Everything you always wanted to know about multicore graph processing but were afraid to ask
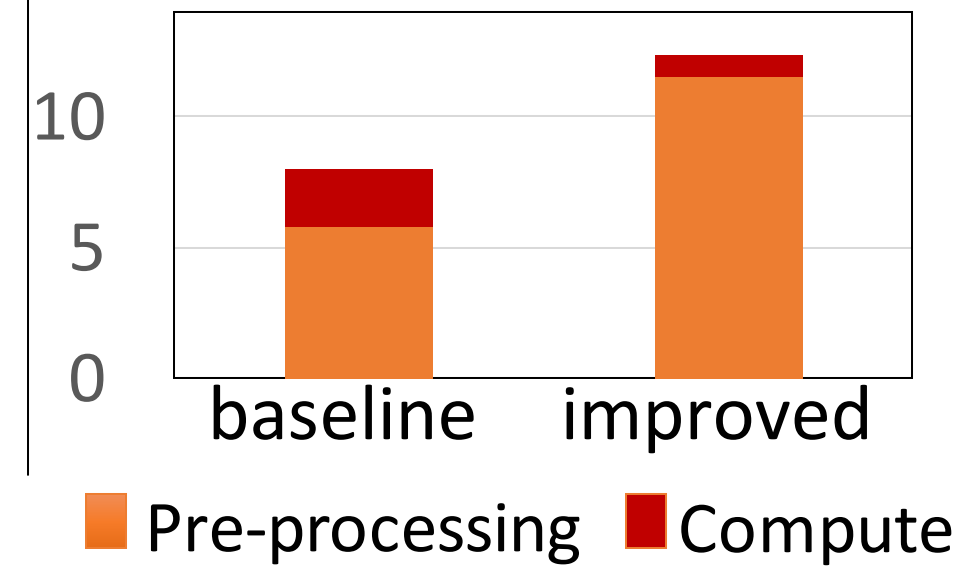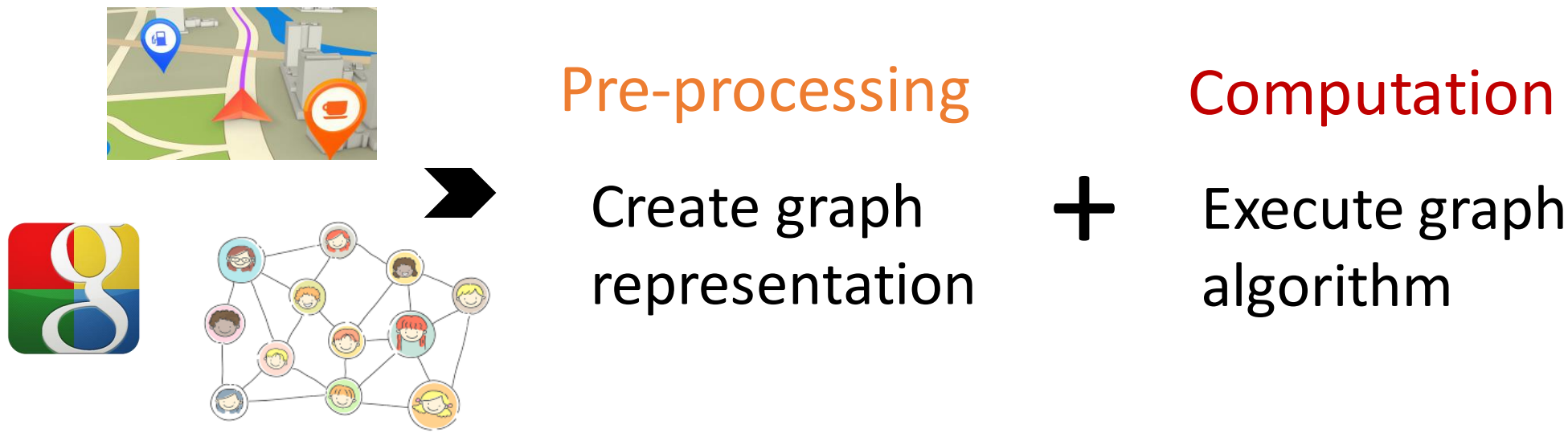
Jasmina Malicevic (EPFL)   Baptiste Lepers (EPFL)   Willy Zwaenepoel (EPFL)
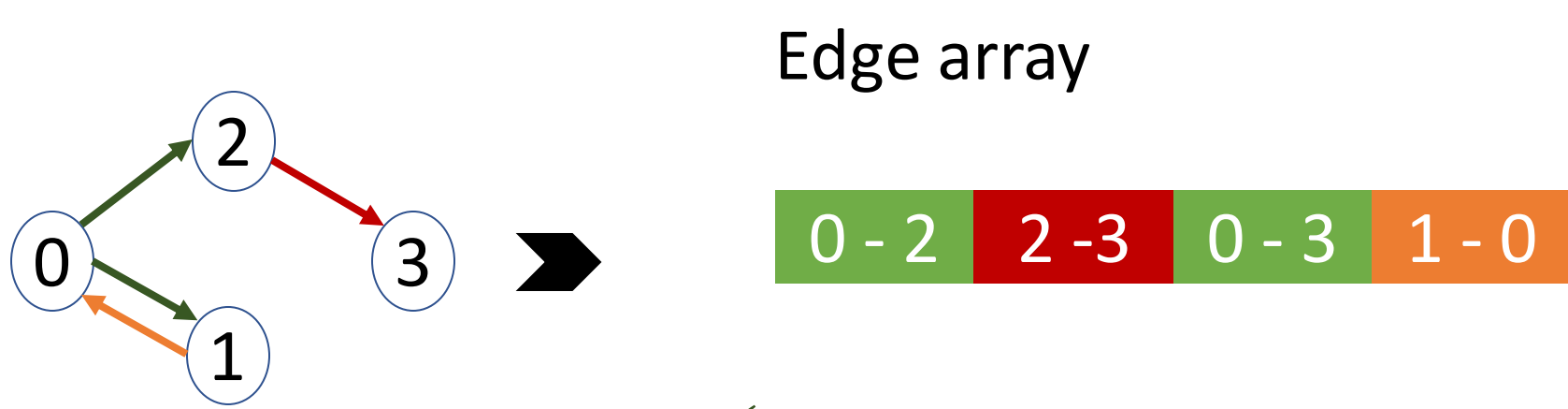
Graph processing ⟷ extracting information from graphs

