# DOCTORAL THESIS

## Authenticated query processing in the cloud

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*Date of Award:*
2019

# Abstract

With recent advances in data-as-a-service (DaaS) and cloud computing, outsourcing data to the cloud has become a common practice. In a typical scenario, the data owner (DO) outsources the data and delegates the query processing service to a service provider (SP). However, as the SP is often an untrusted third party, the integrity of the query results cannot be guaranteed and is thus imperative to be authenticated. To tackle this issue, a typical approach is letting the SP provide a cryptographic proof, which can be used to verify the soundness and completeness of the query results by the clients. Despite extensive research on authenticated query processing for outsourced databases, existing techniques have only considered limited query types. They fail to address a variety of needs demanded by enterprise customers such as supporting aggregate queries over set-valued data, enforcing fine-grained access control, and using distributed computing paradigms. In this dissertation, we take the first step to comprehensively investigate the authenticated query processing in the cloud that fulfills the aforementioned requirements. Security analysis and performance evaluation show that the proposed solutions and techniques are robust and efficient under a wide range of system settings.

**Keywords:** Query Authentication, Query Processing, Aggregate Queries, Access Control, Distributed Systems, Data Integrity

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