APPROX-NoC: A Data Approximation Framework for Network-On-Chip Architectures

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- Perfect accuracy is not required - Approximation
- Large amount of data movement - Networks-on-Chip

Approximation + NoC = APPROX-NoC

Leveraging Inaccuracy for High-Throughput NoC
Approximation can exploit data similarity and improve compression ratio.

**Integer**

![Integer Diagram]

- Ejection Q \(\rightarrow\) NI \(\rightarrow\) Decompr \(\rightarrow\) Core \(\rightarrow\) Compr \(\rightarrow\) VAXX
- Injection Q \(\leftarrow\) Network Interface
- Approx? \(\rightarrow\) Compr

**Floating-point**

![Floating-point Diagram]

- Approximate Logic
- Float Exponent Detection
- s exponent mantissa
- 0 \(\ldots\) 0 1 mantissa
APPROX-NoC achieves:
- Up to 21% average packet latency reduction
- 69% throughput improvement.

Light-Weight Design Features
- **Plug-and-Play** module
- Fast error compute by *shifting* bits
- **Unified** approximate logic for int and float

<table>
<thead>
<tr>
<th>Approx Pattern</th>
<th>Encoded Idx</th>
</tr>
</thead>
<tbody>
<tr>
<td>010X</td>
<td>(e_0)</td>
</tr>
<tr>
<td>10XX</td>
<td>(e_1)</td>
</tr>
</tbody>
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**APPROX-NoC features**

- Error threshold
- Fill and Update
- Dictionary Update
- Approximate Value Compute Logic (AVCL)
- Given word
- Lookup
- Match?
- Encoded index

**Session Information**

Wednesday, 10:30am-11:50am, Session 9B-1