QUALITY PROGRAMMABLE VECTOR PROCESSORS FOR APPROXIMATE COMPUTING

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INTEGRATED SYSTEMS LABORATORY

Computers viewed as *precise calculators*

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▸ Leads to inefficiency

But, I worked harder than needed

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Recognition

Mining

Search

Vision

Video Processing

▶ Relaxed notion of correctness

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Search

Mining
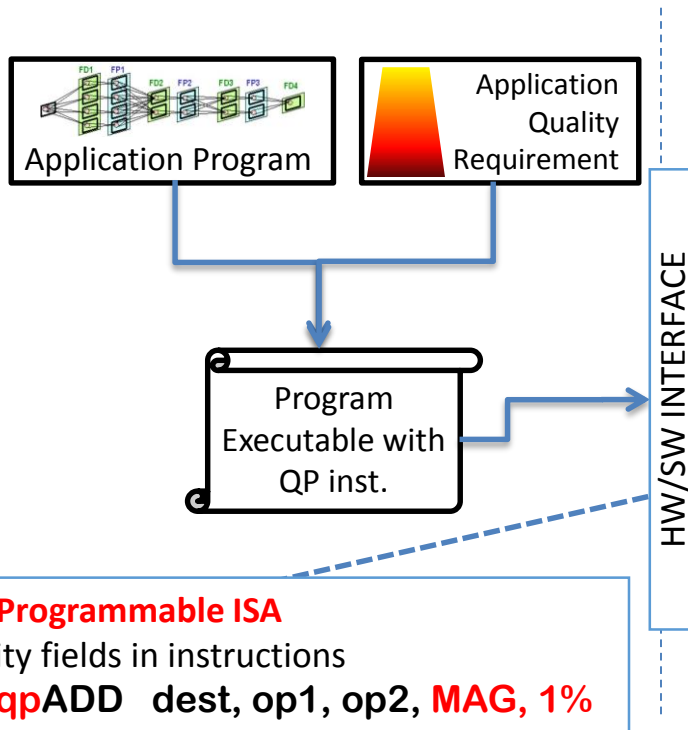
Vision

Recognition

Video Processing

▸ Relaxed notion of correctness

▸ Results cannot be arbitrary either

Good enough answers !!!

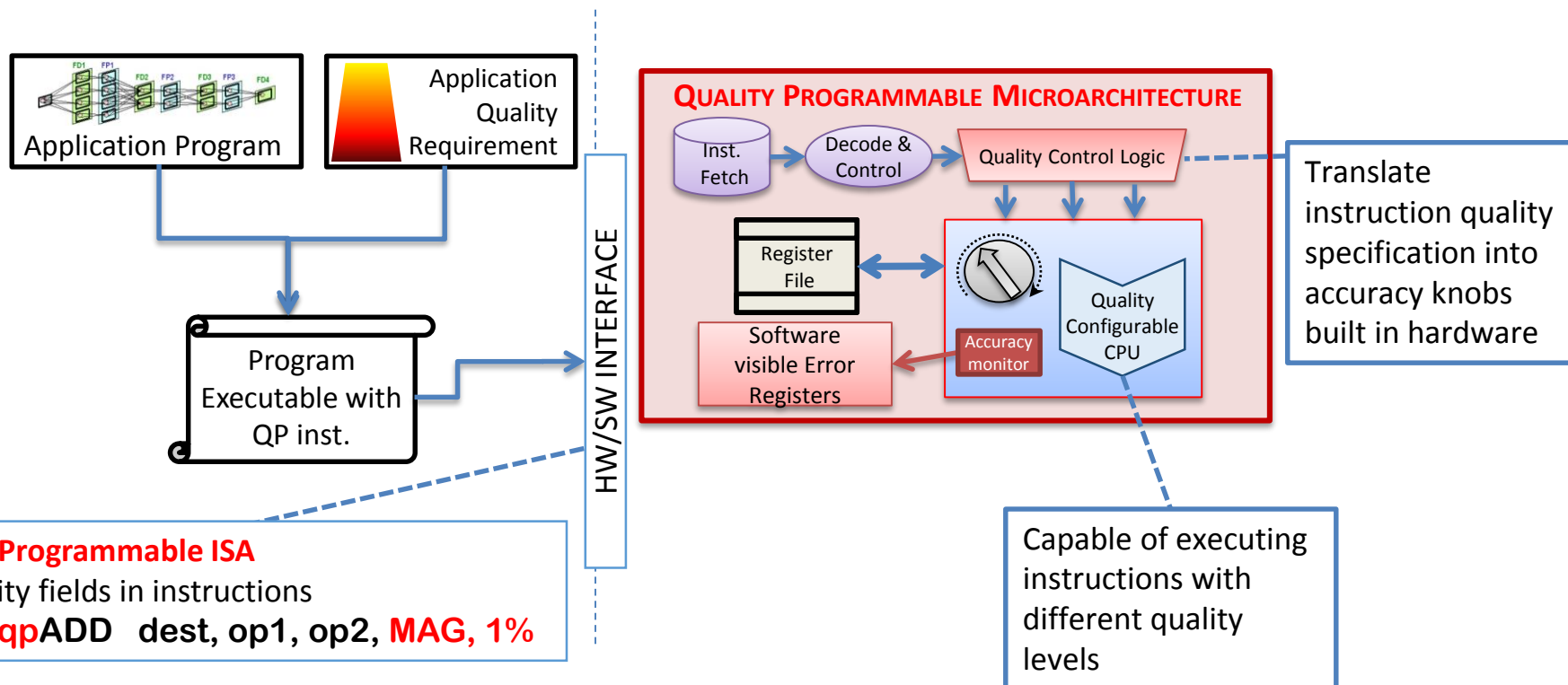# QUALITY PROGRAMMABLE PROCESSORS

▶ Notion of *quality* built into the instruction set

Quality Programmable ISA
Quality fields in instructions
e.g. **qpADD   dest, op1, op2, MAG, 1%**

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Application Program

Application Quality Requirement

Program Executable with QP inst.

HW/SW INTERFACE

QUALITY PROGRAMMABLE MICROARCHITECTURE

Inst. Fetch

Decode & Control

Quality Control Logic

Register File

Software visible Error Registers

Accuracy monitor

Quality Configurable CPU

Translate instruction quality specification into accuracy knobs built in hardware

Capable of executing instructions with different quality levels

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QUORA

Quality programmable 1D/2D vector processor

1.7X savings for NO loss in output quality

>2X savings for modest (<2.5%) quality loss

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Hmm.. Does this really work?

Lots of design considerations!

Session 1A: Approximate Computing

MONDAY @ 1:30 PM

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Quality fields in instructions
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