

BASICS Symposium 2019

会议程序册

广州·中山大学
2019年1月21-22日



BASICS
LAB

一. 会议简介

由上海交通大学 BASICS 实验室与中山大学数据科学与计算机学院计算机科学理论研究所联合举办的“BASICS Symposium 2019” (Basic Studies In Computing Science) 于 2019 年 1 月 21-22 日在中山大学广州校区东校园举行。会议旨在促进计算机科学理论研究领域的交流与合作, 邀请相关学者介绍最新研究成果。报告内容涵盖程序验证、并发理论、算法 (在线算法、近似算法、随机算法)、形式化方法、机器学习理论、量子计算、知识表示与推理等。欢迎您参会!

二. 会议时间与地点

时间: 2019 年 1 月 21-22 日

地点: 广州大学城中山大学数据科学与计算机学院 A101

三. 联系方式

李绿周/中山大学(13802437672)

四. 会议日程安排

时间	内容	地点
1 月 21 日		
9:00-9:10	开幕	计算机学院 A101
9:10-9:40	Nonlinear Craig Interpolant Generation and Its Application to Program Verification 詹乃军/中国科学院软件研究所	
9:40-10:10	Generalization bounds of noisy gradient methods for nonconvex learning 李建/清华大学	
10:10-10:30	茶歇	
10:30-11:00	Revisit D-J algorithm, Simon's algorithm, Grover's algorithm, and Shor's algorithm 邱道文/中山大学	
11:00-11:30	Divergence Preserving Bisimulations, Characterization and Axiomatisation 柳欣欣/中科院软件所	
11:30-12:00	带延迟的在线匹配——欲速则不达 王彧弋/瑞士苏黎世联邦理工	
12:00-13:10	午餐	
13:10-14:00	参观国家超级计算广州中心	超算中心
14:10-14:40	My Understanding of Probabilistic Process Model 傅育熙/上海交通大学	计算机学院 A101
14:40-15:10	On Local Distributed Sampling and Counting 尹一通/南京大学	
15:10-15:40	Inner-Approximating Reachable Sets for Polynomial Systems with Time-Varying Uncertainties 薛白/中科院软件所	
15:40-16:00	茶歇	
16:00-16:30	Local Spectral Subspace Approximation for Community Detection 何琨/华中科技大学	

时间	内容	地点
1月21日		
16:30-17:00	Forgetting in knowledge representation and reasoning 刘咏梅/中山大学	计算机学院 A101
17:00-17:30	Isolation modeling and analysis based on mobility 蒋建民/福建师范大学	
1月22日		
9:00-9:30	On the Decision Tree Complexity of String Matching 孙晓明/中科院计算所	计算机学院 A101
9:30-10:00	标签割问题的近似算法 张鹏/山东大学	
10:00-10:30	Fully Online Matching 唐志皓/香港大学、上海财经大学	
10:30-10:50	茶歇	
10:50-11:20	A Primal-Dual Online Algorithm for the k-Server Problem on Weighted HSTs 陈文彬/广州大学	
11:20-11:50	Optimal exact quantum algorithms for Generalized Deutsch-Jozsa problem 郑盛根/南方科技大学	
11:50-12:00	闭幕	

五. 报告简介

1. 詹乃军/中国科学院软件研究所

报告题目: Nonlinear Craig Interpolant Generation and Its Application to Program Verification

摘要: Interpolation-based techniques have become popularized in recent years because of their inherently modular and local reasoning, which can scale up existing formal verification techniques like theorem proving, model-checking, abstraction interpretation, and so on, while the scalability is the bottleneck of these techniques. Craig interpolant generation plays a central role in interpolation-based techniques, and therefore has drawn increasing attentions. In the literature, there are various works done on how to automatically synthesize interpolants for decidable fragments of first-order logic, linear arithmetic, array logic, equality logic with uninterpreted functions (EUF), etc., and their combinations. But Craig interpolant generation for non-linear theory and its combination with the aforementioned theories are still in infancy, although some attempts have been done.

