UNIVERSITAS
GADJAH MADA
Perancangan Aplikasi Deteksi Scale Pada Pipa Berbasis Citra Tomografi Gamma Menggunakan YOLOv8
Hanif Riadi, Prof. Ir. Nazrul Effendy, S.T., M.T., Ph.D., IPM. ASEAN Eng. ; Dr. Wibisono, M.Si.
Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

DAFTAR PUSTAKA

[1] I. Irwansyah, "Deteksi cacat pada material dengan teknik pengujian tidak merusak," *Lensa*, vol. 2, no. 48, pp. 7–13, 2019.

[2] M. N. Alwahidi, B. Afrizal, and others, "Review Pengujian Pengelasan Metode Non-Destructive Test," *J. Mema (Jurnal Mesin dan Manufaktur)*, vol. 2, no. 1, pp. 30–42, 2025.

[3] C. Dong, J. S. Putra, and A. A. Malcolm, "Artificial Intelligence Defect Detection Robustness in Real-time Non-Destructive Testing of Metal Surfaces," *E-JOURNAL Nondestruct. Test. \& Ultrason.*, vol. 30, no. 3, 2025.

[4] A. El Harrak, M. Rhazzaf, and I. Moumene, "Deep Learning Approach for Non-destructive Radiography Testing of Piping Welds.," *IAENG Int. J. Comput. Sci.*, vol. 51, no. 4, 2024.

[5] N. Lilansa, R. A. Pratama, R. Tanadi, and R. N. K. Natasasmita, "Pengujian Algoritma YOLO untuk Deteksi Cacat pada Produk Hasil Alumunium Casting pada Industri Otomotif," *JTT (JURNAL Teknol. Ter. Учредители P3M Politek. Negeri Indramayu*, vol. 10, no. 2, p. 118, 2024.

[6] M. W. Kasrani, M. J. Mayasa, and others, "Identifikasi Citra Cacat Las Menggunakan Metode Gray Level Co-Occurance Matrix (GLCM) dan K-NN," *J. Tek. Elektro Uniba (JTE UNIBA)*, vol. 7, no. 1, pp. 261–268, 2022.

[7] A. Y. Presnyakov, V. I. Mikerov, O. A. Gerasimchuk, D. I. Yurkov, and others, "X-ray and neutron radiography and tomography in research and industry," *Uspekhi Fiz. Nauk*, vol. 194, no. 6, pp. 618–629, 2024.

[8] G. Jing, S. Tang, X. Li, and H. Wang, "The analysis of scaling mechanism for water-injection pipe columns in the Daqing Oilfield," *Arab. J. Chem.*, vol. 10, pp. S1235--S1239, 2017.

[9] F. N. Kemmer and J. McCallion, *The NALCO water handbook*. McGraw-Hill New York, 1979.

[10] B. Azmi, W. Wibisono, and A. H. Saputro, "Pengukuran scaling pada pipa menggunakan tomografi gamma parallel beam," *J. Ilm. Apl. Isot. dan Radiasi*, vol. 13, no. 1, pp. 1–9, 2017.

[11] W. Wibisono, F. R. Ningsih, P. Sidauruk, and S. W. Kusuma, "Fan beam tomography technique for scale thickness measurement in geothermal pipeline West Java area," *J. Ilm. Apl. Isot. dan Radiasi*, vol. 16, no. 2, pp. 101–106, 2020.

[12] J. Kim, S. Jung, J. Moon, and G. Cho, "Industrial gamma-ray tomographic scan method for large scale industrial plants," *Nucl. Instruments Methods Phys. Res. Sect. A Accel. Spectrometers, Detect. Assoc. Equip.*, vol. 640, no.

UNIVERSITAS
GADJAH MADA
Perancangan Aplikasi Deteksi Scale Pada Pipa Berbasis Citra Tomografi Gamma Menggunakan YOLOv8
Hanif Riadi, Prof. Ir. Nazrul Effendy, S.T., M.T., Ph.D., IPM. ASEAN Eng. ; Dr. Wibisono, M.Si.
Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

1, pp. 139–150, 2011.

