FINAL EDITION · May 2026

Bridging Classical & Quantum Worlds

Celebrating the closure of the DEDALUS project

▸ IN THIS FINAL ISSUE

Seven chapters from a quantum leap

■ CHAPTER 01

A Message from the Coordinator

Dear colleagues, partners, and friends of DEDALUS,

After fourteen intensive months of research, engineering, and community-building, we are proud to mark the official closure of the DEDALUS project — and to share with you what may be the most exciting chapter of all: the results.

DEDALUS was born from a single conviction: the next generation of data management systems will not be purely classical, nor purely quantum, but hybrid. We set out to demonstrate that quantum computing can move from the realm of promise into the realm of practical data management — and that Europe, and Greece in particular, can play a leading role in that transition.

> *"Quantum advantage for data access, in the NISQ era, is more effectively realized through indexing rather than search."*
>
> **— Findings of the DEDALUS project**

The pages that follow summarize the key scientific results, publications, and community activities of the project. We invite you to explore them, to reuse our open-source artefacts, and above all to join us on September 4, 2026, in Boston for QC&DKM 2026.

Thank you for being part of this journey. The DEDALUS network is just getting started.

— Haridimos Kondylakis, PI of the Dedalus project.

■ CHAPTER 02

About DEDALUS

DEDALUS (*Δαίδαλος — Data Management with Quantum Computing Technologies*) is a 14-month research excellence project funded under the Greek National Recovery and Resilience Plan *"Greece 2.0"* with resources from the European Union – NextGenerationEU, through action **SUB1.1: Clusters of Research Excellence (CREs)** — grant code **YP3TA-0560169**, project code OPS TA 5180519.

The project addresses a deceptively simple question: how should classical database systems evolve to exploit the unique computational properties of quantum hardware — superposition, interference, and entanglement — without forcing developers to become quantum physicists?

The Vision

DEDALUS builds a next-generation hybrid platform that offers the best of both worlds — classical and quantum — by intelligently decomposing data-intensive algorithms into parts that can be solved on a

CPU, GPU, or QPU, and combining the benefits of each. A cost estimator selects, for every workload, the most advantageous computational fabric, while high-level APIs hide the complexity of the underlying architectures — much as programmers today rarely care whether their code runs on x86 or ARM.

Research Pillars

- Hybrid query optimization that searches the exponential space of join orders by exploiting quantum advantages.
- Quantum-aware indexing structures that bring deterministic, practical access methods to quantum-encoded data.
- Quantum-enhanced schema discovery and knowledge graph management for flexible, schema-less data.
- Input/output transformation (state preparation and measurement) usable from classical pipelines.
- Evaluation on real QPUs (IBM, D-Wave Advantage) and on custom simulators — practical relevance, not just theory.

■ CHAPTER 03

Key Achievements at a Glance

Six numbers that tell the DEDALUS story.

6× Peak speed-up vs. PostgreSQL on individual queries	**86×** Faster lookups vs. Grover (QuaC indexes)	**50%** Of queries improved over PostgreSQL plans
72% Best-case QUBO variable reduction via pruning	**61%** QuaC accuracy on 7-qubit IBM hardware (vs. <1% Grover)	**5+** Peer-reviewed papers at top international venues

FLAGSHIP SYSTEM · HYBRID QUERY OPTIMISATION

DEDALUS Framework

Our flagship system is the first fully automated end-to-end pipeline that takes a raw SQL query, formulates join ordering as a Quadratic Unconstrained Binary Optimization (QUBO) problem enriched with live database statistics, dispatches it to a classical or quantum backend, and

executes the resulting hinted plan against a live PostgreSQL instance — validating semantic equivalence via bag-semantics comparison.

Two contributions drive its effectiveness: a connectivity-aware join-graph pruning strategy that reduces QUBO dimensionality by 37.9% on average (up to 72%), and a multi-factor cost model synthesising eight statistical dimensions into faithful subset weights. On JOB, TPC-H, and synthetic workloads, DEDALUS outperforms PostgreSQL on ~50% of queries with simulated annealing, 49% with quantum annealing, and 22% with hybrid solvers — at 100% plan correctness.