In this talk, we first prove that a polynomial interpolant of the form $h(x) > 0$ exists for two mutually contradictory polynomial formulas $F(x, y)$ and $G(x, z)$, with the form $f_1 \geq 0 \wedge \dots \wedge f_n \geq 0$, where f_i s are polynomials in x, y or x, z , and the quadratic module generated by f_i s is Archimedean. Moreover, we show that such interpolant can be computed efficiently through solving a semi-definite programming problem (SDP). In addition, we propose a verification approach to assure the validity of the synthesized interpolant and consequently avoid the unsoundness caused by numerical error in SDP solving. Finally, we demonstrate how to apply our approach to invariant generation in program verification.

个人简介: 詹乃军, 中国科学院软件研究所研究员, 中国科学院特聘研究员, 中国科学院大学岗位教授。1993年南京大学数学系获得学士学位; 1996年南京大学计算机系获得硕士学位; 2000年中国科学院软件研究所获得博士学位。2001.5-2004.7, 在德国曼海姆大学数学与信息学院工作; 2004.9-今, 在中国科学院软件研究所工作。现为《Formal Aspects of Computing》、《Journal of Logical and Algebraic Methods in Programming》、《软件学报》、《计算机研究与发展》的编委。

2. 李建/清华大学

报告题目: Generalization bounds of noisy gradient methods for nonconvex learning

摘要: Generalization error (also known as the out-of-sample error) measures of how well the hypothesis obtained from the training data can generalize to previously unseen data. Hence, obtaining tight generalization error bounds are central to statistical learning theory. While generalization error bounds in the convex setting have been studied extensively and fairly well understood, much less is known in the more general nonconvex setting (e.g., deep learning). Since various stochastic gradient methods are the most popular methods in learning nonconvex objectives, it is important to understand the generalization behavior for those methods.

In this talk, we study the (algorithm-dependent) generalization bounds of Stochastic Gradient Langevin Dynamics (SGLD is a slight variant of the most popular SGD algorithm) with non-convex objectives. We present a very simple and elementary proof of a recent result (Mou et al. COLT 18. their proof is based on stochastic differential equation and Fokker-Planck equation). Our proof yields some additional features and allows us to show similar bounds for some other variants of SGLD (with momentum, minibatch, acceleration, and more general noises), and improve on some recent results in (Pensia et al. ISIT 18). Under reasonable assumption of the diffusion process, we can obtain even tighter generalization bounds. Our bounds can provide some intuitive explanation for the phenomenon reported in the popular "rethinking generalization" paper (Zhang et al. ICLR 17).

个人简介: 李建目前是清华大学交叉信息研究院长聘副教授，博士生导师。他在中山大学取得的学士学位和复旦大学取得的硕士学位，马里兰大学博士毕业。他的研究兴趣主要包括算法设计与分析，机器学习，数据库，金融科技。他已经在主流国际会议和杂志上发表了 70 余篇论文，并获得了 VLDB 2009 和 ESA 2010 的最佳论文奖，ICDT 2017 最佳新人奖。清华 221 基础研究青年人才支持计划以及教育部新世纪人才支持计划和国家优秀青年基金。

3. 邱道文/中山大学

报告题目: Revisit D-J algorithm, Simon' s algorithm, Grover' s algorithm, and Shor' s algorithm

摘要: Deutsch-Jozsa algorithm, Simon' s algorithm, Grover' s algorithm, and Shor' s algorithm are the pioneering and most important quantum algorithms in quantum computing. They have efficiently shown that quantum computers are

essentially faster than classical computers for solving some important problems human face, and have discovered brand-new methods for designing quantum algorithms as well. So, in this talk, I would like to revisit these epoch-making algorithms and present a number of results closely related to these problems we have achieved.

