

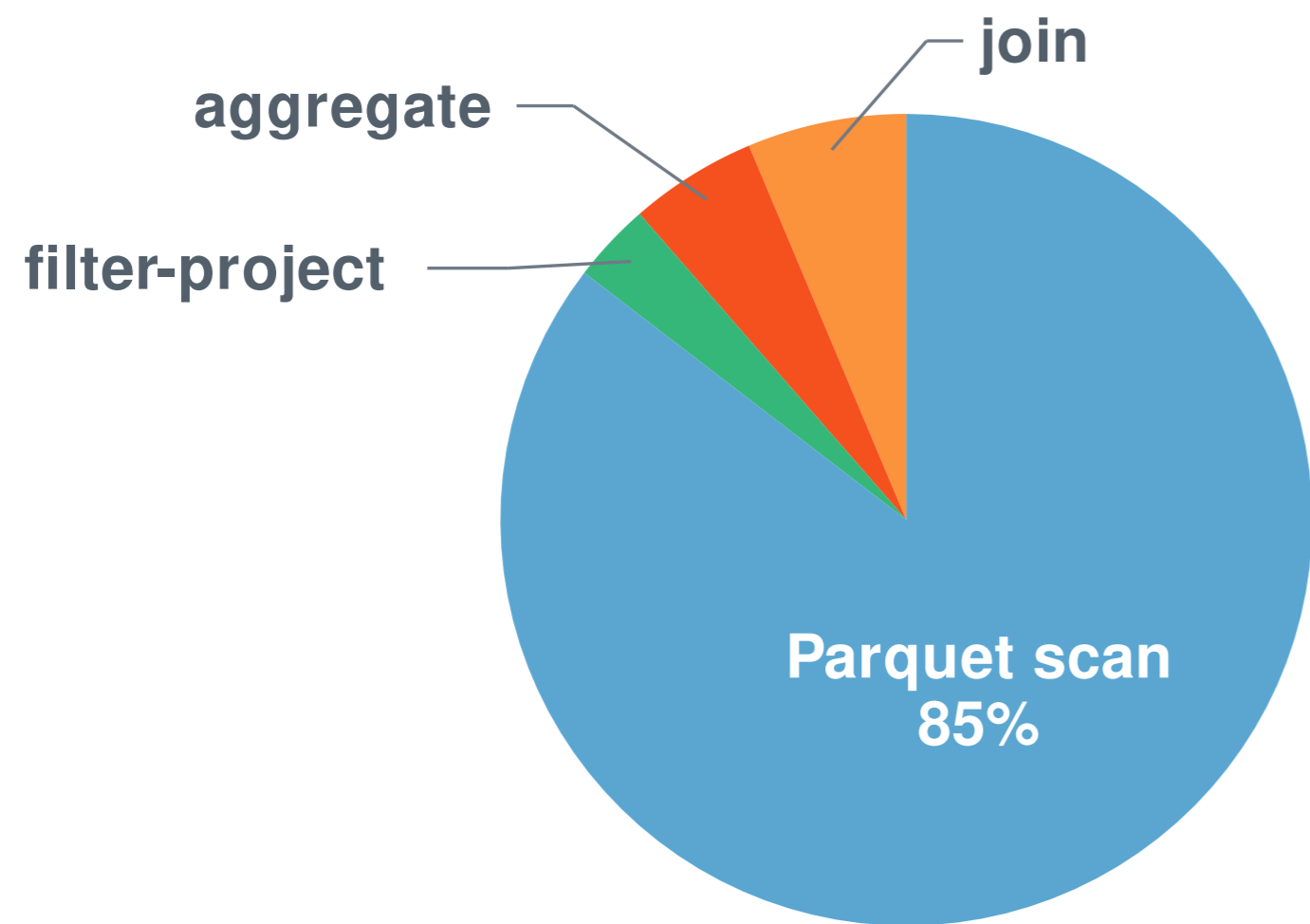
# Do GPUs Really Need New Tabular File Formats?

