

DAFTAR PUSTAKA

- [1] N. Rajagopalan, N. Venkateswaran, A. N. Josephraj, and E. Srithaladevi, "Diagnosis of retinal disorders from optical coherence tomography images using CNN," *PLoS ONE*, vol. 16, no. 7 July, pp. 1–17, 2021. [Online]. Available: <http://dx.doi.org/10.1371/journal.pone.0254180>
- [2] S. A. Badawi, M. Takruri, I. ElBadawi, I. A. Chaudhry, N. U. Mahar, A. K. Nileshwar, and E. Mosalam, "Enhancing Vessel Segment Extraction in Retinal Fundus Images Using Retinal Image Analysis and Six Sigma Process Capability Index," *Mathematics*, vol. 11, no. 14, pp. 1–32, 2023.
- [3] T. Intaramanee, S. Rasmeequan, K. Chinnasarn, B. Jantarakongkul, and A. Rodtook, "Optic disc detection via blood vessels origin using Morphological end point," *4th IGNITE Conference and 2016 International Conference on Advanced Informatics: Concepts, Theory and Application, ICAICTA 2016*, pp. 1–6, 2016.
- [4] R. Klein and B. E. Klein, "The prevalence of age-related eye diseases and visual impairment in aging: Current estimates," *Investigative Ophthalmology and Visual Science*, vol. 54, no. 14, pp. 15–18, 2013.
- [5] T. Y. Wong and T. E. Tan, "The Diabetic Retinopathy "Pandemic" and Evolving Global Strategies: The 2023 Friedenwald Lecture," *Investigative Ophthalmology and Visual Science*, vol. 64, no. 15, 2023.
- [6] T. E. Tan and T. Y. Wong, "Diabetic retinopathy: Looking forward to 2030," *Frontiers in Endocrinology*, vol. 13, no. January, pp. 1–8, 2023.
- [7] Z. L. Teo, Y.-C. Tham, M. Yu, M. L. Chee, T. H. Rim, N. Cheung, M. M. Bikbov, Y. X. Wang, Y. Tang, Y. Lu, I. Y. Wong, D. S. W. Ting, G. S. W. Tan, J. B. Jonas, C. Sabanayagam, T. Y. Wong, and C.-Y. Cheng, "Global Prevalence of Diabetic Retinopathy and Projection of Burden through 2045," *Ophthalmology*, vol. 128, no. 11, pp. 1580–1591, nov 2021. [Online]. Available: <https://linkinghub.elsevier.com/retrieve/pii/S0161642021003213>
- [8] M. Wahidin, A. Achadi, B. Besral, S. Kosen, M. Nadjib, A. Nurwahyuni, S. Ronoatmodjo, E. Rahajeng, M. Pane, and D. Kusuma, "Projection of diabetes morbidity and mortality till 2045 in Indonesia based on risk factors and NCD prevention and control programs," *Scientific Reports*, vol. 14, no. 1, pp. 1–18, 2024. [Online]. Available: <https://doi.org/10.1038/s41598-024-54563-2>
- [9] P. Gupta, R. E. Kidd Man, E. K. Fenwick, A. Aravindhan, A. T. Gan, S. Thakur, B. L. Pauline Soh, J. M. Wood, A. A. Black, A. Chan, D. Ng, T. K. Hean, E. Goh, C. F. F. Mary, J. Loo, C. G. Forde, C. Sabanayagam, C. Y. Cheng, T. Y. Wong, and E. L. Lamoureux, "Rationale and methodology of the population health and eye disease profile in elderly singaporeans study [PIONEER]," *Ageing and Disease*, vol. 11, no. 6, pp. 1444–1458, 2020.
- [10] V. R. P. Borges, D. J. D. Santos, B. Popovic, and D. F. Cordeiro, "Segmentation of blood vessels in retinal images based on nonlinear filtering," *Proceedings - IEEE Symposium on Computer-Based Medical Systems*, vol. 2015-July, no. c, pp. 95–96, 2015.