报告中一些内容已经发表如下:

1. Daowen Qiu, S. Zheng, Generalized Deutsch-Jozsa problem and the optimal quantum algorithm, *Physical Review A*, 2018, 97: 062331.
2. G. Cai, Daowen Qiu, Optimal separation in exact query complexities for Simon problem, *Journal of Computer and System Sciences*, 2018, 97: 83-93.
3. M. Pan, Daowen Qiu, M. Paulo, J. Gruska, Entangling and disentangling in the Grover's search algorithm, *Theoretical Computer Science*. 2018, DOI: 10.1016/j.tcs.2018.10.001
4. G. Xu, Daowen Qiu, X. Zou, J. Gruska, Improving the Success Probability for Shors Factorization Algorithm. 2018, In: Adamatzky A. (eds) *Reversibility and Universality. Emergence, Complexity and Computation*, vol 30. Springer, Cham. <https://doi.org/10.1007/978-3-319-73216-9-21>

个人简介: 邱道文, 1967 年生于江西石城, 中山大学数据科学与计算机学院教授、博士生导师, 为本学院计算机科学理论研究所负责人, 从事量子计算与量子信息、(非确定型) 离散事件系统的监控和诊断、以及模型学习方面的研究。1986 年开始在江西师范大学数学系学习, 七年后获得基础数学硕士学位(模糊逻辑); 1997 年在中山大学数学系学习三年后获得基础数学博士学位(导师: 邓东皋教授)。自 1999 年开始从事量子计算的研究, 主要在量子自动机、量子查询算法、量子态的区分和拷贝、半量子密钥分配等问题开展了一系列的研究工作, 并培养了十余名博士研究生。迄今在 *Information and Computation*, *Journal of Computer and System Sciences*, *Theoretical Computer Science*, *Acta Informatica*, *Physical Review A*, *Quantum Information and Computation*, *Artificial Intelligence*, *IEEE TFS*, *IEEE TAC*, *IEEE TSMC-B*, *Science in China (Series-F)* 等国际学术期刊发表了 100 余篇 SCI 学术论文, SCI 他人引用 1300 次以上。

4. 柳欣欣/中科院软件所

报告题目: Divergence Preserving Bisimulations, Characterization and Axiomatisation

摘要: 关于 divergence preserving 互模拟等价关系, 尽管直观上比较容易理解, 但理论上存在多种刻画, 每种刻画都有各自的长处和短处。我们对一种刻画进行了深入的研究, 取得了从模态逻辑刻画到对有限状态进程完备的推理系统等一些新的结果。部分结果的论文发表在 POPL 2017 和 FoSSaCS 2018 上。

个人简介: 中国科学院软件研究所研究员, 研究方向是并发理论及其在并发程序正确性验证中的应用。

5. 王彧弋/瑞士苏黎世联邦理工

报告题目: 带延迟的在线匹配——欲速则不达

摘要: We study a new online problem, referred to as min-cost perfect matching with delays (MPMD), defined over a finite metric space (i.e., a complete graph with positive edge weights obeying the triangle inequality) M that is known to the algorithm in advance. Requests arrive in a continuous time online fashion at the points of M and should be served by matching them to each other. The algorithm is allowed to delay its request matching commitments, but this does not come for free: the total cost of the algorithm is the sum of metric distances between matched requests plus the sum of times each request waited since it arrived until it was matched. A randomized online MPMD algorithm is presented whose competitive ratio is $O(\log n)$, where n is the number of points in M .

This talk is based on papers presented at (STOC 2016, SODA 2017, CIAC 2017, APPROX 2017, ISAAC 2018).

个人简介: 王彧弋, 现任瑞士苏黎世联邦理工博士后研究员。2015 年于比利时鲁汶大学获得博士学位; 2010 年在新加坡国立大学获得硕士学位; 2009 年在华中科技大学完成本科学习。目前主要关注理论计算机科学和机器学习。

6. 傅育熙/上海交通大学

报告题目: My Understanding of Probabilistic Process Model

摘要: We will define a proper probabilistic process calculus and study its bisimulation semantics.

