

DAFTAR PUSTAKA

- [1] World Health Organization, “Global report on health equity for persons with disabilities,” Geneva, Switzerland, 2022.
- [2] World Health Organization; United Nations Children’s Fund (UNICEF), “Global Report on Assistive Technology,” World Health Organization and UNICEF, Geneva, Switzerland, 2022.
- [3] Kementerian Koordinator Bidang Pembangunan Manusia dan Kebudayaan Republik, “Pemerintah Penuhi Hak Penyandang Disabilitas di Indonesia.” [Online]. Available: <https://www.kemenkopmk.go.id/pemerintah-penuhi-hak-penyandang-disabilitas-di-indonesia>
- [4] Badan Pusat Statistik, “Potret Penyandang Disabilitas di Indonesia: Hasil Long Form Sensus Penduduk 2020,” 2024.
- [5] M. Sidik. M. H., Che. Ghanil. S. A., Ishak. M., Harun. W. S. W., and Daud. N., “A Review on Electric Wheelchair Innovation to Ease Mobility and As a Rehabilitation Tool for Spinal Cord Impairment Patient,” *International Journal of Engineering and Technology*, vol. 10, no. 3, pp. 803–815, Jun. 2018, doi: 10.21817/ijet/2018/v10i3/181003074.
- [6] A. Ghorbel, N. Ben Amor, and M. Jallouli, “A survey on different human-machine interactions used for controlling an electric wheelchair,” in *Procedia Computer Science*, Elsevier B.V., 2019, pp. 398–407. doi: 10.1016/j.procs.2019.09.194.
- [7] B. Zhang, H. Eberle, C. Holloway, and T. Carlson, “Design requirements and challenges for intelligent power wheelchair use in crowds: learning from expert wheelchair users,” Jul. 2021.
- [8] A. Gupta, K. R. Chowdhury, N. Farheen, and M. P. Schoen, “Evolution and Emerging Trends in Intelligent Wheelchair Control: A Comprehensive Review,” *Machines*, vol. 14, no. 1, p. 33, Dec. 2025, doi: 10.3390/machines14010033.
- [9] J. Chen, Y. Sun, and S. Sun, “Improving human activity recognition performance by data fusion and feature engineering,” *Sensors (Switzerland)*, vol. 21, no. 3, pp. 1–23, Jan. 2021, doi: 10.3390/s21030692.
- [10] H. J. Luinge, “Inertial Sensing of Human Movement,” University of Twente, Enschede, The Netherlands, 2002. [Online]. Available: <http://www.tup.utwente.nl/tupress/catalogue/book/index.jsp?isbn=9036518237>
- [11] S. Wilson, H. Eberle, Y. Hayashi, S. Madgwick, A. McGregor, X. Jing, R. Vaidyanathan, “Formulation of a new gradient descent MARG orientation

- algorithm: Case study on robot teleoperation,” *Mech. Syst. Signal Process.*, vol. 130, pp. 183–200, Sep. 2019, doi: 10.1016/j.ymssp.2019.04.064.
- [12] D. S. Nabila, “Perancangan Sistem Pengendalian Kursi Roda Berdasarkan Gerakan Tubuh Menggunakan Sensor Gyroscope dengan Metode Klasifikasi Decision Tree,” Tugas Akhir/Skripsi S-1, e-Skripsi Universitas Andalas, Padang, Indonesia, 2025.
- [13] K. Anam, S. Nahela, M. A. H. Sasono, N. A. Rizal, A. N. Putra, B. Wahono, Y. Putrasari, M. K. A. Wardana, and T. I. Salim, “Electric wheelchair navigation based on hand gestures prediction using the k-Nearest Neighbor method,” *Journal of Mechatronics, Electrical Power, and Vehicular Technology*, vol. 16, no. 1, pp. 132–143, 2025, doi: 10.55981/j.mev.2025.1229.
