46123.2019.00049.

Krizhevsky, A., Sutskever, I. and Hinton, G.E., 2012. ImageNet Classification with Deep Convolutional Neural Networks. In: *Advances in Neural Information Processing Systems*. [online] Curran Associates, Inc. Available at: <https://proceedings.neurips.cc/paper_files/paper/2012/hash/c399862d3b9d6b76c8436e924a68c45b-Abstract.html> [Accessed 16 May 2024].

Kushagre, K., Verma, S., Singh, D. and Mishra, G., 2022. Detection of Cancer using Contrast Stretching. In: *2022 3rd International Conference on Intelligent Engineering and Management (ICIEM)*. [online] 2022 3rd International Conference on Intelligent Engineering and Management (ICIEM). pp.362–366. https://doi.org/10.1109/ICIEM54221.2022.9853194.

Li, Y., Guo, L., Rao, J., Xu, L. and Jin, S., 2019. Road Segmentation Based on Hybrid Convolutional Network for High-Resolution Visible Remote Sensing Image. *IEEE Geoscience and Remote Sensing Letters*, [online] 16(4), pp.613–617. https://doi.org/10.1109/LGRS.2018.2878771.

Lira, J. and Rodríguez, A., 2014. Edge enhancement in multispectral satellite images by means of vector operators. *Geofísica Internacional*, [online] 53(3), pp.289–308. https://doi.org/10.1016/S0016-7169(14)71506-5.

Ma, A., Wang, J., Zhong, Y. and Zheng, Z., 2022. FactSeg: Foreground Activation-Driven Small Object Semantic Segmentation in Large-Scale Remote Sensing Imagery. *IEEE Transactions on Geoscience and Remote Sensing*, [online] 60, pp.1–16. https://doi.org/10.1109/TGRS.2021.3097148.

Mahasree, M., Puviarasan, N. and Aruna, P., 2022. 17 - Interpolation-based reversible data

UNIVERSITAS GADJAH MADA
Segmentasi Semantik Jalan Berbasis Citra Satelit Menggunakan Model Deep Learning Double U-Net dengan Pra-Pemrosesan Citra Rotating Augmentation, Contrast Stretching, dan Edge Enhancement
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Universitas Gadjah Mada, 2024 | Diunduh dari http://etd.repository.ugm.ac.id/

hiding with blockchain for secure e-healthcare systems. In: S. Tanwar, ed. *Blockchain Applications for Healthcare Informatics*. [online] Academic Press. pp.373–400. https://doi.org/10.1016/B978-0-323-90615-9.00005-0.

Mei, J., Li, R.-J., Gao, W. and Cheng, M.-M., 2021. CoANet: Connectivity Attention Network for Road Extraction From Satellite Imagery. *IEEE Transactions on Image Processing*, [online] 30, pp.8540–8552. https://doi.org/10.1109/TIP.2021.3117076.

Müller, D., Soto-Rey, I. and Kramer, F., 2022. Towards a guideline for evaluation metrics in medical image segmentation. *BMC Research Notes*, [online] 15(1), p.210. https://doi.org/10.1186/s13104-022-06096-y.

Nagelli, P. and Reddy, C.L., 2014. Blurred Image Enhancement Using Contrast Stretching, Local Edge Detection and Blind Deconvolution. International Journal of Information and Computation Technology. ISSN 0974-2239 Volume 4, Number 3 (2014), pp. 247-252. https://www.ripublication.com/irph/ijict_spl/ijictv4n3spl_05.pdf.

Nanni, L., Lumini, A., Loreggia, A., Formaggio, A. and Cuza, D., 2022. An Empirical Study on Ensemble of Segmentation Approaches. *Signals*, [online] 3(2), pp.341–358. https://doi.org/10.3390/signals3020022.

Oktay, O., Schlemper, J., Folgoc, L.L., Lee, M., Heinrich, M., Misawa, K., Mori, K., McDonagh, S., Hammerla, N.Y., Kainz, B., Glocker, B. and Rueckert, D., 2022. Attention U-Net: Learning Where to Look for the Pancreas. 1st Medical Imaging with Deep Learning Conference. https://openreview.net/pdf?id=Skft7cijM

Ozturk, O., Isik, M.S., Kada, M. and Seker, D.Z., 2023. Improving Road Segmentation by Combining Satellite Images and LiDAR Data with a Feature-Wise Fusion Strategy. *Applied Sciences*, [online] 13(10), p.6161. https://doi.org/10.3390/app13106161.