Jigao Luo, Qi Chen, Carsten Binnig  
Technische Universität Darmstadt



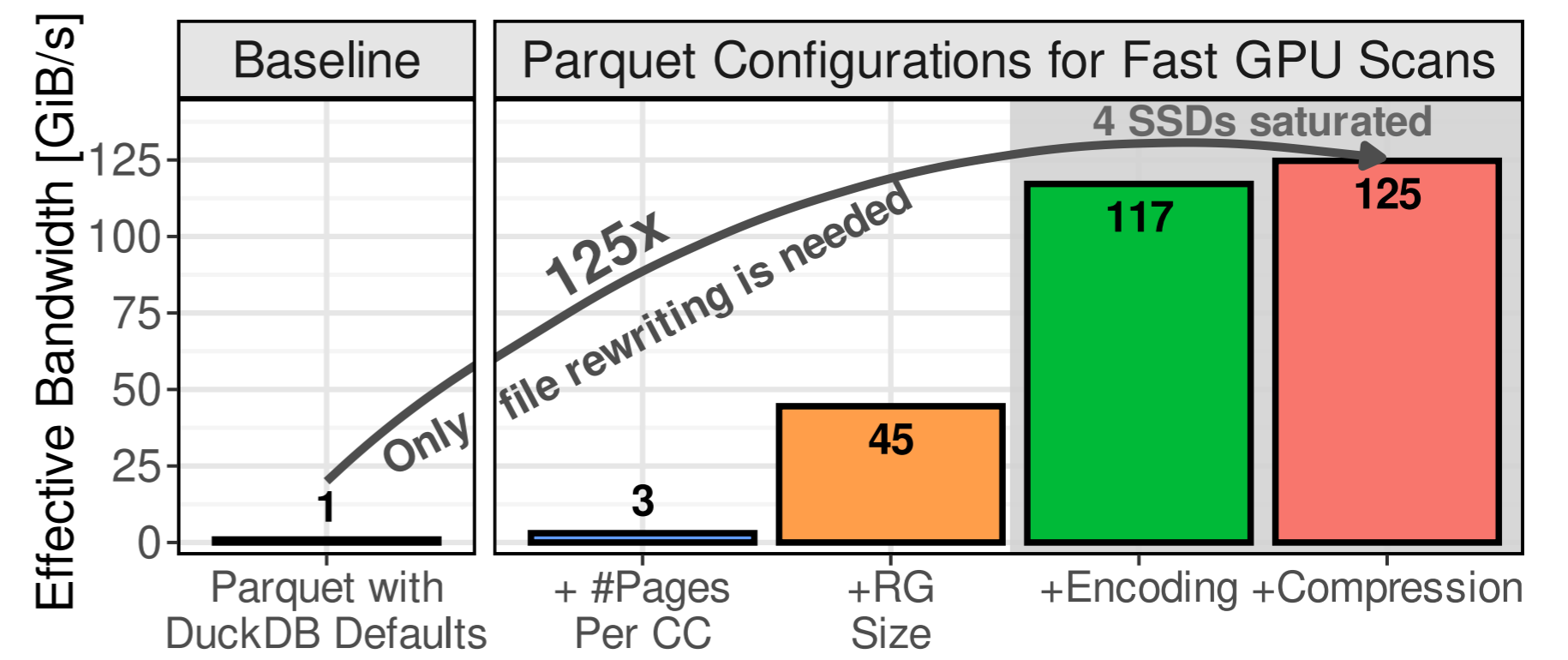
SYSTEMS

## Motivation & Research Question



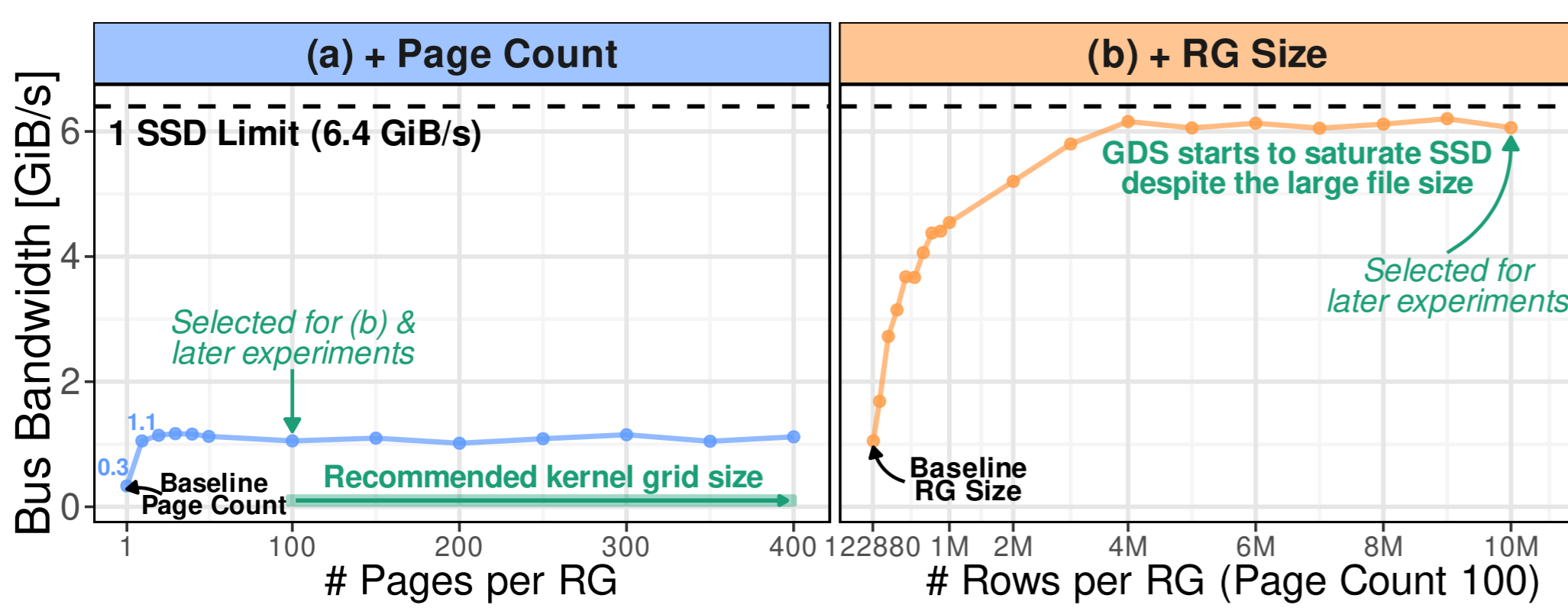
- Parquet: RowGroup → ColumnChunks → Pages (encoded & compressed)
- NVIDIA RAPIDS: **85%(!)** of TPC-H runtime in Parquet scan
- Question: Do GPUs need new file formats?**

