Virtual Instruction Set Computing for Heterogeneous Systems

Heterogeneous systems key to address power wall

**Modern smartphone SoC**

But it’s difficult to program them due to diverse HW!

6 different ISAs, 7 different parallelism models, & Incompatible memory systems
- CPU, GPU, DSP, Vector Units, Multimedia, Audio-Video Hardware accelerators
Problem: Programming Heterogeneous Systems

- **Goal:** Solve major programmability challenges
  - Simpler algorithm design
  - Source- and object-level portability
  - High performance without low-level tuning
  - Uniform programming tools

- **Strategy:** Abstract away hardware differences
  - Low-level, language neutral virtual ISA
  - Wider range of hardware than previous systems
  - Few parallelism models
  - Uniform memory abstractions