DAFTAR PUSTAKA

[1] “Global report on health equity for persons with disabilities.” Accessed: Mar. 06, 2026. [Online]. Available: https://www.who.int/publications/i/item/9789240063600

[2] “Potret Penyandang Disabilitas di Indonesia.” Accessed: Mar. 06, 2026. [Online]. Available: https://www.bps.go.id/id/publication/2024/12/20/43880dc0f8be5ab92199f8b9/potret-penyandang-disabilitas-di-indonesia--hasil-long-form-sp2020.html?__cf_chl_tk=84USeisz.J45rkTisvaaSM1vHcTKE3eax4DqWx5S0WU-1772781138-1.0.1.1-K3pXi_Ig4whQCFjeUQt.EPJjbTcvHLTodS9EPCw3xcY

[3] J. Cui, Z. Huang, X. Li, L. Cui, Y. Shang, and L. Tong, “Research on Intelligent Wheelchair Attitude-Based Adjustment Method Based on Action Intention Recognition,” *Micromachines (Basel).*, vol. 14, no. 6, 2023, doi: 10.3390/mi14061265.

[4] J. Cui, L. Cui, Z. Huang, X. Li, and F. Han, “IoT Wheelchair Control System Based on Multi-Mode Sensing and Human-Machine Interaction,” *Micromachines (Basel).*, vol. 13, no. 7, 2022, doi: 10.3390/mi13071108.

[5] S. Yuliana and M. Riyadi, “Implementation of Brain Computer Interface (BCI) as a Smart Wheelchair Motion Commands,” *Journal of Biomedical Science and Bioengineering*, vol. 2, no. 1, pp. 14–17, 2022, doi: 10.14710/jbiomes.2022.v2i1.14-17.

[6] J. Cui, L. Cui, Z. Huang, X. Li, and F. Han, “IoT Wheelchair Control System Based on Multi-Mode Sensing and Human-Machine Interaction,” *Micromachines (Basel).*, vol. 13, no. 7, 2022, doi: 10.3390/mi13071108.

[7] X. Zhang *et al.*, “Shared eHMI: Bridging Human–Machine Understanding in Autonomous Wheelchair Navigation,” *Applied Sciences (Switzerland)*, vol. 14, no. 1, 2024, doi: 10.3390/app14010463.

[8] Y. Zhang, Z. Ying, X. Tian, S. Jin, J. Huang, and Y. Miao, “Novel Extension Control Instrument for Power Wheelchair Based on Kalman Filter Head Motion Detection,” *Actuators*, vol. 13, no. 4, pp. 1–16, 2024, doi: 10.3390/act13040141.

[9] P. Detection, “WISP, Wearable Inertial Sensor for Online Wheelchair Propulsion Detection,” pp. 1–22, 2022.

[10] M. H. Abdullah, M. A. Ahmed, and C. Author, “Human Activity Recognition Using Accelerometer & Gyroscope Smartphone Sensor by Extract Statistical Features,” vol. 5, no. 5, pp. 1390–1398, 2024, doi: 10.18196/jrc.v5i5.22443.

[11] R. Bodhe, S. Sivakumar, F. H. Juwono, C. Apriono, and G. Sakarkar, "Outdoor activity classification using smartphone based inertial sensor measurements," pp. 76963–76989, 2024, doi: 10.1007/s11042-024-18599-w.
[12] S. Y. Sheikh and M. T. Jilani, "A ubiquitous wheelchair fall detection system using low-cost embedded inertial sensors and unsupervised one-class SVM," *J. Ambient Intell. Humaniz. Comput.*, vol. 14, no. 1, pp. 147–162, 2023, doi: 10.1007/s12652-021-03279-6.
[13] 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 & Applied Science Research*, vol. 16, no. 1, pp. 32514–32523, Feb. 2026, doi: 10.48084/ETASR.15555.
[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*, 2014. doi: 10.1109/EMBC.2014.6943942.
[15] 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, no. 4 April, 2025, doi: 10.1371/journal.pone.0319996.
[16] A. S. Kundu, O. Mazumder, P. K. Lenka, and S. Bhaumik, "Hand Gesture Recognition Based Omnidirectional Wheelchair Control Using IMU and EMG Sensors," *Journal of Intelligent & Robotic Systems 2017 91:3*, vol. 91, no. 3, pp. 529–541, Oct. 2017, doi: 10.1007/S10846-017-0725-0.
[17] P. S. Yadav, V. Agrawal, J. C. Mohanta, and M. D. Faiyaz Ahmed, "A robust sliding mode control of mecanum wheel-chair for trajectory tracking," *Mater. Today Proc.*, vol. 56, pp. 623–630, 2022, doi: 10.1016/j.matpr.2021.12.398.
[18] A. A. Ghezala, C. Sentouh, and P. Pudlo, "Direct Model-Reference Adaptive Control for Wheelchair Simulator Control via a Haptic Interface," *IFAC-PapersOnLine*, vol. 55, no. 29, pp. 49–54, 2022, doi: 10.1016/j.ifacol.2022.10.230.
[19] A. A. Aly *et al.*, "Adaptive Neural Network-Based Fixed-Time Tracking Controller for Disabilities Exoskeleton Wheelchair Robotic System," *Mathematics*, vol. 10, no. 20, 2022, doi: 10.3390/math10203853.
[20] H. Kuper, T. Shakespeare, and W. Mpanju-Shumbusho, "Announcing The Lancet Commission on Disability and Health: Creating disability-inclusive health systems that leave no one behind," *The Lancet*, vol. 406, no. 10500, pp. 215–216, Jul. 2025, doi: 10.1016/S0140-6736(25)01041-4.
[21] A. Cieza, K. Causey, K. Kamenov, S. W. Hanson, S. Chatterji, and T. Vos, "Global estimates of the need for rehabilitation based on the Global Burden