个人简介: 傅育熙, 1992 年获英国曼彻斯特大学博士学位, 现为上海交通大学特聘教授, 是国家杰出青年基金获得者、上海市优秀学科带头人。曾任上海市计算机学会理事长、上海交通大学计算机系主任和软件学院院长, 现为教育部计算机类教指委副主任。研究领域为理论计算机科学, 研究内容涉及程序理论、并发计算模型、验证、交互理论。

7. 尹一通/南京大学

报告题目: On Local Distributed Sampling and Counting

摘要: In this talk, we will show the computational equivalences between approximate inference and approximate/exact sampling, for local computation. The result gives a local variant of the Jerrum-Valiant-Vazirani theorem for global

computing.

Published in PODC' 18, joint work with Weiming Feng.

个人简介: 尹一通, 南京大学计算机科学与技术系教授, 博士生导师。2009 年博士毕业于耶鲁大学计算机科学系, 同年回到母校南京大学任教。开设课程: 高级算法、组合数学、随机算法、概率与计算等。研究方向为理论计算机科学, 尤其是随机算法、数据结构复杂性、分布式计算理论等。在 FOCS、SODA、PODC、SPAA、ICALP、SICOMP、PTRF、IANDC、DC 等会议与期刊发表多篇论文。

8. 薛白/中科院软件所

报告题目: Inner-Approximating Reachable Sets for Polynomial Systems with Time-Varying Uncertainties

摘要: In this paper we propose a convex programming based method to address a long-standing problem of inner-approximating backward reachable sets of state-constrained polynomial systems subject to time-varying uncertainties. The backward reachable set is a set of states, from which all trajectories starting will surely enter a target region at the end of a given time horizon without violating a set of state constraints in spite of the actions of uncertainties. It is equal to the zero sub-level set of the unique Lipschitz viscosity solution to a Hamilton-Jacobi partial differential equation (HJE). We show that inner-approximations of the backward reachable set can be formed by zero sub-level sets of its viscosity super-solutions. Consequently, we reduce the inner-approximation problem to a problem of synthesizing polynomial viscosity super-solutions to this HJE. Such a polynomial solution in our method is synthesized by solving a single semi-definite program. We also prove that polynomial solutions to the formulated semi-definite program exist and can produce a convergent sequence of inner-approximations to the interior of the backward reachable set in measure under appropriate assumptions. Several illustrative examples demonstrate the merits of our approach.

个人简介: 2008 年本科毕业于天津工程师范学院信息与计算科学专业, 并考入北京航空航天大学数学与系统科学学院攻读硕士学位, 2010 年硕转博, 继续在数学与系统科学学院攻读博士学位, 师从余志坤教授。2014 年毕业于北京航空航天大学应用数学专业。2014 年 5 月至 2015 年 9 月, 在新加坡南洋理工大学从事博士后研究工作; 2015 年 11 月至 2017 年 10 月在德国奥登堡大学从事博士后研究工作。2017 年入选中科院百人计划“C”(青年俊才)候选人, 并于 2017 年 11 月在中国科学院软件研究所入职。主要研究兴趣包括混成系统安全性验证、程序验证等。

9. 何琨/华中科技大学

报告题目: Local Spectral Subspace Approximation for Community Detection

摘要: Community detection is an important mining task to uncover modular structures in large networks. We propose a series of local spectral methods for identifying all latent members of a target community supervised by a few labeled seed members. The methods consist of local sampling, sparse indicator finding in the local spectral subspace, and community boundary determination. The effectiveness of the proposed approaches is theoretically analyzed based on Rayleigh quotients, and is experimentally verified on a wide variety of real-world networks as well as the synthetic datasets.

