Special Issue

Statistical Analysis and AI Models in the Big Data Era

Message from the Guest Editors

In the current era of vast amounts of data, statistical analysis has evolved from small-sample inference to addressing high-dimensional, streaming, and diverse data where traditional assumptions often do not apply. Today's statistical methods are closely integrated with algorithm development: Bayesian deep learning offers calibrated uncertainty estimates through variational inference and Monte Carlo dropout with post-specific experimental settings to recalibrate the outputs; conformal prediction ensures finite-sample coverage without relying on distributional assumptions; and robust statistics defend against adversarial or corrupted data. Simultaneously, causal inference and counterfactual reasoning are being adapted for large observational datasets, supporting policy decisions in medicine, finance, and climate science. In essence, the integration of rigorous statistical theory and scalable AI architectures is propelling a transition from basic prediction to principled, reliable decision-making under uncertainty in the Big Data era. We eagerly anticipate contributions that advance our understanding in these critical domains.

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The journal *Mathematics* publishes high-quality, refereed papers that treat both pure and applied mathematics. The journal highlights articles devoted to the mathematical treatment of questions arising in physics, chemistry, biology, statistics, finance, computer science, engineering and sociology, particularly those that stress analytical/algebraic aspects and novel problems and their solutions. One of the missions of the journal is to serve mathematicians and scientists through the prompt publication of significant advances in any branch of science and technology, and to provide a forum for the discussion of new scientific developments.

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