

# Matteo Brucato

PH.D. CANDIDATE · DATA AND INFORMATION MANAGEMENT AND ANALYTICS

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## Summary

**Ph.D. Candidate** in Computer Science at the **University of Massachusetts, Amherst**. Advisor: **Prof Peter J. Haas**. Co-advisors: Prof Alexandra Meliou and Prof Azza Abouzied (NYU).

Ph.D. thesis on systems for scalable and easy prescriptive analytics. Thesis title: “Package Queries: Enabling Declarative and Scalable Prescriptive Analytics in Relational Data”.

More than 8 years of experience in research, with several publications in top-tier conferences and journals in data and information management (SIGMOD, VLDB, CACM, VLDBJ). Multidisciplinary research, with publications in NLP, IR and robotics/AI conferences. Work recognized by several ACM awards (CACM, SIGMOD Highlights, invited VLDBJ, best demos and best paper at VLDB, best young research nominee in RANLP), and several scholarships (Krithi Ramamritham Computer Science Scholarship by UMass; merit, research and exchange scholarships by the University of Bologna).

More than 8 years of mentorship and advising experience. Mentored more than 20 students, at all levels (undergrad, master, and doctoral students), and managed several projects under my direct supervision.

Several industrial internships, both as researcher (MSR, IBM) and software developer (Cineca, Maggiore Hospital).

## Research Interests

**Research areas:** Data Management, Prescriptive Analytics, Decision Making, Stochastic Constrained Optimization, Fair Machine Learning, Artificial Intelligence, Natural Language Processing, Information Retrieval.

**Research interests:** Theoretical and systemic aspects of constrained optimization, decision making and prescriptive analytics at a very large scale; Structured, unstructured, and natural query languages; Scalable and approximate algorithms; Systems for interactive data exploration; Scalable systems for fair ML; Scalable systems for AI and robotics; Personalized text summarization.

## Education

### UMASS AMHERST

Amherst, MA, USA

PH.D. IN COMPUTER SCIENCE

2013 - 2021

- Advisor: Peter J. Haas
- Co-advisors: Alexandra Meliou and Azza Abouzied (NYU)
- Thesis: *Package Queries: Enabling Declarative and Scalable Prescriptive Analytics in Relational Data*

### UNIVERSITY OF BOLOGNA

Bologna, Italy

M.S. IN COMPUTER SCIENCE

2011 - 2013

- Summa cum laude
- Thesis Advisor: Danilo Montesi
- Thesis: *Temporal Information Retrieval*

### UNIVERSITY OF BOLOGNA

Bologna, Italy

B.S. IN COMPUTER SCIENCE

2008 - 2011

- Summa cum laude
- Thesis Advisor: Danilo Montesi
- Thesis: *Mobile systems for patient-reported outcomes*

### EXCHANGE PROGRAMS

#### ÅRHUS UNIVERSITY

Århus, Denmark

EXCHANGE PROGRAM DURING M.S., COMPUTER SCIENCE

Jan - Jun 2013

- Advisor: Christian S. Jensen

#### UC RIVERSIDE

Riverside, CA, USA

EXCHANGE PROGRAM DURING B.S., COMPUTER SCIENCE

Sep - Jun 2011

- Advisor: Vassilis J. Tsotras

## Honors & Awards

2020	<b>Best demo award</b> , VLDB 2020	Tokyo, Japan
2020	<b>Best demo runner-up</b> , VLDB 2020	Tokyo, Japan
2019	<b>Krithi Ramamritham Computer Science Scholarship</b>	Amherst, MA, USA
2018	<b>CACM Research Highlight Award (Invited journal paper in CACM Research Highlights)</b>	Amherst, MA, USA
2017	<b>ACM SIGMOD Research Highlight Award (invited journal paper in SIGMOD Records)</b>	Amherst, MA, USA
2017	<b>Invited journal paper in the VLDB Journal, Special Issue on Best Papers of VLDB 2016</b>	Amherst, MA, USA

