

# Transactions on Graph Data and Knowledge

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## Abstract

Transactions on Graph Data and Knowledge (TGDK) is a new journal publishing peer-reviewed research on graph-based abstractions for data and knowledge, as well as the techniques, theories, applications and results that arise in this setting. TGDK is a community-run, Diamond Open Access journal, meaning that papers are published openly on the Web without fees for authors or read-

ers. In this preface, we provide some brief remarks about the rationale and goals of the new journal, followed by an introduction to its inaugural issue, entitled “Trends in Graph Data and Knowledge”, which collects together 12 diverse vision, position and survey papers on the types of research topics that exemplify the scope of this new journal.

**2012 ACM Subject Classification** Computing methodologies → Knowledge representation and reasoning; Information systems → Semantic web description languages; Information systems → Graph-based database models; Computing methodologies → Machine learning; Theory of computation → Graph algorithms analysis; Mathematics of computing → Graph theory

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**Category** Preface

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**Special Issue** Trends in Graph Data and Knowledge

## 1 Transactions on Graph Data and Knowledge

Transactions on Graph Data and Knowledge (TGDK) is a new Open Access journal publishing research contributions on the use of graph-based abstractions for representing data and knowledge. Such abstractions enable a wide variety of techniques to be applied for integrating, querying, reasoning over and learning from diverse data and knowledge at large scale. As such, the journal draws together expertise from a variety of research communities of Computer Science – including Graph Databases, Graph Representation Learning, Graph Theory, Knowledge Graphs, Knowledge Representation and the Semantic Web – on the topic of graph-based data and knowledge.

Herein we provide an overview of the scope, goals and history of TGDK, and then introduce the First Issue of the journal, entitled “Trends in Graph Data and Knowledge”.



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TGDK Schloss Dagstuhl – Leibniz-Zentrum für Informatik, Dagstuhl Publishing, Germany

## 1.1 Scope of the journal

Recent years have seen a resurgence in interest in the use of graphs for representing data and knowledge, with, for example, the topic of Knowledge Graphs gaining increasing traction in industry and academia alike. Advances in other areas of Computer Science are further reflected in this field; for example, key advances in the area of Deep Learning have led to the emergence of powerful new techniques in the area of Graph Representation Learning.

Such advances increasingly involve a confluence of diverse techniques from seemingly disparate paradigms. Within the field of Artificial Intelligence, new research results and directions continue to emerge on how best to synthesise the symbolic, deductive and logical foundations of Knowledge Representation with the neural, inductive and connectionist underpinnings of Machine Learning for better harnessing graph-based data and knowledge at large scale; advances are being achieved, for example, on combining knowledge graph embeddings and graph neural networks with formal semantics, ontologies and logic. We can then ask how such techniques might interplay with Graph Data Management to enable novel forms of queries over not only explicit data at large scale, but also implicit knowledge: what query languages, optimisations, notions of schema, etc., will form the basis of the graph databases of the future. We can wonder what insights are to be gained from Graph Algorithms & Theory in this setting, where, for example, graph centrality measures, graph isomorphism, spectral graph theory, tree decompositions, etc., have already led to key practical and theoretical advances in various related subareas of Graph Data and Knowledge, and will continue to bolster new insights. In the Semantic Web area, we see such techniques being increasingly drawn together in order to better structure and leverage the content of the Web itself, giving rise to a massive and unprecedented decentralised repository of graph-based knowledge, composed of comprehensive knowledge graphs such as Wikidata, complex ontologies such as those capturing shared knowledge in the Biomedical domain, and a great many Linked Datasets such as those published by governments for the public good.

Graph Data and Knowledge can also play a role in other areas of computer science, leading to advances in Data Science, Information Retrieval, Natural Language Processing, and more besides. More and more use-cases for Graph Data and Knowledge continue to emerge in our society, facilitating new discoveries in scientific disciplines, more transparency in governance, smarter applications for users, better data management in industries, along with many other advances.

All of these techniques, theories, systems, applications and areas interact in complex ways, but have at their foundation a common starting point: the use of graphs to represent data and knowledge. How they will continue to interact lies at the core of TGDK's scope, and our aim is to publish some of the key research contributions that will shape the area's future in the journal. These contributions may range from novel theoretical results – stemming from areas such as Database Theory, Graph Theory, Knowledge Representation, Logic and Ordinal Data Science – to results from systems-oriented, empirical and/or applied research – including Graph Database Systems, Graph Representation Learning, Knowledge Graphs, Linked Data, and more besides. Works that combine both theoretical and empirical contributions will be particularly welcome.

TGDK currently solicits and publishes two types of articles as part of its regular call: research articles and survey articles. Research articles present novel research contributions that advance the state-of-the-art in their respective area, and are judged based on novelty, relevance, potential impact, technical soundness, reproducibility and clarity. Survey articles present a novel, systematic and comprehensive synthesis of published research works within a chosen scope, and are judged based on novelty, relevance, scope, completeness and clarity. Aside from research and survey articles, other types of submissions are occasionally welcomed as part of a Special Issue. This Special Issue, the first of TGDK, presents a selection of vision, position and survey papers. We are also planning a Special Issue for 2024 that will solicit resources papers.