FLAGSHIP SYSTEM · QUANTUM INDEXING

QuaC — Quantum Circuits as Indexes

QuaC introduces a fundamentally new paradigm: treating a quantum circuit itself as a deterministic index structure. Rather than relying on Grover-style probabilistic search, QuaC compiles Knowledge Graph access patterns (subject - predicate, predicate - object, etc.) into reusable CNOT-based quantum circuits whose lookups are deterministic, single-shot, and directly deployable on today's NISQ hardware.

On datasets up to 10^5 key–value pairs (17 input/17 output qubits), QuaC lookups are 5–14× faster than Grover — and up to 86× faster once state preparation is counted. On IBM quantum hardware, QuaC achieves 61% accuracy on 7 qubits where Grover collapses below 1%. To our knowledge, this is the first approach to compile knowledge graph access patterns into reusable quantum circuits at this scale.

FLAGSHIP SYSTEM · SCHEMA DISCOVERY

Quantum-PG-HIVE

Quantum-PG-HIVE extends the PG-HIVE framework for hybrid incremental schema discovery in property graphs by replacing its Locality-Sensitive Hashing step with a QUBO formulation of balanced minimum cut over a sparse similarity graph derived from pattern embeddings. The result: cleaner, more interpretable, and more robust schemas — solved classically via simulated annealing today, ready for quantum annealing tomorrow.

■ CHAPTER 04

Scientific Highlights & Publications

A strong portfolio of papers across leading international venues in database systems and knowledge engineering — all openly accessible.

01. **DEDALUS: A Quantum-Enhanced End-to-End Framework for Cost-Aware Join Order Optimization with Search Space Pruning** *Submitted to VLDB 2026*

02. **DEDALUS (Demo): Quantum-Enhanced Framework for Cost-Aware Join Order Optimization** *EDBT 2026* → open paper

03. **QuaC: Quantum Circuits as Indexes for Knowledge Graphs** *Submitted to VLDB 2026*

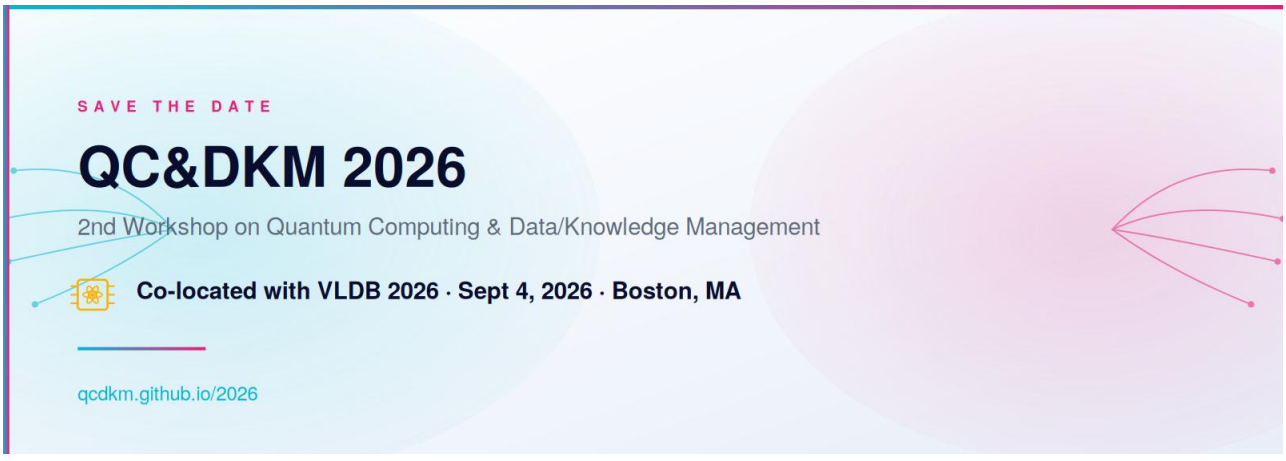
04. **Quantum-PG-HIVE: Schema Discovery for Property Graphs Using Quantum Computing** *EDBT 2026 Workshops*

