RYAN YUNRUI YANG

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EDUCATION

Choate Rosemary Hall, GPA: 4.16/4.00. 2019 - 2023

Coursework: *Algebraic Topology*, *Optimal Transport*, *Zero-Knowledge Cryptography*, *Applied Differential Equations* (12th); *Axiomatic Number Theory*, *Group Theory*, *Combinatorial Game Theory*, *Physics with Calculus* (11th); *Linear Algebra*, *Multivariable Calculus*, *CS550* (10th); *Calculus BC* (9th);

Leadership Positions: President of Choate Math Team, VP of Choate Programming Union (CPU), Co-founder of Choate Linguistics Club, Co-founder of Choate Aerospace Association.

Organizations: Day Student Eco Representative, Editor of SciTECH Magazine, Nominated Writing Center Tutor, Varsity XC and Crew.

RESEARCH EXPERIENCE

Synchronization Protocols in Distributed Optimization & Machine Learning July 2021 - November 2022

Lead an international team and designed the first nonlinear aggregation protocol for distributed optimization, with an empirical speedup of up to 57% speedup and highly novel theoretical analysis.

- Direct Collaborator(s): Prof. Andre Wibisono (Yale) and Dr. Patrick Baker (U.K. RAF)
- First author of the publication and presenter at IEEE MILCOM 22 in National Capital Region, USA.
- Led overall project, designed highly novel core algorithm, wrote field-advancing theoretical analysis.

Transport Control Networking (TCN) February 2022 - Present

Lead designer of Yale initiative designing TCN to become FTS 4, replacing FTS 3.11 for CERN data replication. Worked remotely in Summer 2022, and will be on-site in Geneva during Summer 2023.

- Direct Collaborator(s): Mario Lassnig (CERN).
- Main presenter of TCN paper at NAI@SIGCOMM'22 in Amsterdam, Netherlands and one of first three authors all labeled equal contribution.
- Derived monotonicity theorem analyzing CERN's current FTS (File Transfer System) Optimizer Algorithm
- Main designer of TCN's core zero-order gradient framework.

PEER-REVIEWED CONFERENCE PAPERS

1. J. Dunefsky, M. Soleimani, **R. Yang**, *et al.*, "Transport Control Networking: Optimizing Efficiency and Control of Data Transport for Data-Intensive Networks," in *Proceedings of ACM NAI@SIGCOMM*, August 22, 2022, Amsterdam, Netherlands. ACM Press.
   ACM NAI@SIGCOMM Best Paper
2. **R. Yang**, H. Du, A. Wibisono, P. Baker, "Aggregation in the Mirror Space (AIMS): Fast, Accurate Distributed Machine Learning in Military Settings," in *Proceedings of IEEE MILCOM*, November 28 - December 1, 2022, Maryland, USA. IEEE Press.

For more information, see Google Scholar.

PROJECTS

Algorithmic Game Theory Update Scheduling [PDF]

Work done with Prof. Andre Wibisono (Yale) and Prof. Georgios Piliouras (SUTD). Considered polymatrix games under first-order updating strategies and generalized known behavior in GAN scheduling to multiple agents.

50-page Survey of Optimization [PDF]

Done under the supervision of Dr. Hogue for the Choate Science Research Program, titled "A Review of Accelerated First-Order Methods in Distributed Convex Optimization."

HONORS AND FELLOWSHIPS

2022 **2022 USA IMO Team Selection Test group** Washington, D.C.
30-person selection pool for USA International Math Olympiad team.

2023 **Regeneron STS (Westinghouse) Scholar** Washington, D.C.
One of 300 Winners of the Nation's Oldest Science Fair.

2022 **Presidential Scholar Candidate and Semifinalist** Washington, D.C.
One of 861 high-school seniors selected by the White House.

2022 **Early Inductance into Cum Laude Society** Wallingford, Connecticut
Top ten highest GPAs at Choate (The Niche "#3 Best Private High School in America")

2022 **Kiran Reddy Pendri '06 Award** Wallingford, Connecticut
Choate's highest math prize, given "For Excellence in Advanced Study of Mathematics."

2022 **Choate Rosemary Hall Award in Physics** Wallingford, Connecticut
Choate's highest physics prize, given "For Outstanding Accomplishment and Genuine Interest."

2022 **National Merit Scholar Finalist** Washington, D.C.

2018 **Caroline D. Bradley Scholar** Los Angeles, California.
One of 30 selected for a full four-year, merit-based high school scholarship.

CONTEST RESULTS IN MATH, PHYSICS, AND COMPUTER SCIENCE

Mathematics:

- **Mathematical Olympiad Program (MOP):** Participant (2021), IMO team selection group (2021, 2022)
- **USA Junior Math Olympiad:** 13th place out of 55,000+ on USAJMO (2021). 4× USA(J)MO Qualifier
- **USA Math Olympiad (USAMO):** 23rd place nationwide from pool of 40,000+ (2023)
- **American Invitational Math Exam (AIME)**: 6th place nationwide (15-way tie at 14/15)
- **Asian-Pacific Math Olympiad**: 17th place for USA (2022)
- **Princeton University Math Competition (PUMaC)**: 2nd Place on Individual Finals and 3rd Place Overall (2021); 1st Place on Individual Finals and 3rd Place Overall (2023)

Physics:

- **USA Physics Olympiad:** Pending (2023), Bronze Medallist (2022) and 3-times qualifier (2021,2022,2023)

Competitive Programming:

- **USACO:** Gold Division (2022 - present).

SERVICE

Manuscript Reviewer: International Conference on Machine Learning (ICML) 2023

President's Volunteer Service Award (PVSA) 2020-present
Teacher of most-enrolled class at local Sunday school for three years. 160+ videos on YouTube.

ELMO Problem Selection Committee 2021-present
Written by graduating students at the IMO training camp (MOP).

MISC.

Coding Languages: Java, Python, C++, LaTeX.

Selective Summer Programs: SPARC (2022), MOP (2021), Ross (2020).