Invitation to Submit

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Guest Editors: Dr. Emanuele Piuzzi, Dr. Orlandino Testa and Dr. Erika Pittella
Deadline: 15 August 2026

Advances in Wearable and Implantable Biosensors: Materials, Design, and Applications
Guest Editors: Dr. Zhanhong Li and Dr. Cheng Yang
Deadline: 20 October 2026

Combining Brain-Computer Interfaces and Assistive Biosensing Technologies
Guest Editor: Dr. Chunxiu Yu
Deadline: 15 December 2026

Feature Papers in Biosensors Section 2026
Guest Editors: Prof. Dr. Alexander Star, Prof. Dr. Patrick Wagner and Prof. Dr. Spyridon Kintzios
Deadline: 31 December 2026

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Editorial Office
sensors@mdpi.com

MDPI
Grosspeteranlage 5
4052 Basel, Switzerland
Tel: +41 61 683 77 34
mdpi.com

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Selected Papers

Enhancing Upper Limb Exoskeletons Using Sensor-Based Deep Learning Torque Prediction and PID Control

Authors: Farshad Shakeriaski and Masoud Mohammadian

Abstract: Upper limb assistive exoskeletons help stroke patients by assisting arm movement in impaired individuals. However, effective control of these systems to help stroke survivors is a complex task. In this paper, a novel approach is proposed to enhance the control of upper limb assistive exoskeletons by using torque estimation and prediction in a proportional–integral–derivative (PID) controller loop to more optimally integrate the torque of the exoskeleton robot, which aims to eliminate system uncertainties. First, a model for torque estimation from Electromyography (EMG) signals and a predictive torque model for the upper limb exoskeleton robot for the elbow are trained. The trained data consisted of two-dimensional high-density surface EMG (HD-sEMG) signals to record myoelectric activity from five upper limb muscles (biceps brachii, triceps brachii, anconeus, brachioradialis, and pronator teres) during voluntary isometric contractions for twelve healthy subjects performing four different isometric tasks (supination/pronation and elbow flexion/extension) for one minute each, which were trained on long short-term memory (LSTM), bidirectional LSTM (BLSTM), and gated recurrent units (GRU) deep neural network models. These models estimate and predict torque requirements....

https://doi.org/10.3390/s25113528

Metal–Organic-Framework-Based Optical Biosensors: Recent Advances in Pathogen Detection and Environmental Monitoring

Authors: Alemayehu Kidanemariam and Sungbo Cho

Abstract: Metal–organic frameworks (MOFs) have emerged as highly versatile materials for the development of next-generation optical biosensors owing to their tunable porosity, large surface area, and customizable chemical functionality. Recently, MOF-based platforms have shown substantial potential in various optical transduction modalities, including fluorescence, luminescence, and colorimetric sensing, enabling the highly sensitive and selective detection of biological analytes. This review provides a comprehensive overview of recent advancements in MOF-based optical biosensors, focusing on their applications in pathogen detection and environmental monitoring. We highlight key design strategies, including MOF functionalization, hybridization with nanoparticles or dyes, and integration into microfluidic and wearable devices. Emerging methods, such as point-of-care diagnostics, label-free detection, and real-time monitoring, are also discussed. Finally, the current challenges and future directions for the practical deployment of MOF-based optical biosensors in clinical and field environments are discussed.

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Uncovering the Kinematic Signature of Freezing of Gait in Parkinson's Disease Through Wearable Inertial Sensors

Authors: Francesco Castelli Gattinara Di Zubiena, Alessandro Zampogna, Martina Patera, Giovanni Cusolito, Ludovica Apa, Ilaria Mileti,Antonio Cannuli, Antonio Suppa, Marco Paoloni, Zaccaria Del Prete and Eduardo Palermo

Abstract: Parkinson's disease (PD) is a disorder that causes a decrease in motor skills. Among the symptoms that have been observed, the most significant is the occurrence of Freezing of Gait (FoG), which manifests as an abrupt cessation of walking. This study investigates the impact of spatiotemporal gait parameters using wearable inertial measurement units (IMUs). Notably, 30 PD patients (15 with FoG, 15 without) and 20 healthy controls were enrolled. Gait data were acquired using two foot-mounted IMUs and key parameters such as stride time, gait phase distribution, cadence, stride length, speed, and foot clearance were extracted. Results indicated a tangible decline in motor abilities in PD patients, especially in those with FoG. Differences were observed in the segmentation of gait phases, with diminished swing phase duration observed in patients, and in the diminished spatial parameters of stride length, velocity, and foot clearance....

https://doi.org/10.3390/s25165054

AI-Enabled Microfluidics for Respiratory Pathogen Detection

Authors: Daoguangyao Zhang, Xuefei Lv, Hao Jiang, Yunlong Fan, Kexin Liu, Hao Wang and Yulin Deng

Abstract: Respiratory infectious diseases, such as COVID-19, influenza, and tuberculosis, continue to impose a significant global health burden, underscoring the urgent demand for rapid, sensitive, and cost-effective diagnostic technologies. Integrated microfluidic platforms offer compelling advantages through miniaturization, automation, and high-throughput processing, enabling "sample-in, answer-out" workflows suitable for point-of-care applications. However, their clinical deployment faces challenges, including the complexity of sample matrices, low-abundance target detection, and the need for reliable multiplexing. The convergence of artificial intelligence (AI) with microfluidic systems has emerged as a transformative paradigm, addressing these limitations by optimizing chip design, automating sample pre-processing, enhancing signal interpretation, and enabling real-time feedback control. This critical review surveys AI-enabled strategies across each functional layer of respiratory pathogen diagnostics: from chip architecture and fluidic control to amplification analysis, signal prediction, and smartphone/IoT-linked decision support. We highlight key areas where AI offers measurable benefits over conventional methods. To transition from research prototypes to clinical tools, future systems must become more adaptive, data-efficient, and clinically insightful....

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