LAUNCH ISSUE · №01 · March 2025

Where Databases Meet Quantum

Announcing the launch of the DEDALUS project

▸ IN THIS LAUNCH ISSUE

Six chapters to start a quantum journey

■ CHAPTER 01

Welcome — A Word from the Coordinator

Dear colleagues, partners, and friends,

It is with great enthusiasm that we announce the official launch of DEDALUS — a research excellence project that, for the next fourteen months, will explore one of the most exciting frontiers of modern computer science: the meeting point between classical database systems and quantum computing.

Quantum computers are no longer a thought experiment. They exist, they are improving rapidly, and the data management community urgently needs to understand what they can — and cannot — do for us. DEDALUS will spend the next year answering that question through real implementations, real benchmarks, and real hardware.

> *"The next generation of data management systems will not be purely classical, nor purely quantum — but hybrid."*
> **— The DEDALUS thesis**

This is our launch newsletter — the first of several updates we will publish throughout the project. Expect news on our research progress, publications, demos, open-source releases, and community events. We invite you to follow along, share our work, and join the conversation.

Let's build something new.

— The DEDALUS Team

■ CHAPTER 02

The Big Idea — Why DEDALUS, Why Now

The problem

Modern database systems are extraordinary engineering achievements, but they are running into hard limits. Query optimisation explores exponentially large plan spaces. Indexing structures are stretched by ever-growing knowledge graphs. Schema discovery on flexible data models remains slow and noisy. Meanwhile, an entirely new kind of hardware — quantum computers — has emerged, with computational properties that are fundamentally different from anything we have used before.

The opportunity

Quantum hardware offers two superpowers especially relevant to data management: the ability to represent enormous combinatorial spaces compactly via superposition, and the ability to evaluate many possibilities simultaneously via interference and entanglement. These properties make quantum

computing a natural candidate for problems classical databases struggle with — but the bridge between the two worlds is mostly missing.

Our bet

DEDALUS bets that the right way to bring quantum into data management is not to replace classical systems, but to augment them. We will build a hybrid platform where each task is decomposed into pieces that run on the best available fabric — CPU, GPU, or QPU — and where high-level APIs hide the underlying complexity. If we succeed, working with quantum hardware will eventually feel as ordinary as choosing between x86 and ARM.

■ CHAPTER 03

What We Will Build

DEDALUS is organised around three flagship research lines, each tackling a fundamental task in modern data management, and each delivering an open-source artefact by the end of the project.

RESEARCH LINE 01 · QUERY OPTIMISATION

Hybrid Quantum–Classical Join Ordering

Join order optimisation is one of the most computationally demanding tasks in any relational database system. We will formulate join ordering as a Quadratic Unconstrained Binary Optimization (QUBO) problem enriched with live catalog statistics, and explore how quantum annealers, gate-based quantum simulators, and hybrid solvers can find better plans, faster.

Our goal: an end-to-end pipeline that takes a raw SQL query and produces an executable plan on a live PostgreSQL instance — using quantum resources where they actually help.

RESEARCH LINE 02 · QUANTUM INDEXING

Quantum-Aware Access Methods for Knowledge Graphs

Classical indexes are the workhorses of efficient query processing. We will investigate whether quantum circuits themselves can act as deterministic, reusable index structures over knowledge graphs — turning the access pattern itself into hardware. The aim is to provide a practical alternative to probabilistic quantum search techniques that has so far dominated the field.

RESEARCH LINE 03 · SCHEMA DISCOVERY

Quantum-Enhanced Schema Inference for Property Graphs

Property graphs are flexible by design but notoriously hard to understand at scale. We will investigate how QUBO formulations of clustering problems — natural fits for quantum annealers — can produce cleaner, more interpretable, and more robust schema summaries than today's probabilistic hashing approaches.

■ CHAPTER 04

Roadmap & Milestones

DEDALUS runs for 14 months. Here is what to expect, quarter by quarter.

14	3	10+
Months of focused research	Research lines, three open-source tools	Target publications & community events

Q1

Foundations

- Project launch, team kickoff, infrastructure setup.
- Literature survey and problem formalisation across all three research lines.
- First QUBO encodings for join ordering and schema clustering.

Q2

First prototypes

- Working prototypes for hybrid join ordering and quantum-based indexing.
- Initial experiments on classical simulators and small QPU instances.
- Submission of first workshop and conference papers.

Q3

Scale up

- End-to-end pipeline running against a live PostgreSQL instance.
- Benchmarking on real workloads (JOB, TPC-H).
- Public release of first open-source artefacts on GitHub.

Q4

Community & closure

- Co-organisation of an international workshop dedicated to quantum data management.
- Demos at major venues (EDBT, VLDB, IJCKG).
- Final reports, documentation, and project closure.

CHAPTER 05

Meet the Consortium

DEDALUS is delivered by a tight collaboration between academia and industry — combining deep expertise in databases, knowledge graphs, and quantum computing.

COORDINATOR

University of Crete

Department of Computer Science. Leading the research effort and overall project coordination, building on long-standing expertise in databases, knowledge graphs, and data integration.

INDUSTRIAL PARTNER

Quantum Neural Technologies S.A.

Athens-based company specialising in quantum software and quantum-inspired algorithms. Providing industrial perspective and access to quantum hardware backends.

FUNDING

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■ CHAPTER 06

How to Follow & Get Involved

We want DEDALUS to be more than a research project — we want it to spark a community around quantum data management. Here is how you can be part of it.

Stay informed

- **Visit the project website** · https://dedalus.csd.uoc.gr
- Subscribe to this newsletter — we publish updates approximately every quarter.
- Follow our open-source releases on GitHub — links coming with our first prototypes.

Join the conversation

- Meet us at conferences and workshops throughout 2025–2026.
- Reach out for academic collaborations, internships, or industrial partnerships.
- Share the project with colleagues interested in databases, knowledge graphs, or quantum computing.

Contact

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> *"The road to practical quantum data management is long — and we are just taking the first steps. We are glad to have you with us."*
>
> **— The DEDALUS Team**

Welcome aboard.

Follow our progress — the journey is just beginning.