of Disease study 2019: a systematic analysis for the Global Burden of Disease Study 2019," *The Lancet*, vol. 396, no. 10267, pp. 2006–2017, Dec. 2020, doi: 10.1016/S0140-6736(20)32340-0.
[22] E. Chen, A. Viktorisson, A. Danielsson, A. Palstam, and K. S. Sunnerhagen, "Levels of physical activity in acute stroke patients treated at a stroke unit: A prospective, observational study," *J. Rehabil. Med.*, vol. 52, no. 4, Apr. 2020, doi: 10.2340/16501977-2671.
[23] F. M. Rwegoshora, J. Leo, and S. Kaijage, "A Comparative Study of Assistive Technologies for Physically challenged peoples for usability of Powered Wheelchair Mobility Aid," *International Journal of Advances in Scientific Research and Engineering*, vol. 08, no. 01, pp. 44–51, 2022, doi: 10.31695/ijasre.2022.8.1.6.
[24] G. Da Silva Bertolaccini, F. E. Sandnes, F. O. Medola, and T. Gjøvaag, "Effect of Manual Wheelchair Type on Mobility Performance, Cardiorespiratory Responses, and Perceived Exertion," *Rehabil. Res. Pract.*, vol. 2022, 2022, doi: 10.1155/2022/5554571.
[25] N. Jayasekera, B. Kulathunge, H. Premaratne, I. Nilam, S. Rajapaksha, and J. Krishara, "Revolutionizing Accessibility: Smart Wheelchair Robot and Mobile Application for Mobility, Assistance, and Home Management," *Journal of Robotics and Control (JRC)*, vol. 5, no. 1, pp. 27–53, 2024, doi: 10.18196/jrc.v5i1.20057.
[26] T. Rouvier *et al.*, "Manual wheelchair biomechanics while overcoming various environmental barriers: A systematic review," Jun. 01, 2022, *Public Library of Science*. doi: 10.1371/journal.pone.0269657.
[27] C. Fritsch, Y. Poulet, J. Bascou, P. Thoreux, and C. Sauret, "How Was Studied the Effect of Manual Wheelchair Configuration on Propulsion Biomechanics: A Systematic Review on Methodologies," 2022, *Frontiers Media SA*. doi: 10.3389/fresc.2022.863113.
[28] K. Sutrisno, "Kursi Roda Elektrik dan Manual," https://meenta.net/kursi-roda-elektrik-dan-manual/. Accessed: Mar. 12, 2026. [Online]. Available: https://meenta.net/kursi-roda-elektrik-dan-manual/
[29] 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, 2024, doi: 10.1007/s11517-023-02921-z.
[30] L. Hou *et al.*, "An autonomous wheelchair with health monitoring system based on Internet of Thing," *Sci. Rep.*, vol. 14, no. 1, Dec. 2024, doi: 10.1038/s41598-024-56357-y.
[31] J. Haviland and P. Corke, "Manipulator Differential Kinematics: Part I: Kinematics, Velocity, and Applications [Tutorial]," *IEEE Robot. Autom. Mag.*, vol. 31, no. 4, pp. 149–158, 2024, doi: 10.1109/MRA.2023.3270228.

