Special Issue

LLM-Inspired New Generation Machine Learning: Hyperparameter Optimization and Uncertainty Quantification

Message from the Guest Editors

Large Language Models (LLMs) have redefined scalability, context-awareness, and generalization in AI. Beyond text, their architectural innovations—massive parameterization, in-context learning, and implicit ensemble behavior—offer transformative insights for core machine learning challenges, particularly hyperparameter optimization (HPO) and uncertainty quantification (UQ). This Special Issue seeks to bridge LLM-inspired paradigms with rigorous UQ and adaptive HPO to overcome these limitations. We invite contributions that re-imagine Bayesian frameworks through an LLM lens. Key directions include:

- LLM-driven HPO: meta-learning of search spaces, transformer-based surrogate models, or prompt-guided Bayesian optimization;
- Well-calibrated UQ: Bayesian Model Averaging via ensemble-of-thoughts, Bayesian neural networks with attention-weighted priors, or test-time entropy regularization inspired by chain-of-thought sampling;
- Real-world robustness: UQ under class imbalance (e.g., rare disease detection), survival analysis with censored data, or financial time-series with non-stationarity.

Guest Editors

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Deadline for manuscript submissions

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About the Journal

Message from the Editor-in-Chief

Machine learning deals with understanding intelligence to design algorithms that can learn from data, gain knowledge from experience and improve their learning behaviour over time. The challenge is to extract relevant structural and/or temporal patterns ("knowledge") from data, which is often hidden in high dimensional spaces, thus not accessible to humans. Many application domains, e.g., smart health, smart factory, etc. affect our daily life, e.g., recommender systems, speech recognition, autonomous driving, etc. The grand challenge is to understand the context in the real-world under uncertainty. Probabilistic inference can be of great help here as the inverse probability allows to learn from data, to infer unknowns, and to make predictions to support decision making.

Editor-in-Chief

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