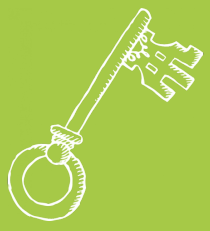


Utilizing Neural Processing Units for Cryptography

Advisor: **Selim Kirbiyik**

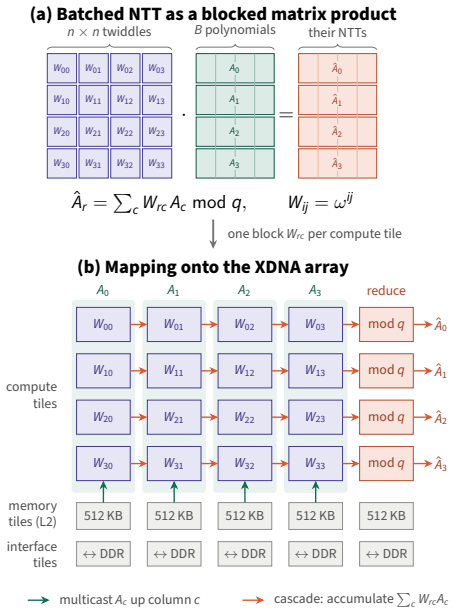
Motivation

Modern processing units include integrated low-power AI accelerators called Neural Processing Units (NPUs). One such example is the AMD XDNA NPU, which features a spatial array architecture with low precision optimized for ML workloads. These architectures are specialized for performing efficient matrix-matrix multiplications.

Identifying which of the cryptographic primitives can be expressed as a matrix-matrix multiplication is of interest. Number Theoretic Transform, utilized in lattice-based cryptography, can be viewed as a matrix product and is a suitable candidate.

Goals and Tasks

- Understand AMD XDNA architecture
- Explore how well cryptographic primitives map to NPUs
- Implement efficient techniques to map primitives to NPUs



An example usage of NPUs.

Literature

- S. Santan
  AMD NPU - Linux Documentation
  docs.kernel.org/accel/amdxdna/amdnpu.html

Courses & Deliverables

☑ **Master Project**
Project code
Report
Presentation

– OR –

☑ **Master's Thesis**
Initial presentation
Project code
Thesis (60+ pages)
Final presentation

Recommended if you're studying

☑ CS ☑ ICE ☑ MATH

Prerequisites

- Interest in fast modular arithmetic
- Programming (x86_64 Assembly, C/C++, Python)

Advisor Contact

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