Princeton’s Computer Science Contest (COSCON)

Mission. To get students of all walks excited and thinking about a variety of topics that arise in computer science and to appreciate their applications in other fields.

Summary of the Fall 2021 Competition. The contest was held on November 6, 2021 on Princeton’s campus. Teams of three students raced to solve our original problems, sourced from a diverse set of CS subfields — algorithms, systems, machine learning, computational complexity, scientific applications, and more! More information can be found below and on subsequent pages:

236 participants
$14k+ in prizes awarded
21 contributors
8 unique challenges
17 majors represented
32 prize winners
Elaboration on the Problems. Our team of writers, solely composed of Princeton undergrads, was responsible for writing, test solving, administering, and grading every problem of the contest. Our problems strived to present a holistic view of the challenges in Computer Science:

- Problem 1 focused on dynamic programming, which is commonly employed in algorithmic optimization and is also often tested in software engineering interviews. Difficulty: Easy
- Problem 2 focused on understanding the evolution of a discrete cellular automata — a common computational problem in fields ranging from epidemiology to material science — using techniques from discrete math. Difficulty: Medium
- Problem 3 applied knowledge of classical data structures to an application that was novel to most competitors: quantum computing. Difficulty: Medium
- Problem 4 focused on being able to visualize and cluster data using unsupervised learning methods. These are important skills in data science, and are commonly used to understand previously unseen data. Difficulty: Medium
- Problem 5 focused on algorithm design and computational complexity, broad areas of importance in theoretical computer science with implications for the performance of programs in practice. Difficulty: Hard
- Problem 6 was somewhat open-ended and focused on real world information security involving analysis of a weak system, development of an exploit, and finally a real world implementation. Difficulty: Extremely Hard; definitely the hardest problem of the contest.
- Problem 7 focused on introducing participants to issues in operating systems such as memory allocation, program layout, and error flow recovery. Difficulty: Very Hard
- Problem 8 focused on applying dynamic programming to solve problems on structuring search trees optimally, which are classic problems in data structure design. Difficulty: Hard

Problems statements and solutions can be found on our GitHub Archive. The solutions contain plaudits for teams that achieved highly on each problem.
Prize Winners. Note that registration was open only to Princeton students. Full standings and how to interpret them can be found here.

❖ UG First Place: Alex Lopez (MAT ’22), Kiril Bangachev (MAT ’22), Aleksa Milojevic (MAT ’23)
❖ UG Second Place: Rahul Saha (COS ’22), Alan Chung (MAT ’22), Kevin Feng (MAT ’22)
❖ UG Third Place: Anna Krokhine ’24, Ian Henriques ’25, Minjae Kwon ’25
❖ UG Fourth Place: Jafar Howe (COS ’23), Anca Negoiu (ORF ’23), Jude Muriithi (COS ’24)
❖ UG Fifth Place: Kevin Huang (COS ’23), Joseph Xu (COS ’24), Jeremy Dapaah (COS ’24)

❖ Graduate First Place: Kaifeng Lyu (COS), Qinshi Wang (COS), Shunyu Yao (COS)
❖ Graduate Second Place: Danny Chen (COS), Yuping Luo (COS), Dingli Yu (COS)
❖ Graduate Third Place: Gregory Chirkov (ECE), August Ning (ECE), Marcelo Orenes (COS)
❖ Graduate Fourth Place: Antonio Molina-Lovett (COS)
❖ Graduate Fifth Place: Yizhan Shu (ORF) and Runzhe Wang (ECE)

❖ First Correct Solution: Bill Ao (COS ’24), Alex Zhang (COS ’24), Eric Ahn (COS ’24)
❖ Best Non-COS/MAT Team: Yizhan Shu (ORF) and Runzhe Wang (ECE)
❖ Best Freshman/Sophomore Team: Anna Krokhine ’24, Ian Henriques ’25, Minjae Kwon ’25
❖ Best Solution to Problem 4 (ML Problem): Dave Singh (MAE ’24), Sean Wang (COS ’24), Alan Ji (ORF ’24) — 99.86% prediction accuracy
❖ Best Solution to Problem 6 (Blackjack Problem): Kaifeng Lyu (COS), Qinshi Wang (COS), Shunyu Yao (COS) — 2195 net wins out of 4000 total hands
❖ Most Persistent and Inquisitive: Aditya Mehta (COS ’24), Andrew Tao (COS ’24), Liam Esparraguera (COS ’24)

And finally, thanks to our contributors, without whom nothing would have been possible.