- [11] M. Miri, Z. Amini, H. Rabbani, and R. Kafieh, "A Comprehensive Study of Retinal Vessel Classification Methods in Fundus Images," *Journal of Medical Signals and Sensors*, vol. 7, no. 2, pp. 59–70, 2017.
- [12] Y. Sun and L. E. Smith, "Retinal vasculature in development and diseases," *Annual Review of Vision Science*, vol. 4, pp. 101–122, 2018.
- [13] M. D. Abramoff, M. K. Garvin, and M. Sonka, "Retinal Imaging and Image Analysis," *IEEE Reviews in Biomedical Engineering*, vol. 3, pp. 169–208, 2010. [Online]. Available: <http://ieeexplore.ieee.org/document/5660089/>
- [14] A. M. Mendonça and A. Campilho, "Segmentation of retinal blood vessels by combining the detection of centerlines and morphological reconstruction," *IEEE Transactions on Medical Imaging*, vol. 25, no. 9, pp. 1200–1213, 2006.
- [15] K.-W. Huang, Y.-R. Yang, Z.-H. Huang, Y.-Y. Liu, and S.-H. Lee, "Retinal Vascular Image Segmentation Using Improved UNet Based on Residual Module," *Bioengineering*, vol. 10, no. 6, p. 722, jun 2023. [Online]. Available: <https://www.mdpi.com/2306-5354/10/6/722>
- [16] H. Abdushkour, T. A. Soomro, A. Ali, F. A. Jandan, H. Jelinek, F. Memon, F. Althobiani, S. M. Ghonaim, and M. Irfan, "Enhancing fine retinal vessel segmentation: Morphological reconstruction and double thresholds filtering strategy," *PLoS ONE*, vol. 18, no. 7 July, 2023. [Online]. Available: <http://dx.doi.org/10.1371/journal.pone.0288792>
- [17] S. W. Mohod, M. Kalpana Devidas, and C. W. Author-Dr Sudhir Mohod, "K-Means Clustering And Two-Level Classification For Vessel Segmentation In Detection Of Diabetic Retinopathy," *Webology*, vol. 19, no. 5, pp. 826–840, 2022. [Online]. Available: <https://www.webology.org/abstract.php?id=4775>
- [18] W. Wiharto and E. Suryani, "The segmentation analysis of retinal image based on k-means algorithm for computer-aided diagnosis of hypertensive retinopathy," *Indonesian Journal of Electrical Engineering and Informatics*, vol. 8, no. 2, pp. 419–426, 2020.
- [19] T. Mapayi, S. Viriri, and J. R. Tapamo, "Comparative study of retinal vessel segmentation based on global thresholding techniques," *Computational and Mathematical Methods in Medicine*, vol. 2015, 2015.
- [20] K. BahadarKhan, A. A. Khaliq, and M. Shahid, "A morphological hessian based approach for retinal blood vessels segmentation and denoising using region based otsu thresholding," *PLoS ONE*, vol. 11, no. 7, pp. 1–19, 2016.
- [21] S. Moccia, E. De Momi, S. El Hadji, and L. S. Mattos, "Blood vessel segmentation algorithms — Review of methods, datasets and evaluation metrics," *Computer Methods and Programs in Biomedicine*, vol. 158, pp. 71–91, 2018.
- [22] D. Sutaji, C. Faticah, and D. A. Navastara, "Segmentasi pembuluh darah retina pada citra fundus menggunakan gradient based adaptive thresholding dan region growing," *Register: Jurnal Ilmiah Teknologi Sistem Informasi*, vol. 2, no. 2, pp. 105–116, 2016.

- [23] Z. Qaiser, W. Ahmad, M. Y. Umair, and Z. Mahmood, “Unsupervised Vessel Segmentation Method in Retinal Images,” *Proceedings - 2022 International Conference on Frontiers of Information Technology, FIT 2022*, pp. 65–70, 2022.
