

# Hanlin Ren

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## Education

Oct 2021 – present

📖 **University of Oxford, UK**  
DPhil in computer science  
Advisor: Prof. Rahul Santhanam

Aug 2016 – Jun 2021

📖 **Tsinghua University, China**  
Bachelor of engineering  
Major: computer science (Special Pilot CS Class, a.k.a Yao Class)  
GPA: 3.83/4; rank: 8/38

## Publications

(Note: in theoretical computer science, the list of authors are usually sorted in alphabetical order.)

- 📖 **On the Complexity of Avoiding Heavy Elements.**  
Zhenjian Lu, Igor C. Oliveira, [Hanlin Ren](#), and Rahul Santhanam  
FOCS 2024.
- 📖 **Symmetric Exponential Time Requires Near-Maximum Circuit Size.**  
Lijie Chen, Shuichi Hirahara, and [Hanlin Ren](#)  
STOC 2024.
- 📖 **Polynomial-Time Pseudodeterministic Construction of Primes.**  
Lijie Chen, Zhenjian Lu, Igor C. Oliveira, [Hanlin Ren](#), and Rahul Santhanam  
FOCS 2023.
- 📖 **Bounded Relativization.**  
Shuichi Hirahara, Zhenjian Lu, and [Hanlin Ren](#)  
CCC 2023.
- 📖 **Range Avoidance, Remote Point, and Hard Partial Truth Table via Satisfying-Pairs Algorithms.**  
Yeyuan Chen, Yizhi Huang, Jiayu Li, and [Hanlin Ren](#).  
STOC 2023.
- 📖 **NP-Hardness of Approximating Meta-Complexity: A Cryptographic Approach.**  
Yizhi Huang, Rahul Ilango, and [Hanlin Ren](#)  
STOC 2023.
- 📖 **On the Range Avoidance Problem for Circuits.**  
[Hanlin Ren](#), Rahul Santhanam, and Zhikun Wang.  
FOCS 2022.
- 📖 **Maintaining Exact Distances under Multiple Edge Failures.**  
Ran Duan and [Hanlin Ren](#).  
STOC 2022.
- 📖 **Robustness of Average-Case Meta-Complexity via Pseudorandomness.**  
Rahul Ilango, [Hanlin Ren](#), and Rahul Santhanam.  
STOC 2022.

## Publications (Continued)

- **A Relativization Perspective on Meta-Complexity.**  
Hanlin Ren and Rahul Santhanam.  
STACS 2022.
- **Hardness of KT Characterizes Parallel Cryptography.**  
Hanlin Ren and Rahul Santhanam.  
CCC 2021. *Invited to the ToC special issue for CCC 2021.*
- **Constructing a Distance Sensitivity Oracle in  $O(n^{2.5794}M)$  Time.**  
Yong Gu and Hanlin Ren.  
ICALP 2021.
- **Approximate Distance Oracles Subject to Multiple Vertex Failures.**  
Ran Duan, Yong Gu, and Hanlin Ren.  
SODA 2021.
- **Improved Distance Sensitivity Oracles with Subcubic Preprocessing Time.**  
Hanlin Ren.  
ESA 2020. *Invited to the JCSS special issue for ESA 2020.*
- **Strong Average-Case Circuit Lower Bounds from Non-trivial Derandomization.**  
Lijie Chen and Hanlin Ren.  
STOC 2020. *Invited to the SICOMP special issue for STOC 2020.*
- **Approximating All-Pair Bounded-Leg Shortest Path and APSP-AF in Truly-Subcubic Time.**  
Ran Duan and Hanlin Ren.  
ICALP 2018.

## Manuscripts / In Submission

- **Meta-Mathematics of Resolution Lower Bounds: A TFNP Perspective.**  
Jiawei Li, Yuhao Li, and Hanlin Ren

## Academic Talks

- **Meta-Mathematics of Resolution Lower Bounds: A TFNP Perspective.**  
NII Algorithm Lunch Seminar. Jul 2024
- **Symmetric Exponential Time Requires Near-Maximum Circuit Size.**  
Tsinghua University. Dec 2023  
Peking University. <https://b23.tv/BV1Cj411J7CB> Dec 2023  
ICT, Chinese Academy of Sciences. Jan 2024  
STOC 2024 (with Zeyong Li). [https://youtu.be/yVBSU1\\_0i2o](https://youtu.be/yVBSU1_0i2o) Jun 2024
- **The Iterative Win-Win Method, and Explicit Constructions (without) Using It.**  
A series of two talks at the CSDM Seminar, Institute for Advanced Study. <https://youtu.be/uxyN2eVYKic> Nov 2023
- **Polynomial-Time Pseudodeterministic Construction of Primes.**  
DIMAP Seminar, University of Warwick. Jun 2023  
TCS+. <https://youtu.be/yalaX02fVow> Sep 2023  
Algorithms and Complexity Theory Seminars, University of Oxford. Oct 2023  
FOCS 2023. Nov 2023  
Recent Developments in Explicit Constructions, FOCS 2023 Workshop. Nov 2023  
UIUC Theory Seminar. Jan 2024  
Meta-Complexity 2023 Reunion, Simons Institute. Apr 2024