WWW2015, ICDM2015, ECML2017, TKDD2018, KBS2019

个人简介: 华中科技大学计算机学院教授、博士生导师、John Hopcroft 实验室主任。中国计算机学会理论专委会委员，ACM 高级会员，CCF 高级会员，IEEE 高级会员，教育部学位与研究生教育发展中心优秀硕博士学位论文通讯评审专家。主要从事计算机科学的基础理论与算法研究，包括组合优化、连续优化、机器学习、深度学习的基础理论与算法。在 NIPS (以及改名后的 NeurIPS)、ICDE、ICLR、WWW、ICDM、ECML、Information Sciences、TKDD、KBS、TSMC、EJOR、COR、TCS、TPDS、中国科学、计算机学报等权威期刊和会议发表论文 80 余篇。

10. 刘咏梅/中山大学

报告题目: Forgetting in knowledge representation and reasoning

摘要: In the past decades, forgetting has been investigated for many logics and has found many applications in knowledge representation and reasoning (KR). Intuitively, forgetting some symbols from a theory should result in a theory that is weaker than the original theory and entails the same set of sentences that do not mention those symbols. A closely related concept is uniform interpolation. In this talk, I will first give a brief review of forgetting in KR. Then I will present our recent results on forgetting in multi-agent modal logics. We adopt the semantic definition of existential bisimulation quantifiers as that of forgetting. We resort to canonical formulas of modal logics introduced by Moss. An arbitrary modal formula is equivalent to the disjunction of a unique set of satisfiable canonical formulas. We show that, for the logics of K_n , D_n , T_n , $K45_n$, $KD45_n$ and $S5_n$, the result of forgetting an atom from a satisfiable canonical formula can be computed by simply substituting the literals of the atom with true. Thus we show that these logics are closed under forgetting, and hence have uniform interpolation. This work has been published in the journal of Artificial Intelligence.

个人简介: 刘咏梅, 中山大学计算机科学系教授。于多伦多大学计算机科学系获博士学位。主要研究方向为人工智能中的知识表示与推理。研究成果持续发表于国际人工智能会议IJCAI 和 AAAI 上。

11. 蒋建民/福建师范大学

报告题目: Isolation modeling and analysis based on mobility

摘要: In a mobile system, mobility refers to a change in position of a mobile object with respect to time and its reference point, whereas isolation means the isolation relationship between mobile objects under some scheduling policies. Inspired by event-based formal models and the ambient calculus, we first propose the two types of special events, entering and exiting an ambient, as movement events to model and analyze mobility. Based on mobility, we then introduce the notion of the isolation of mobile objects for ambients. To ensure the isolation, a priority policy needs to be used to schedule the movement of mobile objects. However, traditional scheduling policies focus on task scheduling and depend on the strong hypothesis: the scheduled tasks are independent—that is, the scheduled tasks do not affect each other. In a practical mobile system, mobile objects and ambients interact with each other. It is difficult to separate a mobile system into independent tasks. We finally present an automatic approach for generating a priority scheduling policy without considering the preceding assumption. The approach can guarantee the isolation of the mobile objects for ambients in a mobile system. Experiments demonstrate these results. To appear in ACM Transactions on Software Engineering and Methodology.

个人简介: 蒋建民 (1972-), 男, 四川渠县人, 博士, 教授, 硕士生导师。1995年本科毕业于四川师范大学物理系计算机专业, 同年进入渝州大学(今为重庆工商大学)任教; 2006年在中国科学院成都计算机应用研究所获得博士学位, 同年进入福建师范大学任教。研究方向为软件开发方法和形式法方法, 提出了能与Petri网媲美的形式化模型——依赖结构(Dependency structure)和能用于复杂系统调度问题的理论——细粒度调度理论, 已经引起国内、国际学术界的注意。目前主持国家自然科学基金面上项目、福建省自然科学基金面上项目, 在国际一流刊物ACM TECS、ACM TCPS、SPE和国内刊物Sci. China等学术期刊发表论文30余篇。