2016 **Best papers**, VLDB 2016  
 2013 **M.S. with Honors**, University of Bologna  
 2013 **Best Young Researcher nominee**, RANLP 2013  
 2013 **Merit Scholarship**, awarded to 0.2% of all students of the University of Bologna  
 2012 **Research Scholarship**, University of Bologna  
 2012 **Merit Certificate**, University of Bologna  
 2012 **Complimentary AAAI Membership**, Stanford Online AI Course  
 2011 **B.S. with Honors**, University of Bologna  
 2011 **Merit Certificate**, University of Bologna  
 2010 **Merit Certificate**, University of Bologna  
 2010 **Exchange Scholarship**, University of Bologna

New Delhi, India  
 Bologna, Italy  
 Hissar, Bulgaria  
 Bologna, Italy  
 Bologna, Italy  
 Bologna, Italy  
 Stanford, CA, USA  
 Bologna, Italy  
 Bologna, Italy  
 Bologna, Italy  
 Bologna, Italy

## Publications

1. Samer B. Nashed, Justin Svegliato, **M. Brucato**, Connor Basich, Rod Grupen, Shlomo Zilberstein  
Solving Markov Decision Processes with Partial State Abstractions  
*ICRA 2021 (under review)*
2. **M. Brucato**, Miro Mannino, Azza Abouzied, P. J. Haas, A. Meliou  
sPaQLTools: A Stochastic Package Query Interface for Scalable Constrained Optimization  
*VLDB 2020*  
 **Best Demo. Video: <https://www.youtube.com/watch?v=1v5KevGKbfE>**
3. Anna Fariha, **M. Brucato**, P. J. Haas, A. Meliou  
SuDocu: Summarizing Documents by Example  
*VLDB 2020*  
 **Best Demo Runner-Up. Video: <https://www.youtube.com/watch?v=ZGzF6cBSYjo>**
4. **M. Brucato**, N. Yadav, A. Abouzied, P. J. Haas, A. Meliou  
Stochastic Package Queries in Probabilistic Databases  
*SIGMOD 2020*
5. **M. Brucato**, A. Abouzied, A. Meliou  
Scalable Computation of High-Order Optimization Queries  
*Communications of the ACM (CACM) 2019*
6. **M. Brucato**, A. Abouzied, A. Meliou  
Package queries: Efficient and scalable computation of high-order constraints  
*The VLDB Journal 2018 (Special Issue on Best Papers of VLDB 2016)*
7. **M. Brucato**, A. Abouzied, A. Meliou  
A Scalable Execution Engine for Package Queries  
*SIGMOD Record 2017 (ACM SIGMOD Research Highlight Award 2017)*
8. **M. Brucato**, A. Abouzied, C. Blauvelt  
Redistributing Funds across Charitable Crowdfunding Campaigns  
*arXiv:1706.00070, 2017*
9. **M. Brucato**, J. F. Beltran, A. Abouzied, A. Meliou  
Scalable Package Queries in Relational Database Systems  
*VLDB 2016*  
 **Best papers of VLDB 2016**  
 **Invited journal paper in the VLDB Journal (Special Issue on Best Papers of VLDB 2016)**  
 **ACM SIGMOD Research Highlight Award (Invited journal paper in SIGMOD Records 2017)**  
 **CACM Research Highlight Award (Invited journal paper in CACM Research Highlight 2018)**
10. **M. Brucato**, A. Abouzied, and A. Meliou  
Improving Package Recommendations through Query Relaxation  
*VLDB 2014, at Data4U*
11. **M. Brucato**, R. Ramakrishna, A. Abouzied, A. Meliou  
PackageBuilder: From Tuples to Packages  
*VLDB 2014*
12. K. Fernandes, **M. Brucato**, R. Ramakrishna, A. Abouzied, A. Meliou  
PackageBuilder: Querying for packages of Tuples  
*SIGMOD 2014*
13. **M. Brucato**, D. Montesi  
Metric Spaces for Temporal Information Retrieval  
*ECIR 2014*
14. **M. Brucato**, L. Derczynski, H. Llorens, K. Bontcheva, C. S. Jensen  
Recognising and Interpreting Named Temporal Expressions  
*RANLP 2013*  
 **Best Young Researcher award nominee**

## Professional Experience

### INDUSTRY

#### Microsoft Research

Redmond, WA, USA

RESEARCH INTERN

May - Aug 2017

Worked under the supervision of **Kaushik Chakrabarti** on natural language to SQL using neural networks.