- [14] J. Fu, T. Liu, M. Jones, G. Qian, and Y. K. Jan, “Characterization of wheelchair maneuvers based on noisy inertial sensor data: A preliminary study,” in *2014 36th Annual International Conference of the IEEE Engineering in Medicine and Biology Society, EMBC 2014*, Institute of Electrical and Electronics Engineers Inc., Nov. 2014, pp. 1731–1734. doi: 10.1109/EMBC.2014.6943942.
- [15] P. Chawaphan, D. Maneetham, and P. N. Crisnapati, “Window-Free IMU-Based Classification of Stair-Climbing Wheelchair Activities Using Machine Learning and Adaptive Boosting,” *Engineering, Technology and Applied Science Research*, vol. 16, no. 1, pp. 32514–32523, Jan. 2026, doi: 10.48084/etasr.15555.
- [16] M. H. Abdullah and M. A. Ahmed, “Human Activity Recognition Using Accelerometer & Gyroscope Smartphone Sensor by Extract Statistical Features,” *Journal of Robotics and Control (JRC)*, vol. 5, no. 5, pp. 1390–1398, 2024, doi: 10.18196/jrc.v5i5.22443.
- [17] M. R. Huda, M. L. Ali, and M. S. Sadi, “Developing a real-time hand-gesture recognition technique for wheelchair control,” *PLoS One*, vol. 20, Apr. 2025, doi: 10.1371/journal.pone.0319996.
- [18] L. Breiman, “Random Forests,” *Mach. Learn.*, vol. 45, no. 1, pp. 5–32, 2001, doi: 10.1023/A:1010933404324.
- [19] N. Ghaffar Nia, A. Amiri, A. Nasab, E. Kaplanoglu, and Y. Liang, “The Power of ANN-Random Forest Algorithm in Human Activities Recognition Using IMU Data,” 2023, pp. 1–7. doi: 10.1109/BHI58575.2023.10313507.
- [20] Anugrah Illahi, “PERANCANGAN SISTEM PENGENDALIAN KURSI RODA BERDASARKAN GERAKAN TUBUH MENGGUNAKAN SENSOR GYROSCOPE DENGAN METODE K-NEAREST NEIGHBOR (KNN),” Tugas Akhir/Skripsi S-1, e-Skripsi Universitas Andalas, Padang, Indonesia, 2025.
- [21] D. Artanto, I. D. Pranowo, M. B. Wicaksono, and A. Siswoyo, “Combining Mindwave, MPU6050, internet of things for reliable safe monitored

- wheelchair control system,” *Indonesian Journal of Electrical Engineering and Computer Science*, vol. 32, no. 2, pp. 742–751, Nov. 2023, doi: 10.11591/ijeecs.v32.i2.pp742-751.
- [22] Z. Liao and Y. Hirata, “Robotic wheelchair system for inclusive dance support for the visually impaired people with haptic feedback and hands-free control,” *ROBOMECH Journal*, vol. 12, no. 1, Dec. 2025, doi: 10.1186/s40648-025-00294-6.
- [23] World Health Organization, *Guidelines on the provision of manual wheelchairs in less resourced settings*. Geneva, Switzerland: World Health Organization, 2008.
- [24] H. Iqbal, J. Zheng, R. Chai, and S. Chandrasekaran, “Electric powered wheelchair control using user-independent classification methods based on surface electromyography signals,” *Med. Biol. Eng. Comput.*, vol. 62, no. 1, pp. 167–182, Jan. 2024, doi: 10.1007/s11517-023-02921-z.
- [25] B. Mason, M. Warner, S. Briley, V. Goosey-Tolfrey, and R. Vegter, “Managing shoulder pain in manual wheelchair users: a scoping review of conservative treatment interventions,” *Clin. Rehabil.*, vol. 34, no. 6, pp. 741–753, Jun. 2020, doi: 10.1177/0269215520917437.
- [26] Kevin. Lynch and F. C. . Park, *Modern robotics : Mechanics, Planning, and Control*. Cambridge, U.K.: Cambridge University Press, 2017.