12. 孙晓明/中科院计算所

报告题目: On the Decision Tree Complexity of String Matching

摘要: String matching is one of the most fundamental problems in computer science. A natural problem is to determine the number of characters that need to be queried (i.e. the decision tree complexity) in a string in order to decide

whether this string contains a certain pattern. Rivest showed that for every pattern p , in the worst case any deterministic algorithm needs to query at least $n - |p| + 1$ characters, where n is the length of the string and $|p|$ is the length of the pattern. He further conjectured that these bounds are tight. By using adversary methods, Tuza disproved this conjecture and showed that more than one half of binary patterns are evasive, i. e. any algorithm needs to query all the characters (see Section 1.1 for more details). In this paper, we give a query algorithm which settles the decision tree complexity of string matching except for a negligible fraction of patterns. Our algorithm shows that Tuza's criteria of evasive patterns are almost complete. Using the algebraic approach of Rivest and Vuillemin, we also give a new sufficient condition for the evasiveness of patterns, which is beyond Tuza's criteria. In addition, our result reveals an interesting connection to Skolem's Problem in mathematics.

个人简介: 孙晓明, 中科院计算所研究员。主要研究领域: 算法与计算复杂性, 量子计算, 社交网络算法研究, 判定树复杂性等。曾获基金委首批优青资助, 中国密码学会优秀青年奖、密码创新二等奖, 入选中组部首批万人计划青年拔尖人才。目前担任 CCF 理论专委会副主任, 学工委主任助理, 密码学会青工委委员, 国际学术会议 COCOON 指导委员会委员, 还担任《软件学报》,《计算机研究与发展》,《JCST》,《中国科学:信息科学》等杂志编委和青年编委。

13. 张鹏/山东大学

报告题目: 标签割问题的近似算法

摘要: 标签 $s-t$ 割问题是在信息安全和计算机网络等领域中提出的一个组合优化问题。给一个图, 边上有标签, 该问题询问最少数目的标签, 使得在图上把具有这些标签的边去掉后, 能够将给定的源点 s 和目标点 t 断开。容易看出, 标签 $s-t$ 割问题是经典的最小 $s-t$ 割问题的推广。

在本报告中, 我们主要介绍标签 $s-t$ 割问题的两个纯组合算法。这两个算法的近似比分别为 $O(m^{1/2})$ 和 $O(n^{2/3})$, 其中 m 和 n 分别为图上的边数和点数。这是标签 $s-t$ 割问题当前已知最好的近似比。(Algorithmica, 2018 年发表)

个人简介: 张鹏, 山东大学软件学院副教授。2007 年 7 月于中科院软件所取得博士学位, 长期以来从事组合优化和近似算法的研究工作。共发表论文 40 多篇, 其中以第一作者、通讯作者发表 SCI 索引论文 19 篇。主持国家自然科学基金面上项目两项。

14. 唐志皓/香港大学、上海财经大学

报告题目: Fully Online Matching

摘要: We introduce a fully online model of maximum cardinality matching in which all vertices arrive online. On the arrival of a vertex, its incident edges to previously-arrived vertices are revealed. Each vertex has a deadline that is after all its neighbors' arrivals. If a vertex remains unmatched until its deadline, the algorithm must then irrevocably either match it to an unmatched neighbor, or leave it unmatched. The model generalizes the existing one-sided online model and is motivated by applications including ride-sharing platforms, real-estate agency, etc.

