This paper was the top ranked security paper in the International Symposium on Computer Architecture in 2022, and it was nominated for the best paper award.

The work is important because it proposes an efficient memory safety scheme for GPUs. As the use of GPUs has become more widespread for general computation, memory safety for these hardware accelerators has also become an important factor in the vulnerability of most computing systems.

The results are impressive:

The proposed hardware performs efficient bounds checking by indexing the bounds table with unique IDs. We further reduce the bounds-checking overhead by utilizing compile-time bounds analysis, workgroup/warp-level bounds checking, and GPU-specific address mode. Our performance evaluations show that GPUShield incurs little performance degradation across 88 CUDA benchmarks on the Nvidia GPU architecture and 17 OpenCL benchmarks on the Intel GPU architecture with a marginal hardware overhead.