Kheeran K. Naidu

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A final-year PhD student in the Algorithms and Complexity Theory group at the University of Bristol with a current focus on *streaming* and *communication complexity*. Seeking a postdoc in a theory group to tackle research questions pertaining to *sublinear algorithms* and beyond.

Education

2020 – present **PhD in Computer Science** at University of Bristol
Researching streaming algorithms and communication lower bounds for graph problems under the supervision of Christian Konrad in the Algorithms and Complexity Theory group.

2016 – 2020 **Integrated Master's in Mathematics and Computer Science *(First-Class Honours)*** at University of Bristol
– Master's Thesis: Probabilistic Machine Learning under the supervision of Carl Henrik Ek.
– Bachelor's Project: Group Theory under the supervision of Francesco Mezzadri.

Publications (by convention, authors are ordered alphabetically by last name)

STOC 2024 **O(log log n) Passes is Optimal for Semi-Streaming Maximal Independent Set**
with Sepehr Assadi, Christian Konrad, and Janani Sundaresan
One of the first optimal multi-pass graph lower bounds. Proved via round-elimination and message compression arguments with a RS graph-like combinatorial structure.

SODA 2024 **An Unconditional Lower Bound for Two-Pass Streaming Algorithms for Maximum Matching Approximation**
with Christian Konrad
The first unconditional semi-streaming lower bound, ruling out $(8/9 + \varepsilon)$ approximations. Proved via the information-cost tradeoff result for Index with a novel RS graph embedding.

STACS 2023 **Maximum Matching via Maximal Matching Queries**
with Christian Konrad and Arun Steward
Designed a $(5/8)$-approximate greedy-only three-pass semi-streaming matching algorithm. Proved that this is optimal among the class of deterministic greedy-only algorithms.

STACS 2023 **Improved Weighted Matching in the Sliding Window Model**
with Cezar-Mihail Alexandru, Pavel Dvořák, and Christian Konrad
Closed the gap between weighted and unweighted maximum matching for sliding window streams, achieving a $(3 + \varepsilon)$-approximate weighted matching in semi-streaming space.

APPROX 2022 **Space Optimal Vertex Cover in Dynamic Streams**
with Vihan Shah (a student-only paper)
Designed an insertion-deletion/sketching algorithm for minimum vertex cover that is optimal up to constant factors, i.e., the space complexity for any α approximation is $\Theta(n^2/\alpha^2)$ bits.

APPROX 2021 **On Two-Pass Streaming Algorithms for Maximum Bipartite Matching**
with Christian Konrad
Proved a restricted semi-streaming lower bound, ruling out $(2/3+\varepsilon)$ approximations for algorithms with a greedy-only first pass (and arbitrary second pass).

Research Talks

Jan 2024 **An Unconditional Lower Bound for Two-Pass Streaming Algorithms for Maximum Matching Approximation**
Publication talk at the 35th ACM-SIAM Symposium on Discrete Algorithms (SODA).

Mar 2023 **Maximum Matching via Maximal Matching Queries**
Publication talk at the 40th Symposium on Theoretical Aspects of Computer Science (STACS).

Sep 2022 **Space Optimal Vertex Cover in Dynamic Streams** *(Virtual)*
Publication talk at the 25th International Conference on Approximation Algorithms for Combinatorial Optimization Problems (APPROX).

Aug 2022 **Space Optimal Vertex Cover in Dynamic Streams (with an overview of graph streaming)** *(Virtual)*
Seminar talk at the Sydney Algorithms and Computing Theory (SACT) Seminar.

Jul 2022 **Space Optimal Vertex Cover in Dynamic Streams (with an overview of graph streaming)**
Seminar talk at the Institut de Recherche en Informatique Fondamentale (IRIF) Algorithms and Complexity Seminar.

Aug 2021 **On Two-Pass Streaming Algorithms for Maximum Bipartite Matching** *(Virtual)*
Publication talk at the 24th International Conference on Approximation Algorithms for Combinatorial Optimization Problems (APPROX).

May 2021 **Finding Matchings in the Semi-Streaming Model** *(Virtual)*
Regular talk at the School of Computer Science, Electrical and Electronic Engineering, and Engineering Maths (SCEEM) PGR Conference (to a general audience).

Mar 2021 **On Two-Pass Streaming Algorithms for Maximum Bipartite Matching** *(Virtual)*
Regular talk at the 37th British Colloquium for Theoretical Computer Science (BCTCS).

Funding Awards

Sep 2020 – Mar 2024 **EPSRC Doctoral Training Partnership Award for Computer Science**
PhD funding for full tuition fees, living expenses, and travel provided by EPSRC.

Jan 2024 **SIAM Travel Award for SODA24**
Conference registration, travel, and expenses support provided by ACM and IBM.

Jan 2021 **SIAM Travel Award for SODA21 (virtual)**
Conference registration waiver provided by Microsoft Research and Google LLC.

Jul 2016 – Jun 2020 **Astro Scholarship Award**
Master's funding for full tuition fees and living expenses provided by Astro Holdings Berhad.

Sep 2016 **Barry Thomas Scholarship in Computer Science**
A one-off payment for outstanding overseas students provided by University of Bristol.

Other Experiences

Sep 2020 – Aug 2023 **Lead Teaching Assistant** at University of Bristol
Delivered lectures & problems classes, managed teaching assistants, and prepared & marked exams for undergraduate and postgraduate taught units for *Algorithms*.

Sep 2018 – Aug 2021 **Teaching Assistant** at University of Bristol
Delivered problems classes for undergraduate units including *Mathematical Methods for Computer Scientists* and *Communication, Complexity and Number Theory*.

Jul 2021 – Nov 2021 **Head of Technology** at Ma-Kasih
Led a tech team of volunteer professional developers over 2 months to re-develop an online platform (https://makasih.care/) for communities struggling during the pandemic.

Jul 2020 – Jul 2022 **Consultant** at Qworky
Provided technical knowledge on Algorithms and Machine Learning, and organised an industry-based seminar to improve clients' awareness of AI and technology.

Oct 2018 – present **Director & Chief Developer** at The Pangean
Founded, developed, and managed a non-profit magazine (https://thepangean.com/) with 500+ published articles. In 2023, it received 4000+ visitors per month on average.

Jul 2017 – Aug 2017 **Intern** at Astro Holdings Berhad
Shadowed a team manager in the Product and Technology department during the company's shift to a cloud-based system and digitised workplace.

References

Available on request.