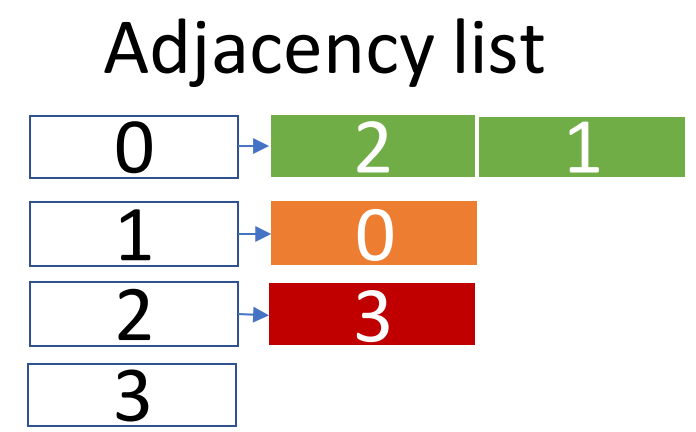### Pre-processing
Create graph representation

+

Computation
Execute graph algorithm

Hidden trade-offs !

- Pre-processing
- Compute

Our work: Study to understand when is pre-processing worth doing!

Pre-processing: graph representation

Edge array

| 0 - 2 | 2 -3 | 0 - 3 | 1 - 0 |

✓ No pre-processing
✗ Can't select **only** relevant edges

Adjacency list

0	→	2	1
1	→	0
2	→	3
3	

✗ Needs pre-processing
✓ Select **only** relevant edges

Which one to use?