We show that the Ranking algorithm by Karp et al. (STOC 1990) is 0.5211-competitive in our fully online model for general graphs. Our analysis brings a novel charging mechanic into the randomized primal-dual technique by Devanur et al. (SODA 2013), allowing a vertex other than the two endpoints of a matched edge to share the gain. To our knowledge, this is the first analysis of Ranking that beats 0.5 on general graphs in an online matching problem, a first step towards solving the open problem by Karp et al. (STOC 1990) about the optimality of Ranking on general graphs. If the graph is bipartite, we show that the competitive ratio of Ranking is exactly the Omega constant, which is approximately 0.5671. Finally, we prove that the fully online model is strictly harder than the previous model as no online algorithm can be $0.6317 < (1-1/e)$ -competitive in our model even for bipartite graphs.

This talk is based on two works that has been published in STOC 2018 and SODA 2019.

个人简介: Zhihao Tang is a currently a PhD student of Computer Science at the University of Hong Kong and will join ITCS at Shanghai University of Finance and Economics as an Assistant Professor. Before that, he obtained a bachelor's degree in mathematics from Peking University in 2014. His research interests include online algorithms and algorithmic game theory.

15. 陈文彬/广州大学

报告题目: A Primal-Dual Online Algorithm for the k -Server Problem on Weighted HSTs

摘要: (发表在 Journal of Combinatorial Optimization)

In this paper, we show that there is a $5/2 \epsilon \cdot \ln(1+k)$ -competitive randomized algorithm for the k -server problem on weighted Hierarchically Separated Trees (HSTs) with depth ϵ when $n = k + 1$, which improved previous best competitive ratio $12\epsilon \ln(1+4\epsilon(1+k))$ by Nikhil Bansal et al. (FOCS 2011, pages 267-276)

个人简介: 陈文彬, 男, 广州大学教授。2003年6月取得中国科学院软件研究所数学硕士学位后进入南京航空航天大学信息学院工作。2007年8月去美国北卡罗来纳州立大学(North Carolina State University)攻读博士学位。2010年12月取得博士学位。2011年5月进入广州大学工作。

主要研究方向是理论计算机科学包括图算法及应用, 格密码算法及应用, 在线算法, 近似算法, 计算复杂性等。已经发表 SCI/EI 检索学术论文 30 余篇, 包括在信息理论的著名期刊 IEEE Transaction on Information Theory, 在理论计算机科学国际知名期刊 Theoretical Computer Science, Journal of Combinatorial Optimization 等等。主持承担了包括国家自然科学基金面上项目等多项课题。

16. 郑盛根/南方科技大学、鹏城实验室

报告题目: Optimal exact quantum algorithms for Generalized Deutsch-Jozsa problem

摘要: The Deutsch-Jozsa problem is a promise problem and it can be equivalently described as a partial Boolean function $DJ_n^0: \{0,1\}^n \rightarrow \{0,1\}$ defined as: n is even, $DJ_n^0(x) = 1$ for $|x| = n/2$ and $DJ_n^0(x) = 0$ for $|x| = 0$ or n , and the other cases are undefined, where $|x|$ is the Hamming weight of x (It is equivalent to the definition that $DJ(f) = 0$ if f is constant, $DJ(f) = 1$ if f is balanced, where f is a k -bit Boolean function $f: \{0,1\}^k \rightarrow \{0,1\}$ such that $n = 2^k$. The definition in this paper is more general since n can be any even number). The optimal quantum algorithm only needs one query to compute DJ_n^0 , while the classical deterministic algorithm requires $n/2 + 1$ queries to compute it in the worst case. In this article, we generalize the Deutsch-Jozsa problem as $DJ_k^n(x) = 1$ for $|x| = n/2$, $DJ_k^n(x) = 0$ for $|x|$ in the set $\{0, 1, \dots, k, n-k, n-k+1, \dots, n\}$, and it is undefined

for the rest of the cases, where $0 \leq k < n/2$. In particular, we give and prove an optimal exact quantum query algorithm with complexity $k+1$ for computing the generalized Deutsch-Jozsa problem DJ_k^n . It is clear that the case of $k=0$ is in accordance with the Deutsch-Jozsa problem. When $k=1$, it is the case that investigated by Montanaro (Algorithmica' 15). We investigate also optimal exact algorithms for distinguishing inputs of Hamming weight k and l .