- [24] W. Wiharto and E. Suryani, “The segmentation analysis of retinal image based on k-means algorithm for computer-aided diagnosis of hypertensive retinopathy,” *Indonesian Journal of Electrical Engineering and Informatics*, vol. 8, no. 2, pp. 419–426, 2020.
- [25] L. Farosanti and C. Fatichah, “Perbaikan Segmentasi Pembuluh Darah Tipis Pada Citra Retina Menggunakan Fuzzy Entropy,” *JUTI: Jurnal Ilmiah Teknologi Informatika*, vol. 17, no. 2, p. 135, 2019.
- [26] R. Liu, W. Pu, H. Nan, and Y. Zou, “Retina image segmentation using the three-path Unet model,” *Scientific Reports*, vol. 13, no. 1, pp. 1–13, 2023. [Online]. Available: <https://doi.org/10.1038/s41598-023-50141-0>
- [27] T. Li, M. Comer, and J. Zerubia, “An Unsupervised Retinal Vessel Extraction and Segmentation Method Based on a Tube Marked Point Process Model,” *ICASSP, IEEE International Conference on Acoustics, Speech and Signal Processing - Proceedings*, vol. 2020-May, pp. 1394–1398, 2020.
- [28] H. Zhou, X. Wang, and G. Schaefer, “Mean shift and its application in image segmentation,” *Studies in Computational Intelligence*, vol. 339, pp. 291–312, 2011.
- [29] G. Hassan, N. El-Bendary, A. E. Hassanien, A. Fahmy, S. Abullahm, and V. Snasel, “Retinal Blood Vessel Segmentation Approach Based on Mathematical Morphology,” *Procedia Computer Science*, vol. 65, no. Iccmit, pp. 612–622, 2015. [Online]. Available: <http://dx.doi.org/10.1016/j.procs.2015.09.005>
- [30] M. P. Gupta, A. A. Herzlich, T. Sauer, and C. C. Chan, “Retinal anatomy and pathology,” *Developments in Ophthalmology*, vol. 55, no. November, pp. 7–17, 2015.
- [31] H. A. Nugroho, R. A. Aras, T. Lestari, and I. Ardiyanto, “Retinal vessel segmentation based on frangi filter and morphological reconstruction,” in *2017 International Conference on Control, Electronics, Renewable Energy and Communications (ICCREC)*, 2017, pp. 181–184.
- [32] zionfuo, “Drive 2004,” 2020. [Online]. Available: <https://www.kaggle.com/datasets/zionfuo/drive2004>
- [33] J. P. Campbell, M. Zhang, T. S. Hwang, S. T. Bailey, D. J. Wilson, Y. Jia, and D. Huang, “Detailed Vascular Anatomy of the Human Retina by Projection-Resolved Optical Coherence Tomography Angiography,” *Scientific Reports*, vol. 7, no. September 2016, pp. 1–11, 2017.
- [34] T. Y. Wong, R. Klein, B. E. Klein, S. M. Meuer, and L. D. Hubbard, “Retinal Vessel Diameters and Their Associations with Age and Blood Pressure,” *Investigative Ophthalmology and Visual Science*, vol. 44, no. 11, pp. 4644–4650, 2003.
- [35] T. A. Ciulla, A. G. Amador, and B. Zinman, “Diabetic Retinopathy and Diabetic Macular Edema,” *Diabetes Care*, vol. 26, no. 9, pp. 2653–2664,

- [36] S. K. Kumar S and S. K., “A Systematic Review of Fundus Image Analysis for Diagnosing Diabetic Retinopathy,” *International Journal of Intelligent Systems and Applications in Engineering*, vol. 2024, no. 16s, pp. 167–181, 2024. [Online]. Available: <https://ijisae.org/index.php/IJISAE/article/view/4803>
- [37] Q. Qin and Y. Chen, “A review of retinal vessel segmentation for fundus image analysis,” *Engineering Applications of Artificial Intelligence*, vol. 128, no. November 2023, 2024.