[32] N. Wagaa, H. Kallel, and N. Mellouli, "Analytical and deep learning approaches for solving the inverse kinematic problem of a high degrees of freedom robotic arm," *Eng. Appl. Artif. Intell.*, vol. 123, p. 106301, Aug. 2023, doi: 10.1016/j.engappai.2023.106301.

[33] T. Lerchl, K. Nispel, T. Baum, J. Bodden, V. Senner, and J. S. Kirschke, "Multibody Models of the Thoracolumbar Spine: A Review on Applications, Limitations, and Challenges," Feb. 01, 2023, *MDPI*. doi: 10.3390/bioengineering10020202.

[34] S. Lee, Y. Jiang, and C. K. Liu, "Anatomically Detailed Simulation of Human Torso," *ACM Trans. Graph.*, vol. 42, no. 4, Aug. 2023, doi: 10.1145/3592425.

[35] "Nyeri Punggung: Deskripsi & Pilihan," Bumrungrad International Hospital. Accessed: Mar. 12, 2026. [Online]. Available: https://www.bumrungrad.com/id/conditions/back-pain

[36] H. Shayestehpour, S. Tørholm, M. Damsgaard, M. E. Lund, C. Wong, and J. Rasmussen, "A generic detailed multibody model for simulating thoracic spine and ribcage kinematics," *Multibody Syst. Dyn.*, vol. 65, no. 1, pp. 51–68, Sep. 2025, doi: 10.1007/s11044-024-10034-0.

[37] P. Eulzer, S. Bauer, F. Kilian, and K. Lawonn, "Visualization of Human Spine Biomechanics for Spinal Surgery," *IEEE Trans. Vis. Comput. Graph.*, vol. 27, no. 2, pp. 700–710, Feb. 2021, doi: 10.1109/TVCG.2020.3030388.

[38] M. Christophy, N. A. F. Senan, J. C. Lotz, and O. M. O'Reilly, "A Musculoskeletal model for the lumbar spine," *Biomech. Model. Mechanobiol.*, vol. 11, no. 1–2, pp. 19–34, 2012, doi: 10.1007/s10237-011-0290-6.

[39] C. Liebsch and H. J. Wilke, "How Does the Rib Cage Affect the Biomechanical Properties of the Thoracic Spine? A Systematic Literature Review," 2022. doi: 10.3389/fbioe.2022.904539.

[40] A. Du Plessis *et al.*, "Vertebrae at the thoracolumbar junction: A quantitative assessment using CT scans," *J. Anat.*, vol. 240, no. 6, 2022, doi: 10.1111/joa.13619.

[41] S. Nakanishi, K. Watanabe, K. Ouchi, M. Hakozaki, N. Oi, and S. Konno, "Reference values of lumbar spine range of motion by sex and age based on the assessment of supine trunk lateral bending-A preliminary study," *Fukushima Journal of Medical Sciences*, vol. 70, no. 1, 2024, doi: 10.5387/fms.2023-24.

[42] Z. Li, Z. Liu, Y. Yang, Z. Zhang, L. Meng, and J. Miao, "In vivo kinematic study of lumbar center of rotation under different loads," *BMC Musculoskelet. Disord.*, vol. 26, no. 1, 2025, doi: 10.1186/s12891-025-08410-8.

[43] "Scapulothoraric Joint," Physiopedia. Accessed: Mar. 12, 2026. [Online]. Available: https://www.physio-pedia.com/Scapulothoracic_Joint

[44] P. Narkhede, S. Poddar, R. Walambe, G. Ghinea, and K. Kotecha, "Cascaded complementary filter architecture for sensor fusion in attitude estimation," *Sensors*, vol. 21, no. 6, 2021, doi: 10.3390/s21061937.

[45] R. Lungu, A. N. Tudosie, M. A. Lungu, and N. C. Crăciunoiu, "Actuators with Two Double Gimbal Magnetically Suspended Control Moment Gyros for the Attitude Control of the Satellites," *Micromachines (Basel).*, vol. 15, no. 9, 2024, doi: 10.3390/mi15091159.

[46] C. Papakonstantinou, V. Lappas, and V. Kostopoulos, "A gimballed control moment gyroscope cluster design for spacecraft attitude control," *Aerospace*, vol. 8, no. 9, 2021, doi: 10.3390/aerospace8090273.

[47] T. Guo, W. Wei, Q. Cai, R. Cui, C. Shen, and H. Cao, "Design and Fabrication of a Novel Wheel-Ring Triaxial Gyroscope," *Sensors*, vol. 22, no. 24, 2022, doi: 10.3390/s22249978.