[13] M. Wevers *et al.*, "X-ray computed tomography for nondestructive testing," in *International Conference on Industrial Computed Tomography*, 2012.

[14] A. A. Kusuma, R. Amin, N. Hidayati, A. Sunandar, R. S. H. F. Ahsan, and R. Y. Pradani, "SMART VISUAL DETECTION BERBASIS DEEP LEARNING DENGAN MENGGUNAKAN METODE ALGORITMA YOLO UNTUK INDENTIFIKASI CACAT PADA PRODUK GARMEN," *JIPI (Jurnal Ilm. Penelit. dan Pembelajaran Inform.*, vol. 10, no. 4, pp. 3704–3713, 2025.

[15] A. A. Faudisyah, K. D. Hartomo, and H. D. Purnomo, "Deteksi Cacat pada Isolasi Trafo Secara Visual menggunakan Algoritma Convolutional Neural Network (CNN)," *J. JTIK (Jurnal Teknol. Inf. Dan Komunikasi)*, vol. 7, no. 4, pp. 620–628, 2023.

[16] R. Nurlizah, A. E. Minarno, and G. W. Wicaksono, "Klasifikasi Penyakit Katarak Pada Mata Manusia Menggunakan Metode Convolutional Neural Network," *J. Repos.*, vol. 4, no. 4, pp. 491–496, 2022.

[17] W. Wu and J. Lai, "Multi camera localization handover based on YOLO object detection algorithm in complex environments," *IEEE Access*, vol. 12, pp. 15236–15250, 2024.

[18] R. Iguernaissi, D. Merad, K. Aziz, and P. Drap, "People tracking in multi-camera systems: a review," *Multimed. Tools Appl.*, vol. 78, no. 8, pp. 10773–10793, 2019.

[19] D. H. Saputra, B. Imran, and others, "Object Detection Untuk Mendeteksi Citra Buah-Buahan Menggunakan Metode Yolo," *J. Kecerdasan Buatan dan Teknol. Inf.*, vol. 2, no. 2, pp. 70–80, 2023.

[20] C. R. Gunawan, N. Nurdin, and F. Fajriana, "Design of a real-time object detection prototype system with YOLOv3 (You Only Look Once)," *Int. J. Eng. Sci. Inf. Technol*, vol. 2, no. 3, pp. 96–99, 2022.

[21] L. De Chiffre, S. Carmignato, J.-P. Kruth, R. Schmitt, and A. Weckenmann, "Industrial applications of computed tomography," *CIRP Ann.*, vol. 63, no. 2, pp. 655–677, 2014.

[22] A. Jancarek, L. Pina, J. Prokop, B. Ekrt, and E. I. Vaynberg, "Prague center of industrial X-ray tomography: research and applications in NDT," in *IV Conferencia Panamericana de END*, 2007.

[23] L. Beránek *et al.*, "Use of computed tomography in dimensional quality control and NDT," *Manuf. Technol.*, vol. 20, no. 5, pp. 566–575, 2020.

[24] V. Wood, "X-ray tomography for battery research and development," *Nat. Rev. Mater.*, vol. 3, no. 9, pp. 293–295, 2018.

[25] D. Soembogo, H. A. I. Rasyid, N. Sianta, and others, "Radiography x-ray in

UNIVERSITAS
GADJAH MADA
Perancangan Aplikasi Deteksi Scale Pada Pipa Berbasis Citra Tomografi Gamma Menggunakan YOLOv8
Hanif Riadi, Prof. Ir. Nazrul Effendy, S.T., M.T., Ph.D., IPM. ASEAN Eng. ; Dr. Wibisono, M.Si.
Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

welding pipe with double wall single image metro method," in *Proceedings of the national seminar on technology and applications of nuclear reactors*, 2016, pp. 13–18.