- [38] G. Satya Nugraha, B. Amelia Riyandari, and E. Sutoyo, “RGB Channel Analysis for Glaucoma Detection in Retinal Fundus Image,” *2020 International Conference on Advancement in Data Science, E-Learning and Information Systems, ICADEIS 2020*, pp. 8–12, 2020.
- [39] Y. Feng, G. Ren, K. He, Y. Liu, and L. Li, “RGB color channel variation based segmentation of crop leaf lesion,” *Proceedings of the 2015 10th IEEE Conference on Industrial Electronics and Applications, ICIEA 2015*, pp. 592–596, 2015.
- [40] P. Kaler, “Study of Grayscale image in Image processing,” *International Journal on Recent and Innovation Trends in Computing and Communication*, vol. VOL 4, no. 11, pp. 309–310, 2022.
- [41] V. M. Mohan, R. Kanaka Durga, S. Devathi, and K. Srujan Raju, “Image processing representation using binary image; grayscale, color image, and histogram,” *Advances in Intelligent Systems and Computing*, vol. 381, no. September 2016, pp. 353–361, 2016.
- [42] A. W. Setiawan, T. R. Mengko, O. S. Santoso, and A. B. Suksmono, “Color retinal image enhancement using clahe,” in *International Conference on ICT for Smart Society*, 2013, pp. 1–3.
- [43] H. Wen, W. Qi, and L. Shuang, “Medical x-ray image enhancement based on wavelet domain homomorphic filtering and clahe,” in *2016 International Conference on Robots & Intelligent System (ICRIS)*, 2016, pp. 249–254.
- [44] B. K. Umri, M. Wafa Akhyari, and K. Kusriani, “Detection of covid-19 in chest x-ray image using clahe and convolutional neural network,” in *2020 2nd International Conference on Cybernetics and Intelligent System (ICORIS)*, 2020, pp. 1–5.
- [45] Z. Yuan, J. Zeng, Z. Wei, L. Jin, S. Zhao, X. Liu, Y. Zhang, and G. Zhou, “Clahe-based low-light image enhancement for robust object detection in overhead power transmission system,” *IEEE Transactions on Power Delivery*, vol. 38, no. 3, pp. 2240–2243, 2023.
- [46] K. Honda, K. Wei, M. Arai, and H. Amano, “Clahe implementation on a low-end fpga board by high-level synthesis,” in *2020 Eighth International Symposium on Computing and Networking Workshops (CANDARW)*, 2020, pp. 282–285.

- [47] A. Wanto, Y. Yuhandri, and O. Okfalisa, "Optimization accuracy of cnn model by utilizing clahe parameters in image classification problems," in *2023 International Conference on Networking, Electrical Engineering, Computer Science, and Technology (IConNECT)*, 2023, pp. 253–258.
- [48] K. Koonsanit, S. Thongvigitmanee, N. Pongnapang, and P. Thajchayapong, "Image enhancement on digital x-ray images using n-clahe," in *2017 10th Biomedical Engineering International Conference (BMEiCON)*, 2017, pp. 1–4.
- [49] H. Weichao, Y. Zhi, J. Shangbin, and L. Ding, "Research on color image defogging algorithm based on msr and clahe," in *2020 Chinese Automation Congress (CAC)*, 2020, pp. 7301–7306.
- [50] B. Rakshit, R. Das, and N. Chattaraj, "Detection-accuracy enhancement of covid-19 from multi-class lung diseases by instrumenting clahe integrated deep learning technique," in *2022 IEEE 2nd International Symposium on Sustainable Energy, Signal Processing and Cyber Security (iSSSC)*, 2022, pp. 1–6.
