

Special Issue

Data Mining, Optimization Algorithms and Applications in the Era of Foundation Models

Message from the Guest Editors

Foundation models—including large language models, vision transformers, and multi-modal architectures—have reshaped AI applications across language, image, and cross-modal tasks. However, in many domain-specific or low-resource scenarios, available data are often limited, highly structured, or weak in statistical regularity, making it difficult for large-scale pretraining to deliver reliable performance. Even the construction of vertical-domain foundation models faces challenges due to data scarcity and adaptation costs. These gaps underscore the continued relevance of classical and domain-adapted models—including CNNs, graph models, and other task-specific architectures—alongside optimization-driven approaches and data-centric learning. This Special Issue invites research that tackles complex, sparse, or structured data using innovative data mining techniques, optimization algorithms, and hybrid modeling strategies. We especially welcome studies that integrate algorithmic rigor with modern AI paradigms to enhance learning in domains where foundation models fall short or must be complemented.

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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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