05. **Knowledge Graphs and Quantum Computing: First Blood** *IJCKG 2025 · Y. Tzitzikas & H. Kondylakis* → open paper

06. **On Encoding Big Knowledge Graphs as Quantum States and on Running Grover's Algorithm** *QC&DKM 2025 Workshop @ IJCKG 2025* → open paper

■ CHAPTER 05

Save the Date



Building on the success of the 1st edition (QC&DKM 2025 @ IJCKG 2025), the second edition of our workshop will once again bring together the database, knowledge representation, and quantum computing communities. It is a focused forum for researchers and practitioners investigating how quantum computing can enhance core data management tasks — and how data-centric requirements shape quantum computing architectures and applications.

Important Dates

- **Paper submission —** May 29, 2026
- **Notification of acceptance —** June 30, 2026
- **Camera-ready —** July 17, 2026
- **Workshop —** September 4, 2026 · Boston, MA, USA

Workshop website: https://qcdkm.github.io/2026

■ CHAPTER 06

Dissemination & Community Building

A core goal of DEDALUS was to build — for the first time — a vibrant community of researchers, engineers, and students at the intersection of quantum computing and data management.

Workshops Founded & Organised

- **1st QC&DKM Workshop** — founded and organised as a satellite event of *IJCKG 2025*.
- **2nd QC&DKM 2026** — co-located with *VLDB 2026* · qcdkm.github.io/2026
- **IEEE QSW 2026** — co-organising the International Conference on Quantum Software · conferences.computer.org/2026/qsw
- **IEEE QSW 2025** — co-organised · conferences.computer.org/2025/qsw

A Strong Presence at EDBT 2026

DEDALUS brought a remarkable lineup of contributions to EDBT 2026 — spanning graph data management, quantum computing, and semantic streams:

- **Quantum-PG-HIVE** — Schema Discovery for Property Graphs using Quantum Computing *Tue Mar 24, 14:00 · Room C6*
- **GSS** — Graph Semantic Summarization using Answer-Centered Explanatory Subgraphs *Tue Mar 24, 16:00 · Room C6*
- **DEDALUS** — Quantum-Enhanced Framework for Cost-Aware Join Order Optimization *Wed Mar 25, 11:00 · Café & Aula Toivo*
- **PG-HIVE** — Hybrid Incremental Schema Discovery for Property Graphs *Wed Mar 25, 15:15 · Room A1*
- **PG-HIVE Demo** — Schema Discovery for Property Graphs *Thu Mar 26, 11:00 · Café & Aula Toivo*
- **Tutorial** — Streams Meet Semantics: RDF Stream Processing *Fri Mar 27, 10:30 · Room A3*

Institutional Engagement

- Launch of **FORTH-QuTech**, FORTH's new Centre for Quantum Science & Technologies (11–13 June 2025) · qutech.iesl.forth.gr
- Lectures in the Computer Science MSc programme at the University of Crete on quantum data management.
- Training and mentoring of a new generation of PhD, postdoctoral, and MSc researchers across the consortium.

■ CHAPTER 07

Consortium & Acknowledgements

DEDALUS was delivered by a tight collaboration between academia and industry:

- **University of Crete** — Department of Computer Science (project coordination)
- **Quantum Neural Technologies S.A.** — Industrial partner, Athens

FUNDING

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We warmly thank every researcher, student, reviewer, and partner who contributed to DEDALUS. The road to practical quantum data management is long — and the first steps have been taken together.

Stay in Touch

Project website · https://dedalus.csd.uoc.gr

QC&DKM 2026 · https://qcdkm.github.io/2026

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Thank you for flying with us.

See you in Boston for QC&DKM 2026