[48] W. Huang *et al.*, "MEMS and MOEMS Gyroscopes: A Review," Dec. 01, 2023, *Springer Verlag*. doi: 10.1007/s13320-023-0693-x.

[49] M. IRWAN, "PEMANFAATAN SENSOR 3 AXIS GYROSCOPE PADA ROBOT SENI TARI BERBASIS RASPBERRY PI," *Jurnal Processor*, vol. 14, no. 1, pp. 23–34, Apr. 2019, doi: 10.33998/processor.2019.14.1.555.

[50] J. Figueiredo, S. P. Carvalho, J. P. Vilas-Boas, L. M. Gonçalves, J. C. Moreno, and C. P. Santos, "Wearable inertial sensor system towards daily human kinematic gait analysis: Benchmarking analysis to MVN BIOMECH," *Sensors (Switzerland)*, vol. 20, no. 8, 2020, doi: 10.3390/s20082185.

[51] Z. Wang, X. Jin, Y. Huang, and Y. Wang, "Research on the Human Motion Recognition Method Based on Wearable," *Biosensors (Basel).*, vol. 14, no. 7, 2024, doi: 10.3390/bios14070337.

[52] A. Suprayogi, H. Fitriyah, and Tibyani, "Sistem Pendeteksi Kecelakaan Pada Sepeda Motor Berdasarkan Kemiringan Menggunakan Sensor Gyroscope Berbasis Arduino," *Jurnal Pengembangan Teknologi Informasi dan Ilmu Komputer*, vol. 3, no. 3, 2019.

[53] "MPU-6000 and MPU-6050 Product Specification Revision 3.4 MPU-6000/MPU-6050 Product Specification," 2013.

[54] S. R. Sain and V. N. Vapnik, "The Nature of Statistical Learning Theory," *Technometrics*, vol. 38, no. 4, 1996, doi: 10.2307/1271324.

[55] J. Cervantes, F. Garcia-Lamont, L. Rodríguez-Mazahua, and A. Lopez, "A comprehensive survey on support vector machine classification: Applications, challenges and trends," *Neurocomputing*, vol. 408, 2020, doi: 10.1016/j.neucom.2019.10.118.

[56] D. A. Pisner and D. M. Schnyer, "Support vector machine," *Machine Learning: Methods and Applications to Brain Disorders*, pp. 101–121, Jan. 2020, doi: 10.1016/B978-0-12-815739-8.00006-7.

[57] E. Becker *et al.*, “Using Inertial Measurement Units and Machine Learning to Classify Body Positions of Adults in a Hospital Bed,” *Sensors*, vol. 25, no. 2, 2025, doi: 10.3390/s25020499.

[58] K. L. Du, B. Jiang, J. Lu, J. Hua, and M. N. S. Swamy, “Exploring Kernel Machines and Support Vector Machines: Principles, Techniques, and Future Directions,” *Mathematics 2024, Vol. 12,* vol. 12, no. 24, Dec. 2024, doi: 10.3390/math12243935.

[59] C. Cortes, V. Vapnik, and L. Saitta, “Support-vector networks,” *Machine Learning 1995 20:3*, vol. 20, no. 3, pp. 273–297, Sep. 1995, doi: 10.1007/BF00994018.

[60] C. J. C. Burges, “A tutorial on support vector machines for pattern recognition,” *Data Min. Knowl. Discov.*, vol. 2, no. 2, pp. 121–167, 1998, doi: 10.1023/A:1009715923555/METRICS.

[61] J. Taborri, E. Palermo, and S. Rossi, “WARNING: A Wearable Inertial-Based Sensor Integrated with a Support Vector Machine Algorithm for the Identification of Faults during Race Walking,” *Sensors 2023, Vol. 23, Page 5245*, vol. 23, no. 11, p. 5245, May 2023, doi: 10.3390/S23115245.

[62] R. Guido, M. C. Groccia, and D. Conforti, “A hyper-parameter tuning approach for cost-sensitive support vector machine classifiers,” *Soft Computing 2022 27:18*, vol. 27, no. 18, pp. 12863–12881, Feb. 2022, doi: 10.1007/S00500-022-06768-8.

[63] P. Cunningham and S. J. Delany, “K-Nearest Neighbour Classifiers-A Tutorial,” 2022. doi: 10.1145/3459665.

