CES Chair for Embedded Systems

Prof. Dr. J. Henkel

Master Thesis

Approximate Component Analysis on a General Purpose Processor

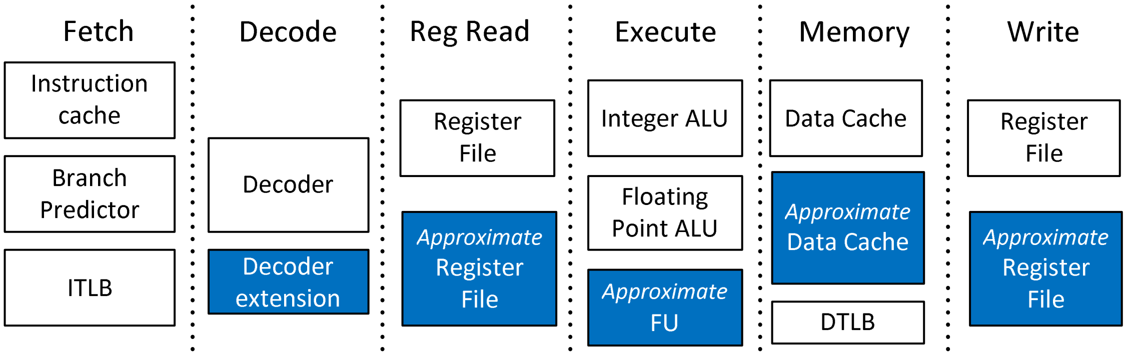

Figure 1- Example Processor Architecture with Approximate Computing Extensions

Computer architecture is evolving with the processed workloads. Modern applications have different characteristics than before. Many application domains including decision making, image processing, recognition, data mining and synthesis show an intrinsic error tolerance in their computation. This tolerance can be attributed to characteristics such as attenuation of error through statistical methods or iterations. Approximate computing leverages application resilience to significantly improve energy and/or performance.

Existing research works have proposed skipping non-critical computations at software level, reducing circuit complexity or lowering the operation voltage at hardware level. Approximate combinational and sequential circuits like approximate adders and multipliers have promising energy reductions when analyzed individually. However such reductions may be insignificant at the processor level while the errors they produce would propagate. Therefore we need to analyze their system level trade-offs.

Tasks:

- Synthesis of existing approximate circuits, an in-order processor and an out-of-order processor
- Analysis of energy, performance and accuracy trade-offs

Skills acquired with the Thesis:

- Implement a real processor, understand the effects of circuit level on architecture
- Work in a research environment
- Technical writing
- Prior knowledge on Approximate Computing is **not** required

Required Knowledge:

- Verilog/VHDL

Helpful skills (not required but helpful):

- C/C++ and scripting skills (tcl, python)
- Experience with EDA tools
- Compiler background

Start Date:
Immediately or within a couple of months

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