- [27] Lumen Learning, “The Vertebral Column,” 2013, [Online]. Available: <https://courses.lumenlearning.com/suny-ap1/chapter/the-vertebral-column/>
- [28] J. A. Waxenbaum, V. Reddy, ; Konstantinos, and M. Affiliations, “Anatomy, Back, Thoracic Vertebrae,” Treasure Island, FL, USA, Jan. 2026. [Online]. Available: <https://www.ncbi.nlm.nih.gov/books/NBK459153/?report=printable>
- [29] A. Brett Sassack and J. D. Carrier Affiliations, “Anatomy, Back, Lumbar Spine,” Treasure Island, FL, USA, Aug. 2023. [Online]. Available: <https://www.ncbi.nlm.nih.gov/books/NBK557616/?report=printable>
- [30] S. Cerfoglio *et al.*, “Evaluation of Upper Body and Lower Limbs Kinematics through an IMU-Based Medical System: A Comparative Study with the Optoelectronic System,” *Sensors*, vol. 23, no. 13, Jul. 2023, doi: 10.3390/s23136156.
- [31] iamaryang, “Getting Started with the MPU6050: Beginner-Friendly Guide with Visual Explanations,” <https://forum.arduino.cc/t/getting-started-with-the-mpu6050-beginner-friendly-guide-with-visual-explanations/1364064>.
- [32] P. By ALLDATASHEETCOM, “MPU-6000 and MPU-6050 Register Map and Descriptions Revision 4.2 MPU-6000/MPU-6050 Register Map and Descriptions,” Aug. 2013.
- [33] ElangSakti, “Cara Kerja Sensor Ultrasonik, Rangkaian, & Aplikasinya.” [Online]. Available: <https://www.elangsakti.com/2015/07/ebook-gratis-belajar-arduino-pemula.html>

- [34] ElectronicWings, "HC-SR04 Ultrasonic Sensor Guide with Arduino Interfacing." Accessed: Jul. 18, 2026. [Online]. Available: <https://www.electronicwings.com/sensors-modules/ultrasonic-module-hc-sr04>
- [35] Handson Technology, "Handson Technology User Guide HC-SR04 Ultrasonic Sensor Module User Guide User Guide: Ultrasonic Sensor V2.0." [Online]. Available: www.handsontec.com
- [36] Mohd Nor Azmi Ab Patar, Norlisa Ramlee, Jamaluddin Mahmud, Hokyo Lee, and Akihiko Hanafusa, "Cost-Effective Vision based Obstacle Avoidance System integrated Multi Array Ultrasonic sensor for Smart Wheelchair," *International Journal of Recent Technology and Engineering*, vol. 8, no. 4, pp. 6988–6993, 2019, doi: 10.35940/ijrteD5190.118419.
- [37] Pallattarage Gavin Anjitha, "OBSTACLE AVOIDANCE ROBOT USING FPGA," 2016. Accessed: Jul. 18, 2026. [Online]. Available: https://www.researchgate.net/publication/341480237_OBSTACLE_AVOIDANCE_ROBOT_USING_FPGA?_tp=eyJjb250ZXh0Ijp7ImZpcnN0UGFnZSI6InB1YmxpY2F0aW9uIiwicGFnZSI6InB1YmxpY2F0aW9uIn19
- [38] Espressif Systems, "ESP32 Series Datasheet," Shanghai, China, 2020. [Online]. Available: <https://www.espressif.com/en/support/download/documents>.
- [39] HIOKI E.E. Corporation, "Lead-acid Battery Handbook Facilitating Accurate Measurement of Lead-acid Batteries," Nagano, Japan, 2020.
- [40] Texas Instruments, "TCA9548A Low-Voltage 8-Channel I2C Switch with Reset | Alldatasheet," Dallas, TX, USA, 2016. [Online]. Available: www.ti.com
- [41] Arduino, "Arduino IDE," *Arduino Documentation*, Accessed: May 19, 2026. [Online]. Available: <https://docs.arduino.cc/software/ide/>
- [42] GS Yuasa, "GS Yuasa E-Learning Support Documentation Lead Acid Battery Operation Overview," May 2019.