PHYSICAL REVIEW A 97, 062331 (2018), arXiv:1603.06505

个人简介: 郑盛根, 1983年1月出生, 博士, 南方科技大学量子科学与工程研究院副教授; 深圳鹏城实验室量子算法软件与云平台重大项目量子算法与复杂性理论子课题负责人, 量子计算中心副研究员、主任助理。从事量子计算理论研究, 2012年在中山大学获得博士学位。2012年10月到2015年6月应IEEE先驱奖得主欧洲科学院院士Gruska教授的邀请作为捷克优秀博士人才引进计划人员前往捷克马萨里克大学从博士后研究工作。2015年7月至2018年2月期间在中山大学数据科学与计算机学院担任副研究员。2013年期间, 在国际著名量子计算学者拉脱维亚大学Ambainis教授(2018年国际数学家大会报告讲者)的团队下访学三个月。并与Ambainis教授等一起合作证明了精确量子算法对几乎所有的布尔函数都有优势, 解决了在精确量子计算领域一个十几年公开的问题。在Information and Computation、Theoretical Computer Science、Quantum Information and Computation、Mathematical Structures in Computer Science等国际权威SCI学术期刊发表论文20多篇。多次参加国际学术会议并作口头报告, 包括QIP, AQIS, CEQIP等国际学术会议。同时是Information and Computation、Journal of Computer and System Sciences、Theoretical Computer Science、Quantum Information and Computation、National Science Review等国际权威SCI期刊的审稿人。

李绿周简介



李绿周, 博士, 中山大学数据科学与计算机学院副教授, 博士生导师, 计算机科学系副主任。2009年6月毕业于中山大学计算机系, 获博士学位, 其后留校任教, 2012年到悉尼科技大学进行合作研究。从事量子计算与量子信息方面的研究, 过去十余年主要从计算科学的角度出发, 围绕“量子计算相对于经典计算有何

优势与本质不同”这一中心问题展开研究, 对量子自动机模型的等价性, 最小化, 计算能力, 模型检测等问题进行了比较深入系统的研究, 解决了研究领域的开放性问题。目前的主要研究兴趣为量子计算模型与算法 (特别是量子机器学习算法)。已在 Journal of Computer and System Sciences, Information and Computation, Theoretical Computer Science, IEEE transaction on Fuzzy Systems, Physical Review A 等国际著名学术期刊发表论文近 50 篇, SCI 收录近 40 篇, 撰写专著《量子有限自动机: 等价性与最小化》(浙江大学出版社, 校稿中)。曾获得 2009 年度中国计算机学会优秀博士学位论文奖, 2012 年度中山大学青年教师授课大赛一等奖。

<http://sdcs.sysu.edu.cn/content/2541>

六. 住宿及交通信息

会议预定酒店：南国国际会议中心（广州大学城外环东路 280 号）

周边其他酒店：广州大学城雅乐轩酒店，J 精品酒店，盈点商务酒店

交通指引：

- 1) 广州白云机场：可乘坐地铁 3 号线北延段从机场南站到体育西路站，在体育西路站换乘地铁 3 号线到客村站，在客村站换乘地铁 8 号线到万胜围站，在万胜围站换乘地铁 4 号线到大学城南站 C 出口下车，再打车到酒店；或者乘坐出租车从机场到大学城南国国际会议中心，费用约 200 元。
- 2) 广州南站：可乘坐地铁 7 号线从广州南站到大学城南站，在 C 出口下车，再打车到酒店；或者乘坐出租车从广州南站到大学城南国国际会议中心，费用约 100 元。

- 会场：中山大学数据科学与计算机学院 A101（广州大学城外环东路 132 号）

- 午餐餐厅：中山大学东校区行政楼餐厅

附 1：广州大学城地图



附 2：中山大学东校区地图

