基本信息

姓名 孙亚辉
出生年月 1990年11月
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现在的职位 研究人员 (Research fellow), 计算机学院 (School of Computing),
新加坡国立大学 (National University of Singapore)

教育与工作经历

2020- **研究人员 (Research fellow), 新加坡国立大学 (National University of Singapore, Singapore)**
2019-2020 **研究人员 (Research fellow), 新加坡南洋理工大学 (Nanyang Technological University, Singapore)**
2018-2019 **博士后 (Postdoctoral fellow), 澳大利亚国立大学 (Australian National University, Australia)**
2014-2018 **博士 (工程学院), 澳大利亚墨尔本大学 (University of Melbourne, Australia)**
论文题目: Classical, prize-collecting and node-weighted Steiner tree problems in graphs
2012-2014 **硕士 (航天工程), 哈尔滨工业大学，哈尔滨 (Harbin Institute of Technology, Harbin)**
2008-2012 **本科 (飞行器设计与工程), 哈尔滨工业大学，哈尔滨 (Harbin Institute of Technology, Harbin)**

研究方向

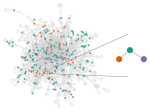
图计算相关的数据挖掘与计算机网络 (知识图谱、社交网络、城市网络、物联网等；**我喜欢数据挖掘工程与理论计算机科学的交叉领域的研究**，简言之：把工程的问题做出理论，把理论的问题做出工程)

职业概述

激励于2003年的神舟五号载人航天工程，我在哈尔滨工业大学攻读了飞行器设计与工程专业的本科学位，与航天工程专业的硕士学位。随后，我在澳大利亚墨尔本大学攻读了工程学院的博士学位，研究方向为图论中的Steiner tree优化问题。我现在的研究方向，也就是图计算与图挖掘，源自我博士期间的研究工作。

代表作

Yahui Sun, Xiaokui Xiao, Bin Cui, Saman Halgamuge, Theodoros Lappas, and Jun Luo. "Finding group Steiner trees in graphs with both vertex and edge weights", **Proceedings of the VLDB Endowment** (2021) (数据库与数据挖掘领域顶会/刊； CCF A类).
[**PDF**]

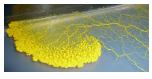


Finding group Steiner trees is a standard approach to information retrieval in relational databases. Most existing work focuses on finding group Steiner trees in vertex-unweighted graphs, and not enough work has been done to find group Steiner trees in graphs with both vertex and edge weights. Here, we develop several algorithms to address this issue. Initially, we extend two algorithms from vertex-unweighted graphs to vertex- and edge-weighted graphs. Then, we develop several new approximation algorithms, one of which provides the tightest polynomial-time approximation guarantee to date. Experiments show that, while no algorithm is the best in all cases, our algorithms considerably outperform the state of the art in many scenarios.

Yahui Sun, Jun Luo, Theodoros Lappas, Xiaokui Xiao, and Bin Cui. "Hunting multiple bumps in graphs", **Proceedings of the VLDB Endowment** (2020) (数据库与数据挖掘领域顶会/刊； CCF A类).
[**PDF**]

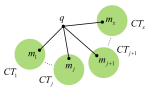
Bump hunting is a graph-related anomaly detection approach. A single bump is hunted in an unweighted graph in the previous work. We extend the previous work by hunting multiple bumps in a weighted graph. We prove that our extended problem can be transformed to a recently formulated prize-collecting Steiner forest problem. We further prove that this problem is NP-hard even in trees. Subsequently, we propose a fast approximation algorithm for solving this problem in trees. Based on this algorithm, we improve the state-of-the-art approximation algorithm for solving this problem in graphs. Experiments on real datasets show the dominance of our improvement over the state-of-the-art algorithms for hunting multiple bumps in graphs.

