Call for Papers
Special Issue on Large Language Models for Combinatorial Constraint Solving (LLM-Solve)

Constraints Journal

Guest Editors

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Overview

Combinatorial problem-solving paradigms, covering Constraint Programming (CP), Boolean Satisfiability (SAT/SMT), and Operations Research (OR), provide powerful frameworks for finding feasible and optimal decisions. However, their industrial adoption has long faced a persistent bottleneck: the steep expertise required to translate problem descriptions in natural language into formal constraint models.

Concurrently, Generative AI and Large Language Models (LLMs) have evolved into sophisticated, multi-agent reasoning engines capable of code synthesis, retrieval-augmented generation, and step-by-step planning. While LLMs excel at processing natural language and generating draft hypotheses, they lack the intrinsic mathematical guarantees required for formal correctness, leading to logical inconsistencies or subtle modeling errors when deployed out-of-the-box.

This Special Issue of the *Constraints* journal explores the synergy between generative AI and constraint solvers. We invite high-quality, original research submissions that leverage LLMs to lower the barrier to combinatorial problem solving.

Topics of Interest

We welcome original research contributions spanning discrete, continuous, and hybrid optimization and satisfaction settings. Topics of interest include, but are not limited to:

1. LLMs for Constraint Modeling & Automated Elicitation

- Automated translation of natural language specifications into formal optimization models (CP, SAT, SMT, MILP, etc.).
- Conversational constraint elicitation, intermediary knowledge compilation from unstructured problem descriptions.
- Automated constraint acquisition, model synthesis, and semantic reformulation using generative AI.

2. Hybrid Architectures & Multi-Model Neuro-Symbolic Systems

- Agentic workflows, self-reflection loops, and retrieval-augmented generation specialized for combinatorial structures.
- Solver-in-the-loop reasoning: using CP/SAT solvers as verification execution engines to control, correct, or bound LLM outputs.
- Multi-model ecosystems separating generation from judging, evaluating, or cross-verifying optimization scripts.

3. Solver Optimization, Configuration, & Tuning

- LLM-guided search heuristics, variable/value branching, node ordering and cut strategy selection.
- Automated hyperparameter tuning, algorithm selection, and solver portfolio configuration using text-based performance representations.
- Generative configurations for low-level solver mechanics, such as cutting-plane selection or preprocessing rules.

4. Benchmarks, Datasets, & Infrastructure

- Open-source repositories and centralized benchmarks for evaluating LLMs on constraint tasks
- Systematic evaluation methodologies focusing on the correctness, robustness, and solution quality of LLM-driven optimization pipelines

Submission Guidelines & Review Process

Please refer to the Constraints Journal submissions guidelines and ensure to select the special issue track: **"SI: Large Language Models for Combinatorial Constraint Solving"**.

`https://link.springer.com/journal/10601/submission-guidelines`

To ensure high scientific quality, streamline the reviewer workload, and provide authors with prompt feedback, this Special Issue will implement a two-phase review process:

- **Phase 1 (Editorial Desk Review):** Upon submission, the Guest Editorial Board will conduct a fast-track initial evaluation to assess scope, relevance, technical rigor, and publication readiness. Papers that do not meet the core criteria will receive an immediate decision, allowing authors to redirect their work without prolonged delays.
- **Phase 2 (Full Peer Review):** Submissions passing Phase 1 will immediately proceed to an in-depth peer review by domain experts. To support a timely and collaborative evaluation process, authors of submitted papers may be invited to contribute as peer reviewers.

Submission Deadline: October 1, 2026

Inquiries: For inquiries regarding scope, track fit, and submissions, please contact the lead guest editor at serdark@cs.brown.edu.