#### IBM Watson

T. J. Watson Research Center, Yorktown Heights, NY, USA

RESEARCH INTERN, WATSON HEALTH

Jun - Aug 2016

Worked under the supervision of **Shilpa Mahatma** and **Yajuan Wang** on “conceptual queries” for healthcare applications.

#### CINECA

Casalecchio di Reno, Bologna, Italy

SOFTWARE ENGINEERING INTERN

Jun - Oct 2012

- Responsible for developing and managing a data warehouse and analytics system for a nationwide videoconferencing system.
- Duties included generating aggregated data and analytics, deployed through usable interfaces to let decision makers understand usage and performance of the videoconferencing system.

#### Maggiore Hospital

Bologna, Italy

SOFTWARE DEVELOPER (VOLUNTEER)

2011 - 2013



- Co-developed software to help the Emergency Room visit their patients using portable ultrasound technology.
- Software deployed on medical tablets to help doctors collect patient's information on the field.
- The collected data was then used to make better informed decisions in the Emergency Room.

### ACADEMIA

#### DREAM Lab (Data systems Research for Exploration, Analytics, and Modeling), University of Massachusetts Amherst, MA, USA

RESEARCH ASSISTANT

Sep 2013 - present

- Working with **Prof Peter J. Haas**, **Prof Alexandra Meliou**, and **Prof Azza Abouzied** (NYU Abu Dhabi) to create  **Package Builder**, a system that extends query engines to support the generation of *packages*, i.e., collections of tuples with global properties that are true of the entire collection.
- Technical paper at SIGMOD 2020
- Demo papers at VLDB 2020
- Invited journal paper at CACM Research Highlights 2019.
- Invited journal paper at the VLDB Journal 2018.
- Invited journal paper at SIGMOD Records 2017.
- Technical paper at VLDB 2016; workshop paper and demo paper at VLDB 2014; undergraduate research poster at SIGMOD 2014.
- Project website: [packagebuilder.cs.umass.edu](http://packagebuilder.cs.umass.edu).
- DREAM Lab website: [dbgroup.cs.umass.edu](http://dbgroup.cs.umass.edu).
- Project code: Scalable-PaQL-Queries on  GitHub

#### Design Technology Lab, NYU Abu Dhabi

Abu Dhabi, UAE

VISITING PH.D. CANDIDATE

Mar - May 2016

- Paper: Redistributing Funds across Charitable Crowdfunding Campaigns (arXiv:1706.00070).

#### AMPLab, UC Berkeley

Berkeley, CA, USA

VISITING PH.D. STUDENT

May - Aug 2015

- Worked on extensions to Package Builder to identify ideal packages by example, under NYU Summer internship.

#### Data-Intensive Systems Lab, Århus University

Århus, Denmark

VISITING M.S. STUDENT

Jan - Jun 2013

- Worked on M.S. thesis on *Temporal Information Retrieval* under the supervision of **Prof Christian S. Jensen**.
- Actively collaborated with researchers within the group.
- Published two papers in main international conferences in the fields of NLP and IR.

#### Database Lab, UC Riverside

Riverside, CA, USA

UNDERGRADUATE RESEARCH INTERN (VOLUNTEER)

Jan - Jun 2013

- Worked closely with a Ph.D. candidate and **Prof Vassilis J. Tsotras** on query optimization techniques for query result diversification.
- Developed a query parser for a SQL-like diversification query language.
- Devised and developed a query optimizer to select optimal diversification query plans.
- Developed client/server technology to issue and evaluate diversification queries.