Yahui Sun, Daniel Rehfeldt, Marcus Brazil, Doreen Thomas, and Saman Halgamuge. “A Physarum-inspired algorithm for minimum-cost relay node placement in wireless sensor networks”, **IEEE/ACM Transactions on Networking** (2020) (计算机网络领域顶刊； CCF A类).
[**PDF**]



Relay node placement is essential in minimizing the costs of wireless sensor networks. Here, we focus on minimum-cost relay node placement. By considering the heterogeneous production and placement costs of relay nodes, our work extends the previous work that considers the costs of relay nodes to be homogeneous. Initially, we conduct some theoretical analyses on the emerging Physarum-inspired algorithms to reveal their potential of computing efficient networks. Based on these analyses, we propose an algorithm for minimum-cost relay node placement. In comparison with the state of the art, our algorithm designs wireless sensor networks with lower relay costs and similar qualities of service. Our work is particularly useful in budget-limited scenarios.

Yahui Sun, Marcus Brazil, Doreen Thomas, and Saman Halgamuge. "The fast heuristic algorithms and post-processing techniques to design large and low-cost communication networks", **IEEE/ACM Transactions on Networking** (2019) (计算机网络领域顶刊； CCF A类).
[**PDF**]



Solving the prize-collecting Steiner tree problem is useful in various scenarios, including computer networking and data mining. We propose two fast algorithms for solving this problem: the first one is a quasilinear-time heuristic algorithm that is faster and consumes less memory than the other algorithms; and the second one is an improvement of a state-of-the-art polynomial-time approximation algorithm (we improve the time complexity of the inside pruning method from $O(n^2)$ to $O(n)$, without sacrificing the optimality of solutions). We show the competitiveness of our algorithms by comparing them with the state of the art. We also propose some post-processing techniques that update the best-known solution for a notoriously difficult benchmark instance.

其他发表文章

Yahui Sun, and Saman Halgamuge. "Minimum-cost heterogeneous node placement in wireless sensor networks", IEEE Access (2019). (投这篇文章的时候我和我博士导师Saman Halgamuge并不太了解IEEE Access; 这是我的, 也是Saman的, 唯一一篇IEEE Access文章；这是一篇经得起时间检验的文章)
[**PDF**]

Yahui Sun, Chenkai Ma, and Saman Halgamuge. "The node-weighted Steiner tree approach to identify elements of cancer-related signaling pathways", International Conference on Bioinformatics (2017).
[**PDF**]

Yahui Sun, Pathima Nusrath Hameed, Karin Verspoor, and Saman Halgamuge. "A physarum-inspired prize-collecting Steiner tree approach to identify subnetworks for drug repositioning", International Conference on Bioinformatics (2016).
[**PDF**]

Yahui Sun, and Saman Halgamuge. "Fast algorithms inspired by physarum polycephalum for node weighted steiner tree problem with multiple terminals", In 2016 IEEE Congress on Evolutionary Computation, pp. 3254-3260. IEEE, (2016).
[**PDF**]

Yahui Sun, Yunhai Geng, and Shuang Wang. "Analysis and calibration of star sensor's image plane displacement", Infrared and Laser Engineering 10 (2014): 26.
[**PDF**]

Yahui Sun, Yingying Xiao, and Yunhai Geng. "On-orbit calibration of star sensor based on a new lens distortion model", In Proceedings of the 32nd Chinese Control Conference, pp. 4989-4994. IEEE, (2013).
[**PDF**]

科研服务经历

会议程序委员会成员： International Conference on Database Systems for Advanced Applications (DASFAA) 2020.
会议与期刊审稿人： ACM SIGKDD Conference on Knowledge Discovery and Data Mining 2019, IEEE Systems Journal, IEEE Wireless Communications Letters.

所获奖项

2014-2018 Melbourne International Research Scholarship, University of Melbourne, Australia (墨尔本大学全奖)
2014-2018 Melbourne International Fee Remission Scholarship, University of Melbourne, Australia (墨尔本大学全奖)
2013 National Scholarship, China (中国国家奖学金)

(日期: 02/2021)