Panse, V. and Gupta, R., 2021. Medical Image Enhancement with Brightness Preserving Based on Local Contrast Stretching and Global Dynamic Histogram Equalization. In: *2021 10th IEEE International Conference on Communication Systems and Network Technologies (CSNT)*. [online] 2021 10th IEEE International Conference on Communication Systems and Network Technologies (CSNT). pp.164–170. https://doi.org/10.1109/CSNT51715.2021.9509670.

Rahman, M.A. and Wang, Y., 2016. Optimizing Intersection-Over-Union in Deep Neural Networks for Image Segmentation. In: G. Bebis, R. Boyle, B. Parvin, D. Koracin, F.

UNIVERSITAS GADJAH MADA
Segmentasi Semantik Jalan Berbasis Citra Satelit Menggunakan Model Deep Learning Double U-Net dengan Pra-Pemrosesan Citra Rotating Augmentation, Contrast Stretching, dan Edge Enhancement
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Universitas Gadjah Mada, 2024 | Diunduh dari http://etd.repository.ugm.ac.id/

Porikli, S. Skaff, A. Entezari, J. Min, D. Iwai, A. Sadagic, C. Scheidegger and T. Isenberg, eds. *Advances in Visual Computing*, Lecture Notes in Computer Science. Cham: Springer International Publishing. pp.234–244. https://doi.org/10.1007/978-3-319-50835-1_22.

Ronneberger, O., Fischer, P. and Brox, T., 2015. U-Net: Convolutional Networks for Biomedical Image Segmentation. In: N. Navab, J. Hornegger, W.M. Wells and A.F. Frangi, eds. *Medical Image Computing and Computer-Assisted Intervention – MICCAI 2015*, Lecture Notes in Computer Science. Cham: Springer International Publishing. pp.234–241. https://doi.org/10.1007/978-3-319-24574-4_28.

Rosebrock, A., 2016. Intersection over Union (IoU) for object detection. *PyImageSearch*. Available at: <https://pyimagesearch.com/2016/11/07/intersection-over-union-iou-for-object-detection/ > [Accessed 2 December 2023].

Shorten, C. and Khoshgoftaar, T.M., 2019a. A survey on Image Data Augmentation for Deep Learning. *Journal of Big Data*, [online] 6(1), p.60. https://doi.org/10.1186/s40537-019-0197-0.

Supiyanto, S. and Suparwati, T., 2021. PERBAIKAN CITRA MENGGUNAKAN METODE CONTRAST STRETCHING. *Jurnal Siger Matematika*, [online] 2(1), pp.13–18. https://doi.org/10.23960/jsm.v2i1.2743.

Szegedy, C., Vanhoucke, V., Ioffe, S., Shlens, J. and Wojna, Z., 2016. Rethinking the Inception Architecture for Computer Vision. In: *2016 IEEE Conference on Computer Vision and Pattern Recognition (CVPR)*. [online] 2016 IEEE Conference on Computer Vision and Pattern Recognition (CVPR). Las Vegas, NV, USA: IEEE. pp.2818–2826. https://doi.org/10.1109/CVPR.2016.308.

Talebi, H. and Milanfar, P., 2021. Learning to Resize Images for Computer Vision Tasks. In: *2021 IEEE/CVF International Conference on Computer Vision (ICCV)*. [online] 2021 IEEE/CVF International Conference on Computer Vision (ICCV). Montreal, QC, Canada: IEEE. pp.487–496. https://doi.org/10.1109/ICCV48922.2021.00055.

Tao, J., Chen, Z., Sun, Z., Guo, H., Leng, B., Yu, Z., Wang, Y., He, Z., Lei, X. and Yang, J., 2023. Seg-Road: A Segmentation Network for Road Extraction Based on Transformer and CNN with Connectivity Structures. *Remote Sensing*, [online] 15(6), p.1602.

UNIVERSITAS GADJAH MADA
Segmentasi Semantik Jalan Berbasis Citra Satelit Menggunakan Model Deep Learning Double U-Net dengan Pra-Pemrosesan Citra Rotating Augmentation, Contrast Stretching, dan Edge Enhancement
Raden Bagus Muhammad AdryanPutra Adhy Wijaya, Wahyono, S.Kom, Ph.D.
Universitas Gadjah Mada, 2024 | Diunduh dari http://etd.repository.ugm.ac.id/

https://doi.org/10.3390/rs15061602.

