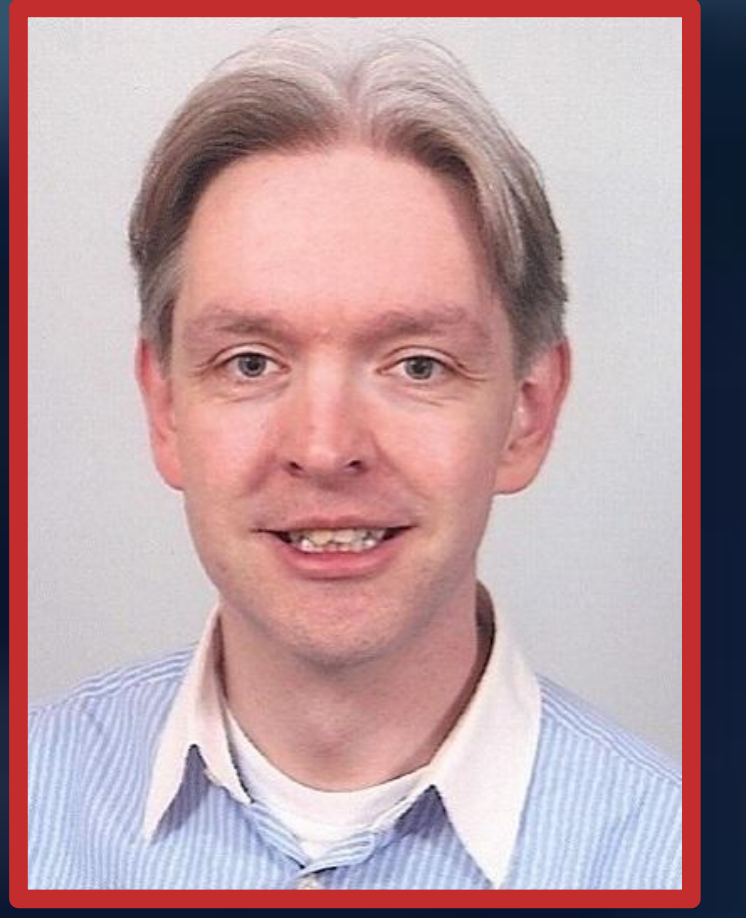


Conflict-Free Vectorized In-Order In-Place Radix- r Belief Propagation Polar Code Decoder Algorithm

Author: Arvid B. van den Brink¹, Marco J.G. Bekooij^{1,2}
¹University of Twente, ²NXP Semiconductors