## 1.2 Goals of the journal

TGDK has the following stated goals and principles:

- To publish high-quality articles:** TGDK publishes articles relating to research on graph data and knowledge. All articles undergo a rigorous peer-review process run by the Editors-in-Chief and the Editorial Board consisting of experienced researchers of international standing, ensuring a high standard regarding novelty, relevance, impact, technical soundness, reproducibility and clarity. We aim to have TGDK indexed as widely as possible as soon as possible, with an Impact Factor competing with the best journals in the area.
- To publish under Diamond OA:** TGDK provides Open Access under the “Diamond” (sometimes known as “Platinum”) model, meaning that no fees are charged to authors or to readers. This is enabled by the financial support of scientific organisations, such as the Semantic Web Science Association (SWSA), that cover the low fees required by Dagstuhl Publishing.
- To publish online in a dependable, reputable manner:** Dagstuhl Publishing provides to TGDK a formal publication mechanism that includes archiving by the *Deutsche Nationalbibliothek* (German National Library). The journal will have an ISSN, and each article will be assigned a DOI and a URN. All articles are indexed on DBLP and we will push for them to be indexed as widely and as soon as possible, e.g., in Scopus, Web of Science collections, etc.
- To publish rather than control content:** All articles at TGDK will be published under a non-exclusive publishing agreement under the CC-BY 4.0 licence. Authors will retain the copyright of their own works. Meta-data relating to articles will be published under CC0, facilitating their inclusion and use as part of open collections of scholarly knowledge.
- To build a community:** TGDK adopts a distinctive scope that combines graphs with data and knowledge. Though existing journals have overlapping scope with TGDK, we believe this particular focus on the combination of graphs with data and/or knowledge to be unique amongst journals. Our goal then is that TGDK crystallise a community specifically around this topic, one composed of a cross-section of established communities such as Artificial Intelligence, Databases, Graph Algorithms & Theory, Knowledge Representation, the Semantic Web, etc.
- To be community-run:** TGDK is run by the community in a non-profit manner. It puts the needs of its research community first. Editors-in-Chief (EiCs) will serve terms of a maximum of four years, and each year a new EiC will be elected from the Editorial Board. The Editorial Board will represent the community in all of its diversity, and participate in strategic decisions. New community members will be regularly invited to form part of the Editorial Board.
- To operate transparently:** Though some aspects of the academic process – such as reviewer identities during single-blind review – are not subject to transparency, our goal is to be as transparent as possible regarding the operation of TGDK, in terms of scope, criteria, review process, budget, procedures for selecting new EiCs, etc. We will also make meta-data about the journal – its articles, authors, etc. – publicly available in structured formats.
- To innovate in how best to serve the research community:** At TGDK, we are open to discussing and exploring novel opportunities to improve the publication process for the community, which may involve, for example, initiatives to improve the review process, reduce review times, incentivise reviewers, improve reproducibility, publish supplementary material, foster good practices in terms of meta-data, enable post-publication discussion, etc.
- To become an exemplary non-profit journal:** Together with Dagstuhl Publishing, we aim for TGDK to show that journals run by the research community, for the research community, offer a promising – and we argue *better* – alternative to journals run by, for example, commercial academic publishers. In particular, TGDK will endeavour to inspire and support other journals to follow a similar path to that exemplified by TGDK and other Diamond OA journals.

### 1.3 History of the journal

The inception of the journal begins with Ian Horrocks, Andreas Hotho and Lalana Kagal, who were Editors-in-Chief of the Journal of Web Semantics (JWS) published by Elsevier. They opted to resign together from JWS at the end of 2022 in order to initiate a new journal that they hoped might better serve the community. They approached the Semantic Web Science Association (SWSA) – a non-profit organisation that manages scientific events in the Semantic Web area, and that is also affiliated with JWS – to discuss the possibility of SWSA supporting a new journal.

A SWSA Task Force comprising senior members of the Semantic Web community, including the three ex-EiCs of JWS, as well as Abraham Bernstein, Tim Finin, Chiara Ghidini, Markus Krötzsch and Axel Polleres, was set up to explore potential publishing models, scopes, titles, etc., for the new journal. A fourth Editor-in-Chief, Aidan Hogan, was invited to join the new initiative.

The Task Force decided that the new journal should have a broad scope so as to capture the growing interest on Knowledge Graphs as well as more established areas of Semantic Web research. Furthermore, the consensus was that the journal should be run in a non-profit manner by the community, should be Open Access, and should strive to be free of fees for authors and readers.

The new Editors-in-Chief began the process of establishing this new journal – creating a webpage with the title and scope, inviting the Editorial Board (with particular emphasis on inviting members from areas other than the Semantic Web) to join, soliciting seed funding from SWSA, contacting potential publishers, etc. – in early 2023. Planning for this First Issue began in April of 2023, with the Editors-in-Chief soliciting topics for articles, culminating in a first batch of papers being published in December 2023. More papers in this particular collection, entitled “Trends in Graph Data and Knowledge” will be published early in 2024.

## 2 Trends in Graph Data and Knowledge

As the Inaugural Editors-in-Chief, we are pleased to herein present the First Issue of this journal: a Special Issue entitled “Trends in Graph Data and Knowledge”.

This issue includes a collection of 12 vision, position and survey papers relating to the past, present and future of research in the area of Graph Data and Knowledge. It draws together diverse perspectives from internationally-renowned experts – many of whom are members of the Editorial Board of TGDK – on what the future holds for this exciting area. All papers received at least three reviews and one meta-review from members of our Editorial Board. This collection of papers covers a diverse range of topics that discuss:

- the interplay between the area of Graph Data & Knowledge and the areas of Machine Learning, Natural Language Processing (particularly large language models) and Ordinal Data Science;
- how Graph Data & Knowledge can help to address challenges relating to autonomous agents, data self-determination, knowledge engineering, the life sciences, and low-resource languages;
- algorithms, analyses, concepts and techniques involving embeddings, evolution, rule learning, and summarisation in the context of Graph Data & Knowledge.

These articles exemplify the types of research topics that we hope to see TGDK publications address in the future. And in case the reader is inspired by one of these articles to follow up on a research direction it mentions, we would be pleased to receive submissions of their contributions.