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Special Issue Reprint

Modelling and Simulation of Transportation Systems

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Transportation systems, with their complexity and need for consonance among infrastructures, vehicles, technologies, data, and humans, resemble the circulatory system of modern societies. The reprint “Modelling and Simulation of Transportation Systems” highlights how computational modelling, simulation and data-driven analytics address the complexity, dynamic nature and stochastic behavior of transport systems. It covers multiple modes and scales, from behavioral traffic safety to urban operations, freight logistics and emerging mobility technologies. Key challenges addressed include understanding risk and driver behaviour using simulator-based testing; improving safety through modelling of traffic and infrastructure layouts; enhancing urban traffic management with scalable network algorithms; and evaluating demand-responsive mobility services. Additional studies address logistics reliability via discrete-event simulation of terminal operations and last-mile locker systems, supporting proactive maintenance and service-level design. The reprint also reflects major transitions, including electrification and automation. Hybrid simulation estimates motorway EV fast-charging needs, while microsimulation assesses how automated vehicle penetration influences intersection performance. Forecasting and transport intelligence use deep learning for spatiotemporal traffic prediction, and crisis resilience uses neural network-based demand modelling for passenger rails. The reprint is for researchers, engineers, planners, and policymakers seeking validated tools for safer, more efficient, resilient and sustainable transportation systems.

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