- [43] M. W. Fatma and M. I. Hamid, "PWM speed control of dc permanent magnet motor using a PIC18F4550 microcontroller," in *IOP Conference Series: Materials Science and Engineering*, Institute of Physics Publishing, Sep. 2019. doi: 10.1088/1757-899X/602/1/012017.
- [44] B. Satria, H. Alam, E. Dalimunthe, and M. Iqbal, "DC Motor Speed Control System Using Pulse Width Modulation (PWM) On Electric Motorcycles," *International Journal of Economic, Technology and Social Sciences, injects*, vol. 5, pp. 200–210, 2024.
- [45] A. Liaw and M. Wiener, "Classification and Regression by randomForest," vol. 2, no. 3, pp. 18–22, Dec. 2002, [Online]. Available: <http://www.stat.berkeley.edu/>
- [46] M. El Habib Daho and M. Amine Chikh, "Combining bootstrapping samples, random subspaces and random forests to build classifiers," *J. Med. Imaging*

- Health Inform.*, vol. 5, no. 3, pp. 539–544, Jun. 2015, doi: 10.1166/jmihi.2015.1423.
- [47] Fhahrezy Thomas, “Analisis Sistem Navigasi Kursi Roda Berbasis Gestur Tangan Menggunakan Sensor Leap Motion dan Algoritma Random Forest,” Tugas Akhir/Skripsi S-1, e-Skripsi Universitas Andalas, Padang, Indonesia, 2025.
- [48] B. Navayo, D. Syauqy, and W. Kurniawan, “Sistem Wearable Deteksi Postur pada Gerakan Lunge dengan Algoritma Random Forest Berdasarkan Data Sensor IMU,” vol. 9, no. 10, pp. 2548–964, Oct. 2025, [Online]. Available: <http://j-ptiik.ub.ac.id>
- [49] C. Devices, “Buzzer Basics - Technologies, Tones, and Drive Circuits,” Oct. 2019. Accessed: May 24, 2026. [Online]. Available: https://media.digikey.com/pdf/Application%20Notes/CUI%20Application%20Notes/Buzzer_Basics.pdf
- [50] M. Sokolova and G. Lapalme, “A systematic analysis of performance measures for classification tasks,” *Inf. Process. Manag.*, vol. 45, no. 4, pp. 427–437, Jul. 2009, doi: 10.1016/j.ipm.2009.03.002.
- [51] David M. W. Powers, “EVALUATION: FROM PRECISION, RECALL AND F-MEASURE TO ROC, INFORMEDNESS, MARKEDNESS & CORRELATION,” *Journal of Machine Learning Technologies*, vol. 2, no. 1, pp. 37–63, 2011.
- [52] V. R. Joseph, “Optimal Ratio for Data Splitting,” *Statistical Analysis and Data Mining: The ASA Data Science Journal*, vol. 15, pp. 531–538, Feb. 2022, doi: 10.1002/sam.11583.
- [53] R. Oktafiani, A. Hermawan, and D. Avianto, “Pengaruh Komposisi Split data Terhadap Performa Klasifikasi Penyakit Kanker Payudara Menggunakan Algoritma Machine Learning,” *Jurnal Sains dan Informatika*, vol. 9, no. 1, pp. 19–28, Jun. 2023, doi: 10.34128/jsi.v9i1.622.
- [54] Suci Amaliah, M. Nusrang, and A. Aswi, “Penerapan Metode Random Forest Untuk Klasifikasi Varian Minuman Kopi di Kedai Kopi Konijiwa Bantaeng,” *VARIANSI: Journal of Statistics and Its application on Teaching and Research*, vol. 4, no. 3, pp. 121–127, Dec. 2022, doi: 10.35580/variansiunm31.