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Advancing health monitoring with cognitive IoT, rapid machine learning, and mechanical systems

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Abstract

Enhancing health monitoring for diabetes patients requires routine surveillance. Integrating IoT, embedded software, data analytics, intelligent systems, and smart devices can alleviate healthcare costs. Improved communication technologies enable remote exercise therapies. An intelligent healthcare infrastructure and expanded network packages are crucial for evolving e-health applications. Integration with 5G ensures higher bandwidth and energy efficiency. Real healthcare programs need seamless integration. In this study, an intelligent infrastructure for diabetes patient tracking using machine learning, smart gadgets, sensors, mobile phones, and mechanical systems ensure comprehensive data collection. Machine learning algorithms analyze patient data for efficient monitoring and prediction. Rigorous testing confirms system effectiveness.

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Abstract

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Innovative micro biotechnological approaches for bioenergy production from waste

Sustainable Management of Agro-Food Waste: Fundamental Aspects and Practical Applications • Book Chapter • 2024 • DOI: 10.1016/B978-0-443-23679-2.00015-X

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Abstract

Energy is of the utmost importance to transact the world economy. Globally, there is a high demand for nonrenewable fossil fuels energy production for electricity, transportation, and manufacturing. Fossil fuels have various negative aspects such as the limited existence of fossil fuels, pollution, dangerous health effects, and threats to the natural environmental balance. The present energy scenario has encouraged the exploration of more efficient alternative sources of energy that provide an uninterrupted balanced energy supply. Biofuels are an environment-friendly alternative source for renewable bioenergy production. Economical biofuels can be produced from carbon-rich agricultural plant crop biowaste. Biofuels occur in the three states: solid wood charcoal, liquid in bioethanol, biodiesel and biogas in gas form. Generally, bioethanol and biodiesel are used as biofuels. Biodiesel is produced by esterifying triglycerides with methanol from plants and animal sources. Fermentative microorganisms obtain biofuels namely bioethanol biogas and biohydrogen by a biochemical procedure. Microbial strains have a significant role in fermentation and sustainable bioenergy production. This has motivated researchers to apply biotechnological approaches to produce high-volume biofuels through an economically viable potential microbial system. This chapter describes advances in microbial biotechnology

approaches used for economical, ecofriendly, toxic-free, renewable, and sustainable bioenergy production from waste. © 2025 Elsevier Inc. All rights reserved.

Author keywords

Biodiesel; bioethanol; biofuels; microbial biotechnology; renewable energy; sustainable bioenergy production

Abstract

Author keywords

Optimizing Routing Paths in Mobile Wireless Sensor Networks: A Sub-Flow Adaptive Multipath Approach for Energy Efficiency and Delay Sensitivity

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Abstract

Wireless Sensor Networks (WSNs) have become crucial in various domains such as social applications, healthcare, and the military. However, their diversity makes them susceptible to a wide range of attacks, leading to challenges like poor throughput, high network latency, and excessive energy consumption. This study proposes a novel approach that combines residual Riemannian neural networks with the Sub-Flow Adaptive Multipath Routing algorithm for enhanced routing and attack detection in WSNs. By leveraging node position data, the Sub-Flow Adaptive Multipath Routing algorithm optimizes energy consumption and extends network lifespan. Simultaneously, residual Riemannian neural networks analyze residual patterns in network traffic data to accurately detect rogue nodes, thereby enhancing security. Blockchain technology is then employed to securely store classified data, ensuring data integrity and security. This integrated approach significantly improves network performance, maintains robust security against potential threats, and enhances the reliability of WSNs in demanding environments. © 2024 IEEE.

Author keywords

blockchain; residual Riemannian neural network; Sub Flow Adaptive Multipath Routing algorithm; Wireless sensor networks

Indexed keywords

Engineering controlled terms

Delay tolerant networks; Intelligent systems; Network security; Routing algorithms; Wireless sensor networks

Engineering uncontrolled terms

Adaptive multipath routing; Block-chain; Energy-consumption; Multipath routing algorithms; Neural-networks; Residual riemannian neural network; Routing path; Sensors network; Sub flow adaptive multipath routing algorithm; Wireless sensor

Engineering main heading

Energy utilization

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Sustainable Water Management and Treatment: Systems, Processes and Technologies

Environmental Science and Engineering • Book Chapter • 2025 • DOI: 10.1007/978-3-031-85327-2_7

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Abstract

Global water resources are rapidly diminishing, driven by population growth, climate changeClimate change, and expanding industrialization. Experts estimate that by 2050, 52% of the projected 9.7 billion people worldwide will reside in areas experiencing water stress or scarcity. The global challenge of accessing clean, potable water will persist as sustainable solutions remain elusive. Water sustainabilitySustainability involves meeting the current generation's water needs without jeopardizing future generations' ability to meet their own. Water is the cornerstone of sustainable developmentSustainable development, serving as a common thread linking global challenges such as energy, food securityFood security, health, peace, security, and poverty eradication. Our survival and well-being depend heavily on effective water resource systems. However, with growing development pressures on land in watersheds and increasing demands for water in streams, rivers, lakes, and aquifers, it is unrealistic to expect these water systems to return to or maintain their pristine, most productive states. Sustainable water managementWater management (SWM) is crucial for addressing these pressures and achieving sustainable development goalsSustainable Development Goals (SDGs). SWM ensures that current water needs are met for all users without compromising the ability of future generations to meet their own needs. This concept aligns with broader sustainability principlesSustainability principles, addressing both present and future water challenges. Enhancing the efficiency of conventional membrane technologies for water treatment is now crucial to minimizing their environmental impactEnvironmental impact.

WastewaterWastewater treatmenttreatmentWastewater treatment removes pollutants, coarse particles, and toxic substances while killing pathogens and producing bio-methaneMethane (CH_4) and manure for agricultureAgriculture. It is crucial in reducing water waste, easing pressure on natural water sources, and supporting clean energy, forming the foundation for sustainable waste managementWaste management. Membrane technologies are increasingly favored forSustainable wastewater treatmentwastewater treatmentWastewater treatment due to their sustainabilitySustainability advantages, including cost-effectiveness, operational ease, and safety. Sustainable water treatment technologies utilize innovative methods such as membrane filtrationMembrane filtration, advanced oxidation processesAdvanced Oxidation Processes (AOPs), and nanotechnologyNanotechnology. Techniques like reverse osmosisReverse osmosis and ultrafiltration are highly effective in removing contaminantsContaminants, microorganisms, and nanoparticles from water. Sustainable water technologies include wastewater treatmentWastewater treatment plants, intelligent irrigation systems, fog catchers, rainwater harvestingRainwater harvesting, tap aerators, seawater desalinationDesalination, portable filters, and solar-powered desalinationDesalination units.

Author keywords

Electro deionization; Membrane technology; Water management; Water pollution; Water scarcity; Water Stress Index; Waterborne diseases

Indexed keywords

Engineering controlled terms

Agriculture; Cost effectiveness; Environmental technology; Microfiltration; Population statistics; Potable water; River pollution; Sustainable development; Sustainable development goals; Wastewater treatment; Water conservation; Water filtration; Waterworks

Engineering uncontrolled terms

Electro-deionization; Future generations; Global challenges; Sustainable water; Sustainable water management; Water needs; Water scarcity; Water stress indices; Water-borne disease; Waters managements

Engineering main heading

Membrane technology

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Abstract

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