- [51] D. Chowdhury, S. K. Das, S. Nandy, A. Chakraborty, R. Goswami, and A. Chakraborty, "An atomic technique for removal of gaussian noise from a noisy gray scale image using lowpass-convoluted gaussian filter," in *2019 International Conference on Opto-Electronics and Applied Optics (Optronix)*, 2019, pp. 1–6.
- [52] F. Xiong, J. Zhang, Z. Zhang, and Y. Ling, "An efficient gaussian filter based on gaussian symmetric markov random field," *IEEE Access*, vol. 10, pp. 74 590–74 604, 2022.
- [53] A. A. Kumar, N. Lal, and R. N. Kumar, "A comparative study of various filtering techniques," in *2021 5th International Conference on Trends in Electronics and Informatics (ICOEI)*, 2021, pp. 26–31.
- [54] N. Jundang, S. Ongkittikul, K. Chutisowan, and J. Suwatcharakulthorn, "Development of gaussian filter for preserving edge by edge template," in *2019 16th International Conference on Electrical Engineering/Electronics, Computer, Telecommunications and Information Technology (ECTI-CON)*, 2019, pp. 637–640.
- [55] N. R. Soora, S. Vodithala, and J. S. H. Badam, "Filtering techniques to remove noises from an image," in *2022 International Conference on Advances in Computing, Communication and Applied Informatics (ACCAI)*, 2022, pp. 1–9.
- [56] S. K. Kopparapu and M. Satish, "Identifying optimal gaussian filter for gaussian noise removal," in *2011 Third National Conference on Computer Vision, Pattern Recognition, Image Processing and Graphics*, 2011, pp. 126–129.
- [57] A. Juliana and A. Triayudi, "Implementasi Morphological Filtering Untuk Penajaman Citra Cctv," *ProTekInfo(Pengembangan Riset dan Observasi Teknik Informatika)*, vol. 1, no. September 2014, pp. 71–75, 2017.
- [58] S. Shamaon Lazar, "Image Noise Suppression Using Color Morphological Filter," *Journal of Education and Science*, vol. 23, no. 4, pp. 120–129, 2010.

- [59] I. G. N. A. D. Saputra, I. G. A. M. Sunaya, I. B. Sugirianta, and I. G. N. B. C. Bawa, "Combination of top-hat and bottom-hat transforms for frequency estimation," in *2018 International Conference on Applied Science and Technology (iCAST)*, 2018, pp. 687–692.
- [60] J. C. Mello Román, J. Luis Vázquez Noguera, H. Legal-Ayala, L. Moré, and D. P. Pinto-Roa, "Image enhancement with preservation of brightness and details using multiscale top-hat transform," in *2019 XXII Symposium on Image, Signal Processing and Artificial Vision (STSIVA)*, 2019, pp. 1–5.
- [61] J. C. Mello-Román, J. L. V. Noguera, H. Legal-Ayala, D. P. Pinto-Roa, M. M. Monteiro, and J. C. A. L. Colmán, "Microscopy mineral image enhancement using multiscale top-hat transform," in *2021 XLVII Latin American Computing Conference (CLEI)*, 2021, pp. 1–6.
- [62] F. Sun and Y. Zhang, "Image segmentation algorithm based on top-hat transformation," in *2018 33rd Youth Academic Annual Conference of Chinese Association of Automation (YAC)*, 2018, pp. 156–161.
- [63] N. Aishwarya, M. Muthulakshmi, and B. S. Abirami, "Contrast enhanced multimodal image fusion using top hat transform and sparse dictionary," in *2022 6th International Conference on Trends in Electronics and Informatics (ICOEI)*, 2022, pp. 01–07.
- [64] C. P. Ranjith, K. Natarajan, S. Madhuri, M. T. Ramakrishna, C. R. Bhat, and V. K. Venkatesan, "Image Processing Using Feature-Based Segmentation Techniques for the Analysis of Medical Images," *Engineering Proceedings*, vol. 59, no. 1, 2023.
