Summary of William Hoza's Research

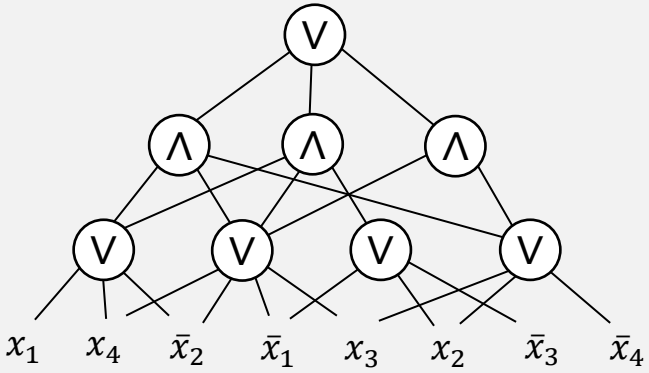
Research Area: Computational Complexity Theory

Subarea 1:
Space-Bounded Derandomization

Example:

Theorem [Hoza 2021]: If a decision problem can be solved by a randomized algorithm that uses S bits of space, where $S \geq \log n$, then it can also be solved by a deterministic algorithm that uses $O\left(S^{1.5}/\sqrt{\log S}\right)$ bits of space.

Subarea 2:
Circuit Complexity

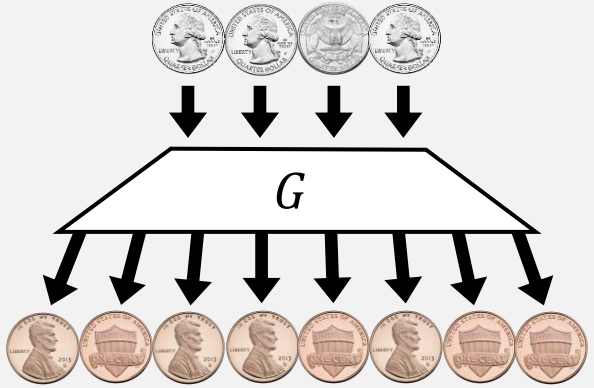


Example:

Theorem [Hoza 2023]: For every constant d and every n, there exists a depth-$(d+3)$ linear-size AC^0 circuit h on n variables such that for every depth-d subexponential-size AC^0 circuit f, we have

$$\Pr_x[f(x) = h(x)] \leq 1/2 + 1/n^{\omega(1)}.$$

Subarea 3:
Pseudorandom Generators



Example:

Theorem [Hatami, Hoza, Tal, Tell 2021]: For every constant $d \in \mathbb{N}$, there exists a $\delta > 0$ such that given an $\left(n^{1-\delta}\right)$-bit truly random seed, one can efficiently generate n pseudorandom bits that appear random to depth-d threshold circuits with $n^{1+\delta}$ wires.