## Academic Talks (Continued)

- **NP-Hardness of Approximating Meta-Complexity: A Cryptographic Approach.**  
Minimal Complexity Assumptions for Cryptography, Meta-Complexity 2023, Simons Institute. <https://youtu.be/v9JiEf2WH58> May 2023  
ICT, Chinese Academy of Sciences (online). May 2023  
STOC 2023. <https://youtu.be/DtJQ5-3zptE> Jun 2023
- **Robustness of Average-Case Meta-Complexity.**  
Seminar at Meta-Complexity 2023, Simons Institute. Mar 2023
- **Bounded Relativization.**  
Student Seminar, Meta-Complexity 2023, Simons Institute. Feb 2023  
CCC 2023. <https://youtu.be/gPqcSXNU0ms> Jul 2023  
Warwick complexity meetings (online). Nov 2023
- **Range Avoidance, Remote Point, and Hard Partial Truth Table via Satisfying-Pairs Algorithms.**  
Lower Bounds, Learning, and Average-Case Complexity, Meta-Complexity 2023, Simons Institute. <https://youtu.be/pd45Av1iTLw> Feb 2023  
STOC 2023. Jun 2023
- **Recent Advances in the Range Avoidance Problem.**  
Yaoclass Seminar (online). Dec 2022
- **Range Avoidance Part II: Beyond Circuit Lower Bounds.**  
New Directions in Derandomization, FOCS 2022 Workshop. <https://vimeo.com/user39621409/review/772183410/1201f3a1d4> Nov 2022
- **On the Range Avoidance Problem for Circuits.**  
ICMS workshop on Mathematical Approaches to Lower Bounds: Complexity of Proofs and Computation. Jul 2022  
Warwick complexity meetings (online). Aug 2022  
FOCS 2022. <https://vimeo.com/user39621409/review/771296149/46488425a3> Nov 2022
- **Maintaining Exact Distances under Multiple Edge Failures.**  
STOC 2022. <http://youtu.be/B1wMXgTCy8o> Jun 2022
- **A Relativization Perspective on Meta-Complexity.**  
STACS 2022 (online). Mar 2022
- **Faster Algorithms for Distance Sensitivity Oracles.**  
IJTCS 2021 (hybrid). Aug 2021  
Yaoclass Seminar. Nov 2021
- **Constructing a Distance Sensitivity Oracle in  $O(n^{2.5794}M)$  Time.**  
ICALP 2021 (online). <http://youtu.be/uIFoucab6d4> Jul 2021
- **Hardness of KT Characterizes Parallel Cryptography.**  
DIMACS workshop on meta-complexity, barriers, and derandomization. <http://youtu.be/hZZaEuuntTY> Apr 2022  
CCC 2021 (online). <http://youtu.be/esFxj1cNLCE> Jul 2021  
Yaoclass Seminar. Apr 2021  
Oxford-Warwick complexity meetings (online). Apr 2021
- **Approximate Distance Oracles Subject to Multiple Vertex Failures.**  
SODA 2021 (online). <https://player.vimeo.com/video/496602190>. Jan 2021  
Yaoclass Seminar. Dec 2020
- **Improved Distance Sensitivity Oracles with Subcubic Preprocessing Time.**  
ESA 2020 (online). <https://youtu.be/2Z46AybFkJ8>. Sep 2020

## Academic Talks (Continued)

- **Strong Average-Case Circuit Lower Bounds from Non-trivial Derandomization.**  
STOC 2020 (online). <https://youtu.be/xWDQ4Lef0Vs>. Jun 2020  
SIGMA, ICT, Chinese Academy of Sciences (online). Mar 2020
- **Approximating All-Pair Bounded-Leg Shortest Path and APSP-AF in Truly-Subcubic Time.**  
ICALP 2018. Jul 2018

## Special Issue Invitation

- STOC 2020, ESA 2020, CCC 2021

## Teaching Experience

- |                      |  |
|----------------------|--|
| 2020 Fall            | ■ <b>Design and Analysis of Algorithms</b> (graduate level)<br><i>Instructor: Prof. Ran Duan</i><br>Teaching assistant |
| 2021 Spring          | ■ <b>Theory of Computation</b> (undergraduate level)<br><i>Instructor: Prof. Ran Duan</i><br>Teaching assistant        |
| 2022 Michaelmas Term | ■ <b>Advanced Complexity Theory</b> (Part C)<br><i>Instructor: Prof. Rahul Santhanam</i><br>Marker and tutor           |

## Selected Awards

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|------|---|
| 2021 | ■ Clarendon Scholarship   |
| 2019 | ■ Yao Award, bronze prize   |
| 2018 | ■ Evergrande Scholarship  |
| 2017 | ■ Baidu "Future Star" Scholarship   |
| 2015 | ■ Gold medal (15th place) in Chinese National Olympiad in Informatics (NOI) |