- [65] R. Sarma and Y. K. Gupta, "A comparative study of new and existing segmentation techniques," *IOP Conference Series: Materials Science and Engineering*, vol. 1022, no. 1, 2021.
- [66] J. A. Nichols, H. W. Herbert Chan, and M. A. Baker, "Machine learning: applications of artificial intelligence to imaging and diagnosis," *Biophysical Reviews*, vol. 11, no. 1, pp. 111–118, 2019.
- [67] M. I. Jordan and T. M. Mitchell, "Machine learning: Trends, perspectives, and prospects," *Science*, vol. 349, no. 6245, pp. 255–260, 2015.
- [68] C. Janiesch, P. Zschech, and K. Heinrich, "Machine learning and deep learning," *Electronic Markets*, vol. 31, no. 3, pp. 685–695, sep 2021. [Online]. Available: <https://link.springer.com/10.1007/s12525-021-00475-2>
- [69] M. M. Taye, "Understanding of Machine Learning with Deep Learning: Architectures, Workflow, Applications and Future Directions," *Computers*, vol. 12, no. 5, 2023.
- [70] M. Á. Carreira-Perpiñán, "A review of mean-shift algorithms for clustering," pp. 1–28, 2015. [Online]. Available: <https://arxiv.org/pdf/1503.00687>
- [71] R. Ranjbarzadeh, A. Caputo, E. B. Tirkolaei, S. Jafarzadeh Ghouschi, and M. Bendeche, "Brain tumor segmentation of MRI images: A comprehensive

review on the application of artificial intelligence tools,” *Computers in Biology and Medicine*, vol. 152, p. 106405, jan 2023. [Online]. Available: <https://linkinghub.elsevier.com/retrieve/pii/S0010482522011131>

- [72] O. Rainio, J. Teuvo, and R. Klén, “Evaluation metrics and statistical tests for machine learning,” *Scientific Reports*, vol. 14, no. 1, pp. 1–14, 2024. [Online]. Available: <https://doi.org/10.1038/s41598-024-56706-x>
- [73] G. M. Foody, “Ground Truth in Classification Accuracy Assessment: Myth and Reality,” *Geomatics*, vol. 4, no. 1, pp. 81–90, 2024.
- [74] A. Tharwat, “Classification assessment methods,” *Applied Computing and Informatics*, vol. 17, no. 1, pp. 168–192, 2018.
- [75] I. ATAS, “Performance Evaluation of Jaccard-Dice Coefficient on Building Segmentation from High Resolution Satellite Images,” *Balkan Journal of Electrical and Computer Engineering*, vol. 11, no. 1, pp. 100–106, 2023.
- [76] K. H. Zou, S. K. Warfield, A. Bharatha, C. M. Tempany, M. R. Kaus, S. J. Haker, W. M. Wells, F. A. Jolesz, and R. Kikinis, “Statistical Validation of Image Segmentation Quality Based on a Spatial Overlap Index,” *Academic Radiology*, vol. 11, no. 2, pp. 178–189, 2004.
- [77] Z. Fan, J. Lu, C. Wei, H. Huang, X. Cai, and X. Chen, “A hierarchical image matting model for blood vessel segmentation in fundus images,” *IEEE Transactions on Image Processing*, vol. 28, no. 5, pp. 2367–2377, 2019.
- [78] M. Alhussein, K. Aurangzeb, and S. I. Haider, “An unsupervised retinal vessel segmentation using hessian and intensity based approach,” *IEEE Access*, vol. 8, pp. 165 056–165 070, 2020.
- [79] M. S. Miri and A. Mahloojifar, “Retinal image analysis using curvelet transform and multistructure elements morphology by reconstruction,” *IEEE Transactions on Biomedical Engineering*, vol. 58, no. 5, pp. 1183–1192, 2011.