[26] S. Syarip, B. Ahmad, and P. Nopianto, "Kajian Aplikasi Metode Hamburan Compton Energi Ganda untuk Pengukuran Densitas Fluidadan Uji Tak Merusak Pipa," *Indones. J. Mater. Sci.*, vol. 6, no. 3, p. 272816, 2005.

[27] J. Kim, S. Jung, J. Moon, J. G. Park, J. Jin, and G. Cho, "Development of transportable gamma-ray tomographic system for industrial application," *Nucl. Instruments Methods Phys. Res. Sect. A Accel. Spectrometers, Detect. Assoc. Equip.*, vol. 693, pp. 203–208, 2012.

[28] B. Azmi, A. H. Saputro, and others, "Portable gamma ray tomography system for investigation of geothermal power plant pipe scaling," in *2017 15th International Conference on Quality in Research (QiR): International Symposium on Electrical and Computer Engineering*, 2017, pp. 159–163.

[29] H. Yang, Y. Yan, Z. Yu, and Z. Ning, "Micro pin header defect detection system based on OpenCV," in *Journal of Physics: Conference Series*, 2021, p. 12037.

[30] B. Mutiargo *et al.*, "Evaluation of X-ray Computed Tomography (CT) images of additively manufactured components using deep learning," in *Proceedings of the 3rd Singapore International Non-Destructive Testing Conference and Exhibition (SINCE2019), Singapore*, 2019, p. 9.

[31] L. Posilović, D. Medak, M. Subašić, T. Petković, M. Budimir, and S. Lončarić, "Flaw detection from ultrasonic images using YOLO and SSD," in *2019 11th International Symposium on Image and Signal Processing and Analysis (ISPA)*, 2019, pp. 163–168.

[32] F. M. Suyama, M. R. Delgado, R. D. Da Silva, and T. M. Centeno, "Deep neural networks based approach for welded joint detection of oil pipelines in radiographic images with Double Wall Double Image exposure," *Ndt \& E Int.*, vol. 105, pp. 46–55, 2019.

[33] N. Meyendorf, N. Ida, R. Singh, and J. Vrana, *Handbook of nondestructive evaluation 4.0*. Springer, 2022.

[34] B. Raj, T. Jayakumar, and M. Thavasimuthu, *Practical non-destructive testing*. Woodhead Publishing, 2002.

[35] X. Maldague, "Theory and practice of infrared technology for nondestructive testing," *(No Title)*, 2001.

[36] E. M. Unett, J. Campling, and A. J. Royle, *Radiographic techniques and image evaluation*. Springer, 2013.

[37] J. D. Achenbach, "Quantitative nondestructive evaluation," *Int. J. Solids Struct.*, vol. 37, no. 1–2, pp. 13–27, 2000.

UNIVERSITAS
GADJAH MADA
Perancangan Aplikasi Deteksi Scale Pada Pipa Berbasis Citra Tomografi Gamma Menggunakan YOLOv8
Hanif Riadi, Prof. Ir. Nazrul Effendy, S.T., M.T., Ph.D., IPM. ASEAN Eng. ; Dr. Wibisono, M.Si.
Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

[38] D. Ensminger and L. J. Bond, *Ultrasonics: fundamentals, technologies, and applications*. CRC press, 2024.

[39] P. Rice-Evans and Z. Aung, "On the decay of cobalt 60," *Zeitschrift für Phys. A Hadron. Nucl.*, vol. 240, no. 5, pp. 392–395, 1970.

[40] D. C. Wilding, "Identification of an Unknown Material Through Gamma Ray Detection," *McMaster J. Eng. Phys.*, vol. 1, no. 1, 2017.

[41] M. R. Newell, R. B. Rothrock, and D. Henzlova, "Demonstration of the advanced list mode module," 2023.

[42] W. H. Geist, P. A. Santi, M. T. Swinhoe, and others, *Nondestructive assay of nuclear materials for safeguards and security*. Springer, 2024.

