



PhD in DATA ANALYTICS AND DECISION SCIENCES - 39th cycle

THEMATIC Research Field: REACTIVE KNOWLEDGE MANAGEMENT

Monthly net income of PhDscholarship (max 36 months)
€ 1400.0
In case of a change of the welfare rates during the three-year period, the amount could be modified.

Context of the research activity	
Motivation and objectives of the research in this field	<p>Graph databases have become increasingly popular in recent years due to their ability to store complex and highly interconnected data; they are ever more used as the underlying technology for managing large knowledge graphs. The goal of this PhD is to explore ways in which graph databases can be used for supporting an extension of knowledge graph management, called <i>Reactive Knowledge Management</i>, based on the new concept of <i>reactive knowledge rule</i>. The thesis will explore several possibilities both at the conceptual and implementation levels. On the conceptual level, the use of <i>Partitioned Knowledge Graphs</i> to represent shared knowledge will be considered, enabling us to manage large amounts of data in more structured and efficient manners. On a practical level, a first prototype will be built with the Neo4j graph database system, but alternatives following the GQL standard will also be experimented.</p>
Methods and techniques that will be developed and used to carry out the research	<p>The student will work both on theory and on practical problems. For what concerns theory, methods will include: 1) <i>concepts & language support</i> (expanding current primitives and their functionalities); 2) <i>knowledge materialization</i> (dealing with propagation within a large knowledge graph); 3) <i>reactive query computations</i> (including view materializations, termination, confluence). More practically, the student will deal with building a testbed architecture where the theoretical solutions can be properly validated. The test cases could take inspiration from known COVID-19 related scenarios</p>



	or climate change-related crisis management, offering appropriate ingredients for enacting reactive knowledge management behaviors.
Educational objectives	The student will learn to conceptualize knowledge management scenarios and translate them into new theoretical advancements. Additionally, the student will also experiment with a variety of database paradigms and technologies, both SQL and NoSQL, having the opportunity to produce prototypes that resolve reactive needs in real-case scenarios.
Job opportunities	Knowledge management is an attractive research and professional area. Graduates with expertise in this area can easily find jobs both in academia and in private organizations. PhD candidates who recently graduated in our group are currently employed in important public and private institutions.
Composition of the research group	1 Full Professors 2 Associated Professors 1 Assistant Professors 5 PhD Students
Name of the research directors	Prof. Stefano Ceri

Contacts	
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Additional support - Financial aid per PhD student per year (gross amount)	
Housing - Foreign Students	--
Housing - Out-of-town residents (more than 80Km out of Milano)	--

Scholarship Increase for a period abroad	
Amount monthly	700.0 €
By number of months	6

Additional information: educational activity, teaching assistantship, computer availability, desk availability, any other information
List of Universities, Companies, Agencies and/or National or International Institutions that are cooperating in the research:



1. Universitat Politecnica de Valencia - Spain
2. Inria Saclay - France
3. NUS - Singapore
4. L3S - Hannover

There are various forms of financial aid for activities of support to the teaching practice. The PhD student is encouraged to take part in these activities, within the limits allowed by the regulations.