## Advising & Mentoring

#### Research Advisor for undergraduate student Agam Sandhu

Amherst, MA

UMASS AMHERST

2020

Agam Sandhu is working on scalable stochastic constrained optimization under costly sampling methods.

#### Research Advisor for PhD student Ahmad Chatha (NYU)

Amherst, MA

UMASS AMHERST

2020

Ahmad Chatha is working on combining scalable constrained optimization methods with scenario-based methods for stochastic optimization.

### **Project Mentor (in collaboration with Microsoft)**

UMASS AMHERST

Amherst, MA

2020

Mentored MS students (Abdul Hannan Kanji, Parul Gupta, Ge Gao, Xinlu Liu) for their Independent Class project (CS 696DS), in collaboration with Microsoft, to improve the Fairlearn library (<https://fairlearn.github.io>).

### **Research Advisor for MS student Kanchi Masalia**

UMASS AMHERST

Amherst, MA

2020

Kanchi Masalia is working on SuDocu, a new system for personalized efficient document summarization by example. SuDocu website:

<http://sudocu.cs.umass.edu>.

### **Research Advisor for undergrad Genglin Liu**

UMASS AMHERST

Amherst, MA

2020

Genglin Liu worked on the frontend of SuDocu, a new system for personalized efficient document summarization by example. SuDocu website:

<http://sudocu.cs.umass.edu>.

### **Research Mentor for undergraduate student Kyaw Htet**

UMASS AMHERST

Amherst, MA

Fall 2019

Kyaw worked on analyzing scenario reductions methods for stochastic optimization.

### **Project Mentor (in collaboration with Microsoft)**

UMASS AMHERST

Amherst, MA

Spring 2019

Mentored a group of four MS students (Katie House, Shanu Vashishtha, Deeksha Razdan, Cheng-Yin Eng) for their Independent Class project (CS 696DS), in collaboration with Microsoft to produce notebooks that showcase their Machine-as-a-service platform Azure ML.

### **Research Mentor for undergraduate student Nishad Ranade**

UMASS AMHERST

Amherst, MA

2018–2019

Nishad worked on Monte Carlo scenario reductions methods.

### **Research Mentor for 1st-year PhD student Nishant Yadav**

UMASS AMHERST

Amherst, MA

2018

Nishant and I worked together on stochastic package queries.

### **Research Mentor for graduate student Sandhya Sankaranarayanan**

UMASS AMHERST

Amherst, MA

Fall 2015

Sandhya and I worked together on extending the package query language PaQL.

### **Research Mentor for undergraduate student Kevin Fernandez**

UMASS AMHERST

Amherst, MA

Spring 2014

Kevin and I worked together on evaluation techniques for package queries. This work was invited to present at the *ACM SIGMOD 2014 Undergraduate Research Poster Competition*.

### **Research Mentor for graduate student Rahul Ramakrishna**

UMASS AMHERST

Amherst, MA

2013 - 2014

Rahul and I worked together on interface abstractions for package queries. Our work was demonstrated at *VLDB 2014*.

## **Teaching**

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### **Teaching Assistant for Undergraduate Database Systems (CS 345)**

UMASS AMHERST

Amherst, MA

Fall 2020

Office hours, question answering, grading and labs.

### **Teaching Assistant for Undergraduate Class “A Networked World” (INFO 203)**

UMASS AMHERST

Amherst, MA

Spring 2018

Homework grading.

### **Teaching Assistant for Undergraduate Introduction To Computation (CS 250)**

UMASS AMHERST

Amherst, MA

Fall 2017

Responsible for discussion sessions, occasional lectures, office hours, homework and discussion grading.

### **Teaching Assistant for Undergraduate Database Systems (CS 345)**

UMASS AMHERST

Amherst, MA

Fall 2015

Responsible for occasional lectures, project advising, office hours, homework and project grading.