Tong, X.-Y., Xia, G.-S., Lu, Q., Shen, H., Li, S., You, S. and Zhang, L., 2020. Land-cover classification with high-resolution remote sensing images using transferable deep models. *Remote Sensing of Environment*, [online] 237, p.111322. https://doi.org/10.1016/j.rse.2019.111322.

Tumanyan, V. 2024. Semantic segmentation: Complete guide [Updated 2024] | SuperAnnotate. [online] Available at: <https://www.superannotate.com/blog/guide-to-semantic-segmentation> [Accessed 16 May 2024].

Van Beers, F., 2021. Capsule Networks with Intersection over Union Loss for Binary Image Segmentation: In: *Proceedings of the 10th International Conference on Pattern Recognition Applications and Methods*. [online] 10th International Conference on Pattern Recognition Applications and Methods. Online Streaming, --- Select a Country ---: SCITEPRESS - Science and Technology Publications. pp.71–78. https://doi.org/10.5220/0010301300710078.

Wang, Z., Berman, M., Rannen-Triki, A., Torr, P.H.S., Tuia, D., Tuytelaars, T., Gool, L.V., Yu, J. and Blaschko, M.B., 2023. Revisiting Evaluation Metrics for Semantic Segmentation: Optimization and Evaluation of Fine-grained Intersection over Union. NeurIPS 2023 Datasets and Benchmarks Poster. https://proceedings.neurips.cc/paper_files/paper/2023/file/bd3611971089d466ab4ca96a20f7ab13-Paper-Datasets_and_Benchmarks.pdf

Westi dan Ig. Indardi. 2019. modul teori semester 1 2019 kartografi.pdf. Available at: <https://prodi1.stpn.ac.id/wp-content/uploads/2016/12/modul%20teori%20semester%201%202019%20kartografi.pdf> [Accessed 2 December 2023].

Wu, M., Zhang, C., Liu, J., Zhou, L. and Li, X., 2019. Towards Accurate High Resolution Satellite Image Semantic Segmentation. *IEEE Access*, [online] 7, pp.55609–55619. https://doi.org/10.1109/ACCESS.2019.2913442.

Yalcin, I., Karakas, G., Kocaman, S., Saunier, S. and Albinet, C., 2022. INVESTIGATIONS ON THE EFFECT OF HD PROCESSING IN LAND COVER CLASSIFICATION. *The International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences*, [online] XLIII-B1-2022, pp.293–300.

UNIVERSITAS
GADJAH MADA
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Universitas Gadjah Mada, 2024 | Diunduh dari http://etd.repository.ugm.ac.id/

https://doi.org/10.5194/isprs-archives-XLIII-B1-2022-293-2022.

Yang, X., Li, X., Ye, Y., Zhang, X., Zhang, H., Huang, X. and Zhang, B., 2019. Road Detection via Deep Residual Dense U-Net. In: *2019 International Joint Conference on Neural Networks (IJCNN)*. [online] 2019 International Joint Conference on Neural Networks (IJCNN). pp.1–7. https://doi.org/10.1109/IJCNN.2019.8851728.

Zhang, Z., Miao, C., Liu, C. and Tian, Q., 2022. DCS-TransUperNet: Road Segmentation Network Based on CSwin Transformer with Dual Resolution. *Applied Sciences*, [online] 12(7), p.3511. https://doi.org/10.3390/app12073511.

Zhou, Z., Rahman Siddiquee, M.M., Tajbakhsh, N. and Liang, J., 2018. UNet++: A Nested U-Net Architecture for Medical Image Segmentation. In: D. Stoyanov, Z. Taylor, G. Carneiro, T. Syeda-Mahmood, A. Martel, L. Maier-Hein, J.M.R.S. Tavares, A. Bradley, J.P. Papa, V. Belagiannis, J.C. Nascimento, Z. Lu, S. Conjeti, M. Moradi, H. Greenspan and A. Madabhushi, eds. *Deep Learning in Medical Image Analysis and Multimodal Learning for Clinical Decision Support*, Lecture Notes in Computer Science. Cham: Springer International Publishing. pp.3–11. https://doi.org/10.1007/978-3-030-00889-5_1.

Zou, K.H., Warfield, S.K., Bharatha, A., Tempany, C.M.C., Kaus, M.R., Haker, S.J., Wells, W.M., Jolesz, F.A. and Kikinis, R., 2004. Statistical Validation of Image Segmentation Quality Based on a Spatial Overlap Index. *Academic radiology*, [online] 11(2), pp.178–189. https://doi.org/10.1016/S1076-6332(03)00671-8.