BFS — Time (s) — adjacency list, edge array

SpMV — Time (s) — adjacency list, edge array
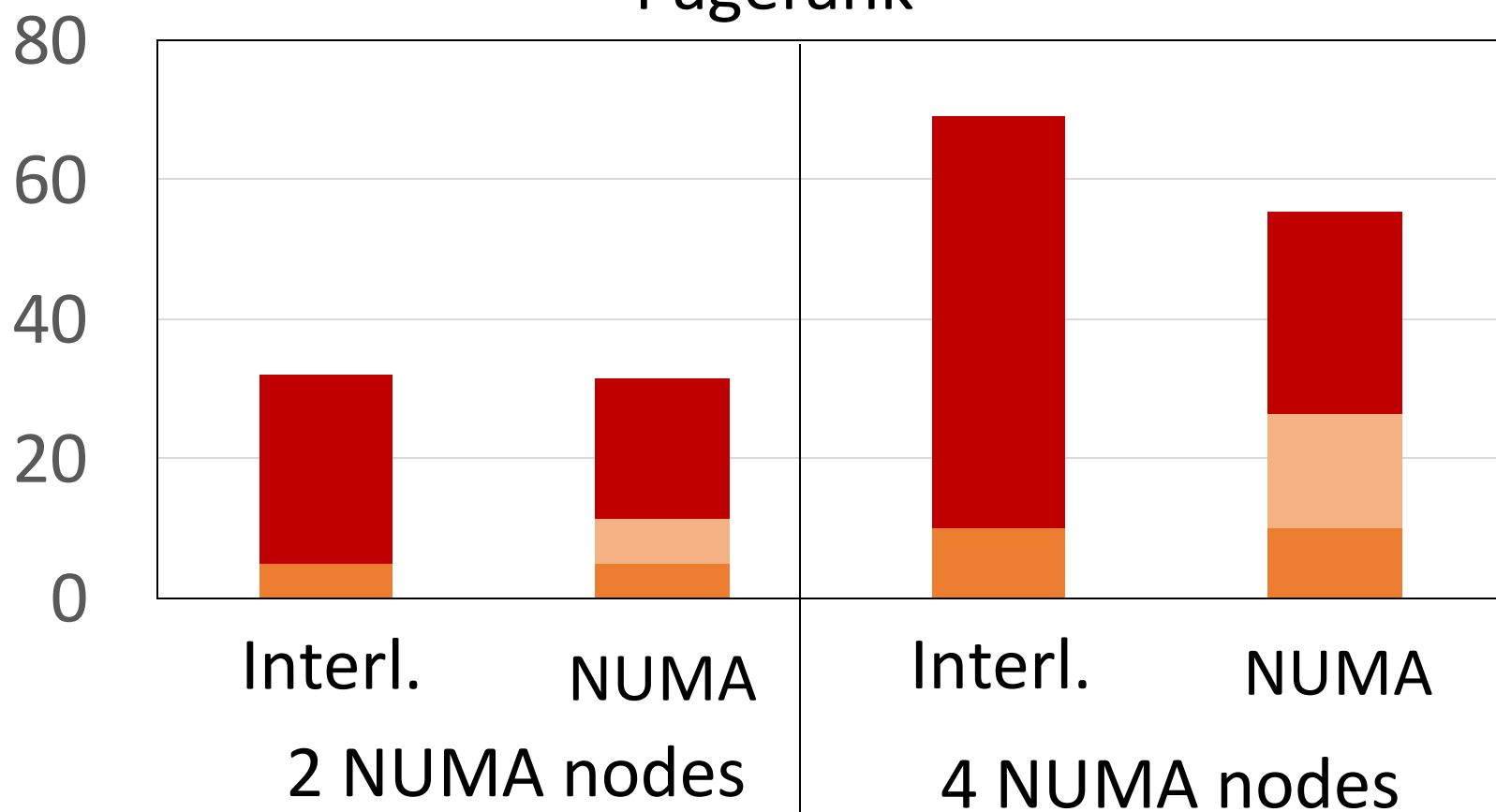- Pre-processing
- Compute
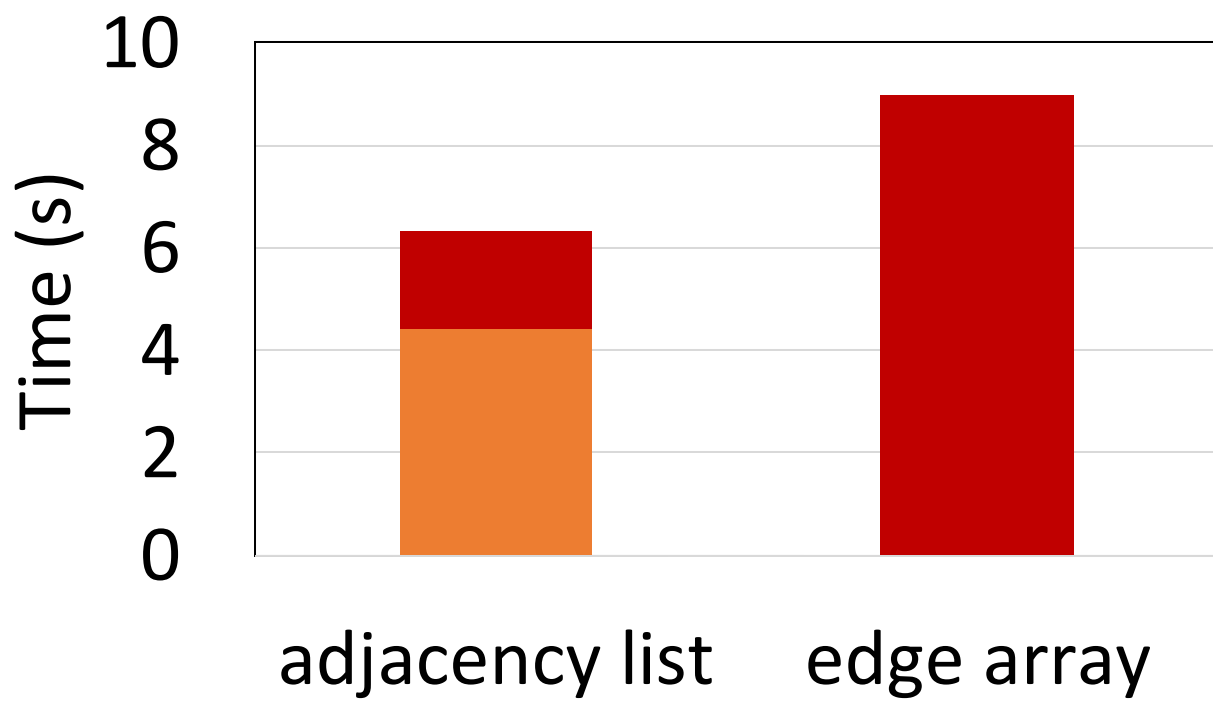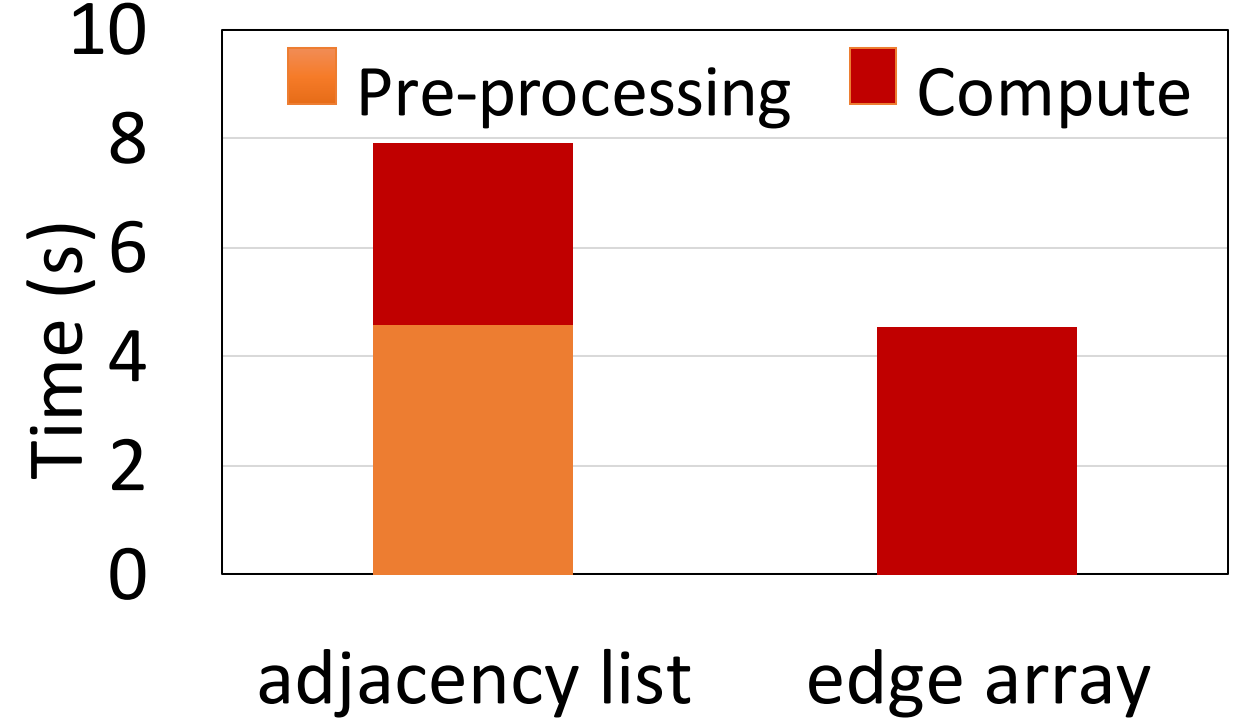
Compute optimizations
NUMA awareness

✓ Data stored local to CPU (on attached NUMA node)
✗ Additional pre-processing – NUMA aware data partitioning

- Pre-processing
- NUMA partitioning
- Compute

Pagerank — Interl., NUMA (2 NUMA nodes); Interl., NUMA (4 NUMA nodes)

BFS — Interl., NUMA (2 NUMA nodes); Interl., NUMA (4 NUMA nodes)