## **Professional Service & Leadership**

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### **Reviewer**

- *IEEE Transactions of Knowledge and Data Engineering (TKDE)*.

2020

### **Guest Editorial Board**

- *Information Processing and Management*, special issue on *Time and Information Retrieval*, Elsevier, 2014/2015.

2014 - 2015

## External Review Committee

2013 - 2015

- VLDB 2017
- SIGMOD 2015
- VLDB 2015
- RANLP 2013

## Lab Seminar Organizer

[Amherst, MA, USA](#)

UMASS AMHERST DATABASE LAB

2014 - 2015

- Coordinated weekly discussion seminar, including invited talks and paper readings, for the UMass Amherst Database Research group (~10 Ph.D. students and faculty), and webmaster duties.

## Student Seminar Leader

[Amherst, MA, USA](#)

UMASS AMHERST DATABASE LAB

Fall 2015

- Organized and coordinated a weekly discussion seminar among Ph.D. and M.S. students in the UMass Amherst Database Research group to foster research collaborations, exchange of ideas, group discussions, and group cohesion.

## Talks

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### INDUSTRY

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#### Scalable Package Queries in Relational Database Systems

[Redmond, WA, USA](#)

MICROSOFT RESEARCH

Jun 2017

#### Conceptual Queries for Multiple Data Sources

[Austin, TX, USA](#)

IBM WATSON

Aug 2016

#### Package Queries: From Tuples to Packages

[Berkeley, CA, USA](#)

BERKELEY LABS

Jul 2015

### ACADEMIA

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#### Stochastic Package Queries For In-database Optimization Under Uncertainty

[Virtually at INFORMS 2020](#)

INFORMS 2020

November 2020

#### sPaQLTools: A Stochastic Package Query Interface for Scalable Constrained Optimization

[Tokyo, Japan \(virtually\)](#)

VLDB 2020

September 2020

- Video: <https://www.youtube.com/watch?v=1v5KevGKbfE>

#### Stochastic Package Queries in Probabilistic Databases

[Portland, OR, USA \(virtually\)](#)

SIGMOD 2020

June 2020

- Video: <https://www.youtube.com/watch?v=UrEOePlK06I>

#### Package Queries: Enabling Declarative and Scalable Prescriptive Analytics in Relational Data

[Cambridge, MA, USA](#)

MIT CSAIL, DATA SYSTEMS GROUP

Feb 2020

#### Stochastic Package Queries for In-Database Constrained Optimization Under Uncertainty

[Cambridge, MA, USA](#)

MIT, NORTH EAST DATABASE DAY, SAMBERG CONFERENCE CENTER

Jan 2020

#### Scalable Package Queries in Relational Database Systems

[New Delhi, India](#)

VLDB 2016

Sep 2016

- Slides: [packagebuilder.cs.umass.edu/papers/scalable-paql-presentation-share.pdf](https://packagebuilder.cs.umass.edu/papers/scalable-paql-presentation-share.pdf)

#### Package Queries: From Tuples to Packages

[Berkeley, CA, USA](#)

AMPLAB, UC BERKELEY

Jun 2015

#### Improving Package Recommendations through Query Relaxation

[Hangzhou, China](#)

VLDB 2014

Sep 2014

- Slides: [packagebuilder.cs.umass.edu/papers/package-recomm-slides-web.pdf](https://packagebuilder.cs.umass.edu/papers/package-recomm-slides-web.pdf)

#### Metric Spaces for Temporal Information Retrieval

[Amsterdam, the Netherlands](#)

ECIR 2014

Apr 2014

#### Metric Spaces for Temporal Information Retrieval

[Bologna, Italy](#)

UNIVERSITY OF BOLOGNA

Dec 2013

#### Metric Spaces for Temporal Information Retrieval

[Århus, Denmark](#)

ÅRHUS UNIVERSITY

Jan 2013