

PROJECT APPROVAL

G³: Geometric Graph Grammar ToolChain

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Status: Approved

Date: June 26, 2026

Authority: Founder, pursuant to §14.4 of the Bylaws (Initial Period)

1 Project Identification

Project Name. G³ (Geometric Graph Grammar ToolChain).

Description. G³ is an infrastructure and analysis foundation for geometric grammar induction. The toolchain learns context-free geometric graph grammars from input graphs (inverse procedural modeling) and generates geometric structures from such grammars (forward modeling).

Motivations. Many systems of interest to the Society's research — social systems, biological systems, and other dynamical systems including economic systems — characteristically exhibit fractal or self-similar geometric structure. A generative graph grammar provides a natural language for capturing such structure: it expresses the coupling of non-local substructures in compact, operationally executable, and formally verifiable form. The toolchain therefore offers a methodological foundation for the analysis of social organization, the spacetime structure of social value propagation, and the dynamics of biological and economic systems. Beyond the graph-theoretic case, the 2-complex is foundational in modern theoretical field-theoretic physics as a discrete-spacetime basis. The extension of grammar induction to 2-complex structures, and more generally to k-complex structures, opens a methodological bridge between graph-theoretic geometry and field-theoretic spacetime.

Objectives. The Project pursues three objectives, in order:

1. Implement the two-dimensional grammar inducer following the established reference algorithm;
2. Extend the algorithm to three-dimensional geometric structures; and
3. Design and implement higher-dimensional induction and analysis algorithms from a k-complex perspective, with particular attention to the 2-complex case as a methodological bridge to field-theoretic applications.

Expected Outcomes. An open-source toolchain available to the international research community; a methodological foundation that the Society and its collaborators may apply to the

analysis of social, biological, and dynamical systems; and, through the k-complex extension, an instrument that supports research at the interface between graph-theoretic geometry and discrete-spacetime field theory.

2 Infrastructural Domain Classification

Primary classification. G^3 is classified under **Schedule A, Domain I: Theoretical Infrastructure**, articulated in Schedule A as “understanding clearly how people are actually connected to one another.”

Reasoning for the classification. The classification rests on the following considerations:

1. **Graphs are relational structures.** A graph consists of nodes (entities) and edges (relations between them). The fundamental object of study in graph theory is therefore relational by construction. Tools that improve the analysis and representation of graphs are tools that improve the understanding of relational structures.
2. **Grammar induction is the discovery of compositional rules.** The act of inducing a graph grammar from data is the act of finding the rules by which complex relational structures are built from simpler ones. This is, in formal terms, the construction of a compositional ontology for the relational domain under study. The grammar is a theoretical artifact: it states, in compressed form, what the underlying generative principles are.
3. **The toolchain is methodological, not domain-specific.** G^3 does not, of itself, study any particular substantive domain. It provides a method that can be applied to many domains where relational structure is the object of inquiry (architectural, biological, social, urban, organizational, and other graph-representable systems). It is therefore properly understood as theoretical/methodological infrastructure rather than as a project within any specific applied domain.
4. **Compression as understanding.** The technique of finding a compact grammatical description of input data is, in information-theoretic terms, equivalent to finding a model that captures what is generative and discarding what is incidental. This identification of generative principle from observation is one of the senses in which “understanding” is operationalized in modern theoretical work. The toolchain therefore contributes directly to the Society’s theoretical mission as articulated in Domain I.

Cross-domain applicability. While the primary classification is Theoretical, the toolchain may, when applied, support work classified under other domains of Schedule A. For example, an application of G^3 to the analysis of a co-creative process (Domain V) or to the structural analysis of educational interactions (Domain VI) would, when performed, fall within those respective domains. The primary classification reflects the nature of the toolchain itself, not the domains of its eventual applications.

3 License Selection

License. MIT License, with copyright held by Serendip Commons Society.

Reasoning. The MIT License is permissive, simple, and broadly compatible with other licenses. It allows the toolchain to be adopted, modified, and combined freely in academic, research, and

commercial contexts, while preserving attribution of the Society as originator. This selection is consistent with the Society’s commitment to working in the open and to international research collaboration without claim of proprietary control over downstream use.

4 Ethics Review Determination

Determination. Ethics review under §3.5 of the Bylaws is **not required** for the development and release of the G³ toolchain.

Reasoning for the determination. The relevant text of §3.5 requires ethics examination for any project involving “human subjects, sensitive personal data, vulnerable populations, biomedical or psychological research, or other matters requiring ethical review.” The G³ toolchain, as a project of the Society:

- Does not involve human subjects;
- Does not collect, process, or store personal data of any kind;
- Does not involve any vulnerable population;
- Is not biomedical or psychological research; and
- Operates on synthetic and publicly-available geometric data structures that have no connection to identifiable persons.

The toolchain is a purely mathematical and algorithmic artifact. Its development, release, and use raise no question of the protection of persons that ethics review is designed to address.

Caveat regarding downstream applications. This determination applies to the toolchain itself. Specific applications of the toolchain that, in future, involve any of the categories enumerated in §3.5 (for example, application to medical-imaging data, to social-network data containing personal identifiers, or to research involving human participants) would require ethics review at the time of those applications, and would constitute separate projects for the purposes of the Society’s project approval procedure. The present determination does not pre-approve any such future application.

5 Authority and Effective Date

This Project Approval is issued by the undersigned Founder, exercising the authority granted under §14.4 of the Bylaws to approve projects of the Society during the Initial Period. The Project is approved as of the date set forth above. The Society shall maintain this Project Approval document, together with all subsequent records relating to the Project (including version releases, contributor records, and any future amendments to the classification, license, or ethics determination set forth herein), in the permanent records of the Society pursuant to §5.11 of the Bylaws.

This Project Approval supersedes no prior approval, as the G³ Project is the first formally-approved project of the Society. The procedural elements of this Approval (the structure of project identification, the form of domain classification with reasoning, the form of license selection with reasoning, and the form of ethics review determination) are submitted as a non-binding precedent that may inform the development of the Project Intake and Approval Procedure con-

templated by §5.17 of the Bylaws.

Wanhong, Founder

Date: June 26, 2026