1 Motivation

Make channel coding using Polar Coding more efficient

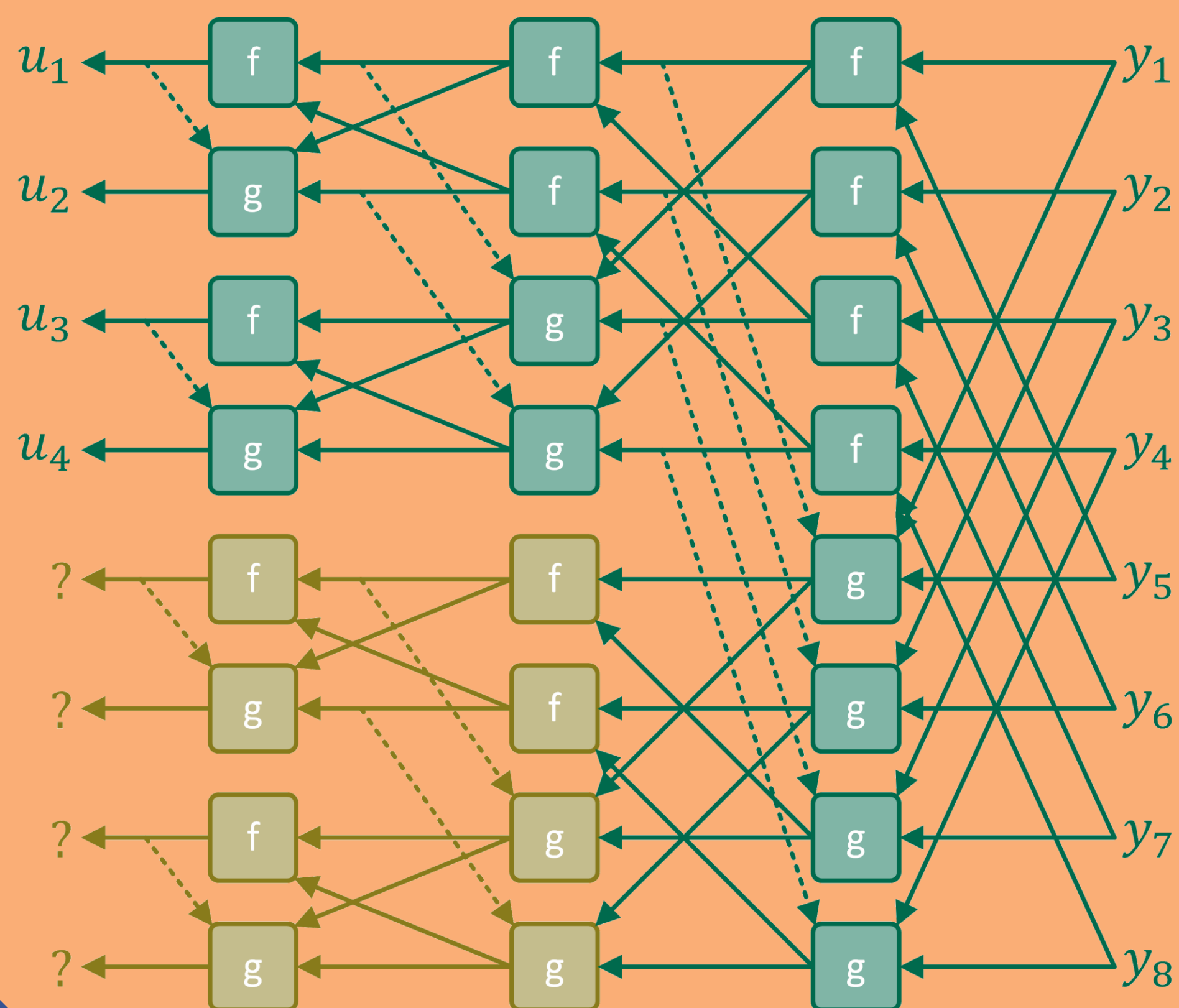
- Throughput
- Power



6 Conclusion

- Less memory accesses using vectorization while maintaining regular memory access pattern
- Save memory by in-place processing