[43] T. Burr, S. Croft, D. Dale, A. Favalli, B. Weaver, and B. Williams, "Emerging applications of bottom-up uncertainty quantification in nondestructive assay," 2015.

[44] S. Tavernier, *Experimental techniques in nuclear and particle physics*. Springer Science \& Business Media, 2010.

[45] M. U. Khandaker, "High purity germanium detector in gamma-ray spectrometry," *Int. J. Fundam. Phys. Sci.*, vol. 1, no. 2, pp. 42–46, 2011.

[46] M. Heil *et al.*, "A 4π BaF_2 detector for (n, γ) cross-section measurements at a spallation neutron source," *Nucl. Instruments Methods Phys. Res. Sect. A Accel. Spectrometers, Detect. Assoc. Equip.*, vol. 459, no. 1–2, pp. 229–246, 2001.

[47] N. Tsoulfanidis and S. Landsberger, *Measurement and detection of radiation*. CRC press, 2021.

[48] N. Tsoulfanidis and S. Landsberger, *Measurement and Detection of Radiation*, 4th ed. New York: CRC Press, 2015.

[49] N. Tsoulfanidis, *Measurement and Detection of Radiation*. New York: University of Missouri-Rolla, 1983.

[50] F. Souisa, "Ratnawati, and B. Sudarsana," Pengaruh Perubahan Jarak Obyek Ke Film Terhadap Pembesaran Obyek Pada Pemanfaatan Pesawat Sinar-X, Typpe CGR,"," *Bul. Fis.*, vol. 15, no. 2, pp. 15–21, 2014.

[51] K. Tarigan, T. Sembiring, and others, "Pembuatan dan Karakterisasi Perisai Radiasi Sinar-X Berbasis Polyester Timbal Asetat Sebagai Salah Satu Alternatif Pengganti Kaca Timbal," Universitas Sumatera Utara, 2018.

[52] A. C. Kak and M. Slaney, *Principles of computerized tomographic imaging*. SIAM, 2001.

[53] M. S. M. Yusoff, R. Sulaiman, K. Shafinah, and R. Fatihah, "Image Reconstruction of Computed Tomography Using Fan-beam".

UNIVERSITAS
GADJAH MADA
Perancangan Aplikasi Deteksi Scale Pada Pipa Berbasis Citra Tomografi Gamma Menggunakan YOLOv8
Hanif Riadi, Prof. Ir. Nazrul Effendy, S.T., M.T., Ph.D., IPM. ASEAN Eng. ; Dr. Wibisono, M.Si.
Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

[54] MathWorks, "Radon Transform." Accessed: Jan. 11, 2026. [Online]. Available: https://www.mathworks.com/help/images/radon-transform.html

[55] C. Shorten and T. M. Khoshgoftaar, "A survey on image data augmentation for deep learning," *J. big data*, vol. 6, no. 1, pp. 1–48, 2019.

[56] X. Ying, "An overview of overfitting and its solutions," in *Journal of physics: Conference series*, 2019, p. 22022.

[57] A. Rismayanti and R. Rahmadewi, "DETEKSI DAN KLASIFIKASI TINGKAT KEMATANGAN BUAH MANGGA HARUM MANIS MENGGUNAKAN YOU ONLY LOOK ONCE (YOLO) V8," *JATI (Jurnal Mhs. Tek. Inform.*, vol. 9, no. 3, pp. 3645–3654, 2025.

[58] J. Redmon, S. Divvala, R. Girshick, and A. Farhadi, "You only look once: Unified, real-time object detection," in *Proceedings of the IEEE conference on computer vision and pattern recognition*, 2016, pp. 779–788.

[59] M. Nasrullah and A. Diker, "Derin Öğrenme ve YOLO Algoritmaları ile Nesne Tespiti ve Şerit Belirleme," in *2nd International Conference on Intelligent Transportation Systems*, 2021, pp. 68–79.

