

Georgios Chatzimilioudis

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Research Interests

Information retrieval and data mining in distributed databases, wireless sensor networks and social networks.

Degrees

Ph.D. Department of Computer Science at University of California Riverside Area of Study:Databases Dissertation: Data Analysis and Query Processing in Wireless Sensor Networks Adviser: Dr. Dimitrios Gunopulos	June 2010
M.Sc. Department of Computer Science at University of California Riverside Thesis title: Operator Placement for Multi-Predicate Snapshot Queries in Wireless Sensor Networks Adviser: Dimitrios Gunopulos	December 2008
B.Sc. Computer Science Department at Aristotle University of Thessaloniki Thesis title: Rare event prediction using inter-transactional association rules	December 2004

Dissertation

Data Analysis and Query Processing in Wireless Sensor Networks

This dissertation minimizes the cost of answering queries in wireless sensor networks. To answer a query, data generated by the sensors needs to be collected and processed. We optimize the cost by constructing sophisticated query trees. Queries are divided into two categories: queries that need data from all the nodes (universal queries) in the network and queries that need data from a subset of nodes only (subset queries).

For universal queries we propose a distributed algorithm to construct a near-optimal balanced communication tree with minimum overhead. Such a tree has inherently minimal number of collisions during query execution, and therefore avoids numerous retransmissions. Our algorithm outperforms previous work both in tree construction overhead and in tree balance.

For subset queries we present methods for constructing query trees to route and perform in-network processing of data. First, we focus on snapshot queries and show that minimizing the problem is NP-hard. We propose a dynamic programming algorithm to compute the optimal solution for small problem instances. We also propose a low complexity, approximate, heuristic algorithm for solving larger problem instances efficiently. Finally, we adapt the Fermat point problem (1-median problem) for a weighted graph, and propose a centralized solution that is used as heuristic in the above algorithms.

Dealing with continuous subset queries, we present an optimal distributed algorithm to adapt the placement of a single operator. Our parameter-free algorithm finds the optimal node to host the operator with minimum communication cost overhead. Three ideas, proposed here, make this feature possible: 1) identifying the special, and most frequent case, where no flooding is needed, otherwise 2) limitation of the neighborhood to be flooded and 3) variable speed flooding and eves-dropping. To our knowledge this is the first optimal and distributed algorithm to solve the 1-median (Fermat node) problem. In our experiments we show that for the rest of cases our

algorithm saves 30\%-80\% of the energy compared to previously proposed techniques.

Awards

- Gerondelis Foundation Scholarship (2008)
- University of California Riverside Scholarship (2005-2007)

Publications

1. "**A Simple Communication Tree Construction Algorithm For Wireless Sensor Networks**", Georgios Chatzimilioudis, Dimitrios Gunopulos. Under Submission. IEEE Transactions on Knowledge and Data Engineering.
2. "**Minimum-Hot-Spot Query Trees for Wireless Sensor Networks**", Georgios Chatzimilioudis, Demetrios Zeinalipour-Yazti. Hellenic Data Management Symposium 2010.
3. "**Minimum-Hot-Spot Query Trees for Wireless Sensor Networks**", Georgios Chatzimilioudis, Demetrios Zeinalipour-Yazti. Ninth International ACM Workshop on Data Engineering for Wireless and Mobile Access (in conjunction with SIGMOD/PODS) 2010.
4. "**A Distributed Technique For Dynamic Operator Placement In Wireless Sensor Networks**", Georgios Chatzimilioudis, Nikos Mamoulis, Dimitrios Gunopulos. The 11th International Conference on Mobile Data Management 2010.
5. "**Applying Electromagnetic Field Theory Concepts to Clustering with Constraints**", Huseyin Hakkoymaz, Georgios Chatzimilioudis, Dimitrios Gunopulos, Heikki Mannila. ECML/PKDD 2009.
6. "**Operator Placement for Multi-Predicate Snapshot Queries in Wireless Sensor Networks**", Georgios Chatzimilioudis, Huseyin Hakkoymaz, Nikos Mamoulis, Dimitrios Gunopulos. The 10th International Conference on Mobile Data Management 2009.

Research Experience

Graduate Research Assistant, University of California Riverside, CA, USA 2008-2010
Advisor: Prof. Dimitrios Gunopulos
Group: Database Lab

- Query Processing in Sensor Networks
- Clustering with constraints in networks

Research Intern for the RFID and Wireless Sensor Network group at Siemens Corporate Research Princeton, New Jersey, USA Spring and Summer 2008
Definition of a generic metric to evaluate the eco-efficiency of buildings through automated analysis of sensory data. This task was part of the "High Performance Buildings" project. Model mechanical and electrical building equipment in simulators and use the simulators (EnergyPlus, TranSys). Supervisor: Dr. Chellury Sastry.

Research Intern for the Intelligent Autonomous Systems group at Siemens Corporate Technology, Munich, Germany Summer 2007
Created a tool using data mining techniques, that would predict failures in expensive high technology medical machines. The data to mine came from extensive machine, maintenance and customer service logs, which where very diverse sources in format and information accuracy.

Teaching Experience

- Teaching Assistant, University of California - Riverside** 2005-2008
- Distributed Systems Project, prepared by Dr. Vana Kalogeraki, I had to tutor the students through the different project phases.
 - Software Engineering, taught by Dr. Iulian Neamtiu. Prepared solutions to exercises given in class, maintained the class webpage, graded projects. I prepared TA lecture notes and the different class projects.
 - Security in Computer Science, taught by Dr. Mart Molle. I prepared TA lectures and the weekly lab projects. Graded the weekly projects and the term project.
 - Introduction to Programming in C++, taught by Prof. Brian Linard. Prepared solutions, maintained the webpage, graded projects, exercises and final exams.
 - Introduction to Computer Science, taught by Prof. Toby Gustafson, graded projects, exercises and final exams.
- Temporary Teacher at an "All-day" Public Elementary School, Thessaloniki, Greece** 2005
Teaching Introduction into Computers and Internet

Work Experience

- Software Developer Intern for the TransNet project at Siemens Communications, Munich, Germany** Summer 2006
Conceptual design and implementation of a validation engine and user access rights engine for the TransNet project. During my internship I made extensive use of testing, based on the JUnit Framework, and writing of the functional specifications.
- Webdeveloper at Advanced Software Technologies, Thessaloniki, Greece** Winter 2004/5
Webdeveloping and programming in PHP and ASP.NET

Service

- Secretary, Cashier, Event Organizer and Website Administrator for Capoeira Grupo Cordao de Ouro Riverside, USA** 2008/2009
under the direction of Rildo Cordeiro Da Silva (Mestre Penteadado)
- Event Organizer and Website Administrator for Capoeira Grupo Cordao de Ouro Riverside, USA** 2007/2008
under the direction of Rildo Cordeiro Da Silva (Mestre Penteadado)
- Secretary, Event Organizer and Website Administrator for Capoeira Grupo Cordao de Ouro Riverside, USA** 2007
under the direction of Rildo Cordeiro Da Silva (Mestre Penteadado)

Languages

English (fluent), **German** (fluent), **Greek** (mother tongue)

References

- **Dr Dimitrios Gunopulos.** email:dg@cs.ucr.edu, tel: +1 951-827-2479
- **Dr Nikos Mamoulis.** email:nikos@cs.hku.hk, tel: +852 285-78-243
- **Dr Chellury Sastry.** email:Chellury.Sastry@pnl.gov, tel: +1 509-372-4180