2 Decoder



5 In-Place Algorithm

- Separate intermediate memory

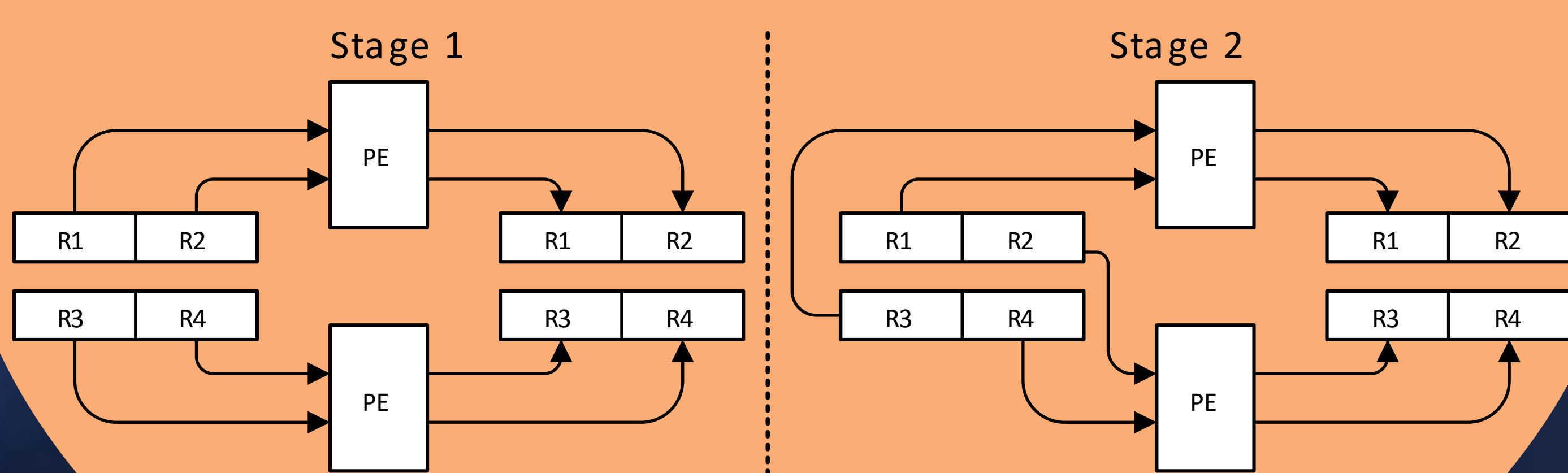
	Right Bound				Left Bound			
Stage	1	2	...	n-1	n	n-1	...	1
Read R	R_0	R_1	...	R_{n-1}	R_{n-1}	R_{n-2}	...	R_0
Read L	L_1	L_2	...	L_n	L_n	L_{n-1}	...	L_1
Write R	R_1	R_2	...	R_n	-	-	...	-
Write L	-	-	...	-	L_{n-1}	L_{n-2}	...	L_0

- New, overwrite data in shared intermediate memory

	Right Bound				Left Bound			
Stage	1	2	...	n-1	n	n-1	...	1
Read L	L_1	L_2	...	L_n	R_{n-1}	R_{n-2}	...	R_0
Write R	R_1	R_2	...	R_n	L_{n-1}	L_{n-2}	...	L_0

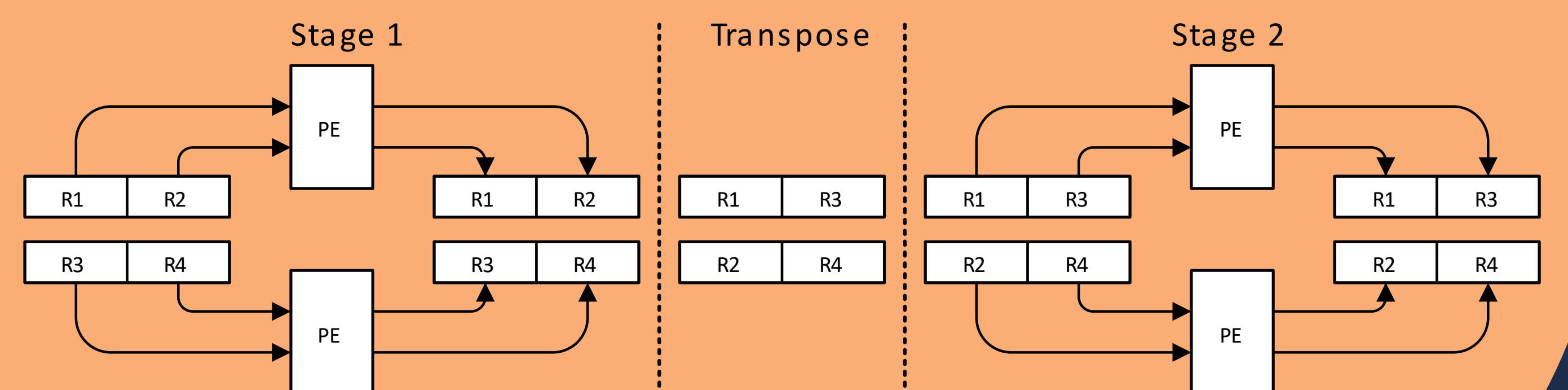
3 Vectorization Problem

- Data scattering prevents vectorization



4 Solved Data Scattering

- Make use of transpose operation on $r \times r$ matrix



- Address Calculation Algorithm