[60] A. Aktaş, Ö. Demir, and B. Doğan, "Derin öğrenme yöntemleri ile dokunsal parke yüzeyi tespiti," *Gazi Üniversitesi Mühendislik Mimar. Fakültesi Derg.*, vol. 35, no. 3, pp. 1685–1700, 2020.

[61] S. Aydın, M. Taşyürek, and C. Öztürk, "MR Görüntülerinde Evrişimli Sinir Ağlar Kullanılarak Alzheimer Hastalık Tespiti," *Erciyes Üniversitesi Fen Bilim. Enstitüsü Fen Bilim. Derg.*, vol. 39, no. 3, pp. 357–368, 2023.

[62] S. Yilmaz, "Beyin tümörü tanıları için YOLOv7 algoritması tabanlı karar destek sistemi tasarımı," *Kocaeli Üniversitesi Fen Bilim. Derg.*, vol. 6, no. 1, pp. 47–56, 2023, doi: 10.53410/koufbd.1236305.

[63] M. Çiftçi, M. U. Türkdamar, and C. Öztürk, "Leveraging YOLO Models for Safety Equipment Detection on Construction Sites," *J. Comput. Theor. Appl.*, vol. 1, no. 4, pp. 492–506, 2024.

[64] Z. Zheng, P. Wang, W. Liu, J. Li, R. Ye, and D. Ren, "Distance-IoU loss: Faster and better learning for bounding box regression," in *Proceedings of the AAAI conference on artificial intelligence*, 2020, pp. 12993–13000.

[65] A. Bochkovskiy, C.-Y. Wang, and H.-Y. M. Liao, "Yolov4: Optimal speed and accuracy of object detection," *arXiv Prepr. arXiv2004.10934*, 2020.

[66] M. Hussain, "YOLO-v1 to YOLO-v8, the rise of YOLO and its complementary nature toward digital manufacturing and industrial defect detection," *Machines*, vol. 11, no. 7, p. 677, 2023.

[67] S. S. Saleh, M. H. Koniyo, and M. Polin, "Deteksi Dini Hama dan Penyakit Tanaman Padi dengan Metode YOLO," *Diffus. J. Syst. Inf. Technol.*, vol. 5, no. 2, pp. 173–182, 2025.

UNIVERSITAS
GADJAH MADA
Perancangan Aplikasi Deteksi Scale Pada Pipa Berbasis Citra Tomografi Gamma Menggunakan YOLOv8
Hanif Riadi, Prof. Ir. Nazrul Effendy, S.T., M.T., Ph.D., IPM. ASEAN Eng. ; Dr. Wibisono, M.Si.
Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

[68] J. Terven, D.-M. Córdova-Esparza, and J.-A. Romero-González, "A comprehensive review of yolo architectures in computer vision: From yolov1 to yolov8 and yolo-nas," *Mach. Learn. Knowl. Extr.*, vol. 5, no. 4, pp. 1680–1716, 2023.

[69] N. Khairunisa, A. Jamaludin, and others, "Analisis perbandingan algoritma cnn dan yolo dalam mengidentifikasi kerusakan jalan," *J. Inform. dan Tek. Elektro Terap.*, vol. 12, no. 3, 2024.

[70] M. Maulidiansyah and M. A. Yaqin, "Deteksi Tumpukan Sampah dengan Metode You Only Look Once (YOLO)," *TRILOGI J. Ilmu Teknol. Kesehatan, dan Hum.*, vol. 4, no. 2, pp. 76–79, 2023.

[71] N. Bressler, "How to check the accuracy of your machine learning model," *s interneta, https//deepchecks. com/how-to-check-the-accuracy-of-your-machine-learning-model*, vol. 24, 2022.

[72] A. F. Gad, "Evaluating deep learning models: the confusion matrix, accuracy, precision, and recall," *Deep Learn.*, 2020.

[73] C. Dewi, A. P. S. Chen, and H. J. Christanto, "YOLOv7 for face mask identification based on deep learning," in *2023 15th international conference on computer and automation engineering (ICCAE)*, 2023, pp. 193–197.