[64] S. Mohsen, A. Elkaseer, and S. G. Scholz, “Human Activity Recognition Using K-Nearest Neighbor Machine Learning Algorithm,” in *Smart Innovation, Systems and Technologies*, 2022. doi: 10.1007/978-981-16-6128-0_29.

[65] 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, 2021, doi: 10.3390/s21030692.

[66] M. Çalişan, M. Fatih TALU, A. Makalesi, and R. Article Mücahit ÇALIŞAN, “Comparison of Methods for Determining Activity from Physical Movements,” *Journal of Polytechnic*, vol. 24, no. 1, pp. 17–23, Mar. 2021, doi: 10.2339/POLITEKNIK.632070.

[67] P. Hall, B. U. Park, and R. J. Samworth, “Choice of neighbor order in nearest-neighbor classification,” *Ann. Stat.*, vol. 36, no. 5, pp. 2135–2152, Oct. 2008, doi: 10.1214/07-AOS537.

[68] A. Tharwat, “Classification assessment methods,” *Applied Computing and Informatics*, vol. 17, no. 1, 2018, doi: 10.1016/j.aci.2018.08.003.

[69] S. Sathyanarayanan, “Confusion Matrix-Based Performance Evaluation Metrics,” *African Journal of Biomedical Research*, pp. 4023–4031, Nov. 2024, doi: 10.53555/AJBR.V27I4S.4345.

[70] D. Hercog, T. Lerher, M. Truntič, and O. Težak, “Design and Implementation of ESP32-Based IoT Devices,” *Sensors*, vol. 23, no. 15, 2023, doi: 10.3390/s23156739.
[71] M. J. Espinosa-Gavira, A. Agüera-Pérez, J. C. Palomares-Salas, J. M. Sierra-Fernandez, P. Remigio-Carmona, and J. J. González de-La-Rosa, “Characterization and Performance Evaluation of ESP32 for Real-time Synchronized Sensor Networks,” in *Procedia Computer Science*, 2024. doi: 10.1016/j.procs.2024.05.104.
[72] I. Ruslianto, U. Ristian, H. Hasfani, K. Sari, and J. DrHHadari Nawawi, “JEPIN (Jurnal Edukasi dan Penelitian Informatika) Rekayasa Sistem Fotosintesis dan Ekosistem pada Media Aquascape Berbasis Internet Of Things,” 2023.
[73] “ESP32 Datasheet.” Accessed: Mar. 13, 2026. [Online]. Available: https://documentation.espressif.com/esp32_datasheet_en.pdf
[74] “TCA9548A Low-Voltage 8-Channel I 2 C Switch with Reset,” Texas Instruments. Accessed: Mar. 12, 2026. [Online]. Available: https://www.ti.com/lit/ds/symlink/tca9548a.pdf
[75] “TCA9548A – I2C Multiplexer,” Wolles Elektronikkiste. Accessed: Mar. 12, 2026. [Online]. Available: https://wolles-elektronikkiste.de/en/tca9548a-i2c-multiplexer\
[76] 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*, 2019. doi: 10.1088/1757-899X/602/1/012017.
[77] 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 Sciencesinjects*, vol. 5, no. 2, 2024.
[78] C. S. Makola, P. F. Le Roux, and J. A. Jordaan, “Comparative Analysis of Lithium-Ion and Lead–Acid as Electrical Energy Storage Systems in a Grid-Tied Microgrid Application,” *Applied Sciences (Switzerland)*, vol. 13, no. 5, 2023, doi: 10.3390/app13053137.
[79] R. L. Oliveri, M. G. Insinga, S. Pisana, B. Patella, G. Aiello, and R. Inguanta, “High-performance lead-acid batteries enabled by Pb and PbO2 nanostructured electrodes: Effect of operating temperature,” *Applied Sciences (Switzerland)*, vol. 11, no. 14, 2021, doi: 10.3390/app11146357.
[80] D. E. O. Juanico, “Revitalizing lead-acid battery technology: a comprehensive review on material and operation-based interventions with a novel sound-assisted charging method,” *Frontiers in Batteries and Electrochemistry*, vol. 2, 2024, doi: 10.3389/fbael.2023.1268412.
[81] “CENTRA Plus CB955 | Exide.” Accessed: Mar. 13, 2026. [Online]. Available: https://www.exidegroup.com/eu/en/battery/CB955

[82] D. Nabila, “Perancangan Sistem Pengendalian Kursi Roda Berdasarkan Gerakan Tubuh Menggunakan Sensor Gyroscope dengan Metode Klasifikasi Decision Tree,” *e-Skripsi Universitas Andalas*, 2025.