

## Basic information

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Domain	<a href="https://yahuisun.com">https://yahuisun.com</a>
Email	yahui.sun@ntu.edu.sg
Languages	Mandarin, English, C++, R, MATLAB
Current position	Research fellow, School of Computer Science and Engineering, Nanyang Technological University



## Education and positions

2019-	<b>Research fellow, Nanyang Technological University, Singapore</b>
2018-2019	<b>Postdoctoral fellow, Australian National University, Australia</b>
2014-2018	<b>Ph.D. in Steiner tree problems in graphs, University of Melbourne, Australia</b> Thesis title: Classical, prize-collecting and node-weighted Steiner tree problems in graphs
2012-2014	<b>M.S. in aerospace engineering, Harbin Institute of Technology, China</b>
2008-2012	<b>B.S. in aerospace engineering, Harbin Institute of Technology, China</b>

## Research interests

- graph mining  $\subset$  data mining (knowledge graphs, social networks, road networks, smart cities, etc.)
- networking (computer networks, Internet of things, smart cities, etc.)

## Career profile

Motivated by China's first crewed space mission in 2003, I studied aerospace engineering for my bachelor and master degrees in the Harbin Institute of Technology. Then, I studied Steiner tree problems in graphs for my PhD degree in the University of Melbourne. My current research interests originated from my PhD study.

## Selected publications

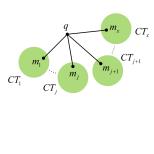
**Yahui Sun**, Jun Luo, Theodoros Lappas, Xiaokui Xiao, and Bin Cui. "Hunting multiple bumps in graphs", **Proceedings of the VLDB Endowment** (2020 accepted).  
[coming soon]



*Bump hunting is an emerging graph mining 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 bump hunting problem can be transformed to a recently formulated Prize-Collecting Steiner Forest Problem (PCSFP). We further prove that PCSFP is NP-hard even in trees. Then, we propose a fast approximation algorithm for solving PCSFP in trees. Based on this algorithm, we improve the state-of-the-art approximation algorithm for solving PCSFP in graphs, and prove that the solutions of our improvement are always better than or equal to those of the state-of-the-art algorithm. We collect real datasets to conduct experiments, and show the dominance of our improvement over the state-of-the-art algorithm. Moreover, we explore two applications using real datasets: finding communities of researchers in a DBLP network with 1,094,552 vertices, 6,911,318 edges, and 82,492 keywords; and finding regions with high levels of activity in the Austin city network with 66,200 vertices and 92,707 edges.*

**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).

[PDF]



*Solving the Prize-Collecting Steiner Tree Problem is useful in various areas, including computer networking, data mining, and signal processing. We propose two fast algorithms for solving the Prize-Collecting Steiner Tree 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 that can produce near-optimal solutions at a speed that is only inferior to the first one (by improving the time complexity of the inside pruning algorithm from  $O(n^2)$  to  $O(n)$ , without sacrificing the optimality of solutions). We demonstrate the competitiveness of our algorithms by comparing them with the state-of-the-art ones in large graphs with up to 1,000,000 vertices and 10,000,000 edges. We also propose some post-processing techniques to update the best-known solution for a notoriously difficult benchmark instance.*

## The other publications

**Yahui Sun**, and Saman Halgamuge. "Minimum-cost heterogeneous node placement in wireless sensor networks", IEEE Access (2019).  
[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]

## Submitted manuscripts

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, (submitted in 03/2018; under the third round of review)

## Scholarships and awards

2014-2018	Melbourne International Research Scholarship, University of Melbourne, Australia
2014-2018	Melbourne International Fee Remission Scholarship, University of Melbourne, Australia
2013	National Scholarship, China
2008-2014	First-level Scholarship (multiple), Harbin Institute of Technology, China

(timestamp: 12/2019)