## Idea & Contributions



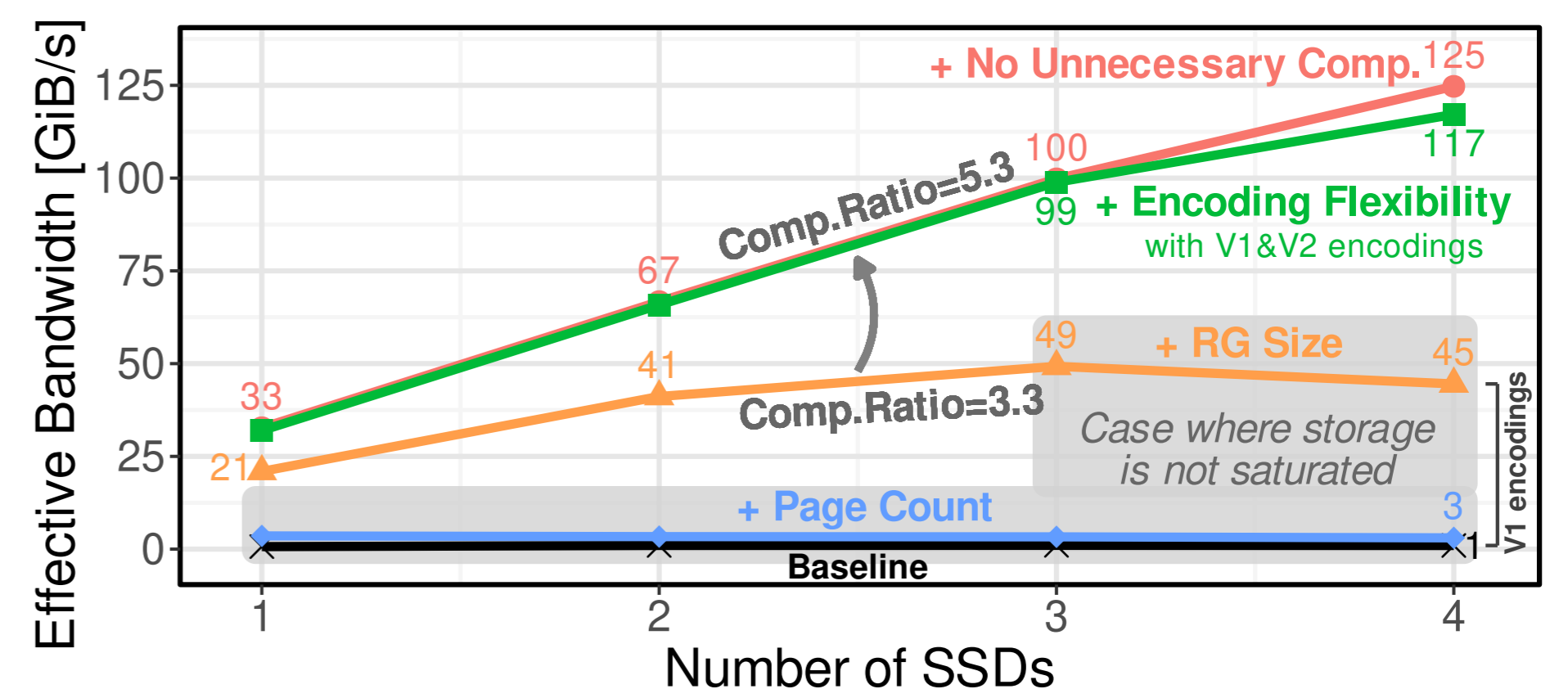
- Configuration Defaults: inherited from CPU best practices
- Issue: CPU defaults != GPU-optimal
- Misconception: Parquet is often wrongly criticized
- Up to **125x** speedup after GPU-aware rewriting → 4 Insights

## Insight 1 & 2: # Pages in CC & RG Size



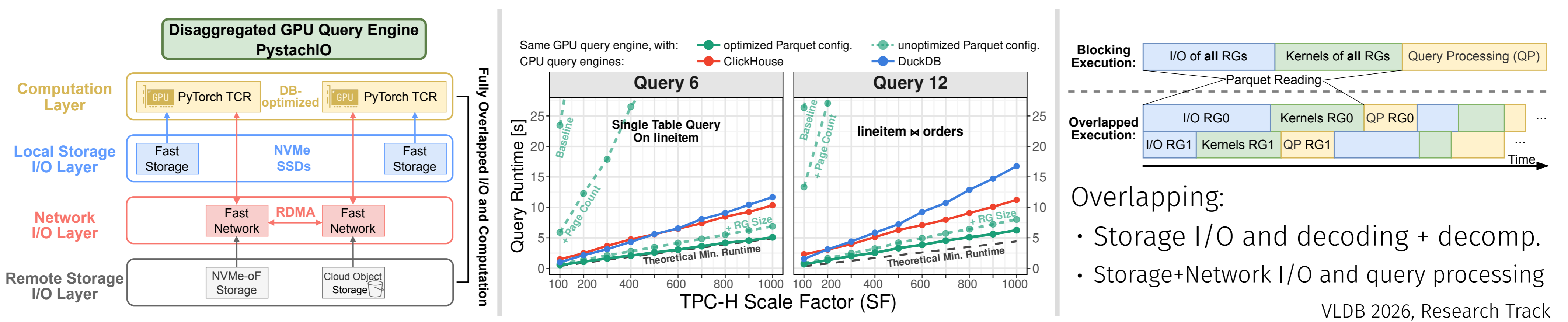
- # Pages in ColumnChunk → grid size of GPU decoding kernel
  - Insight 1:** Avoid too few pages to prevent low GPU util.
- GPU I/O stack: MB-level I/O sizes saturate SSDs
  - Insight 2:** Use million-row RG size for storage saturation

## Insight 3 & 4: Encoding & Compression

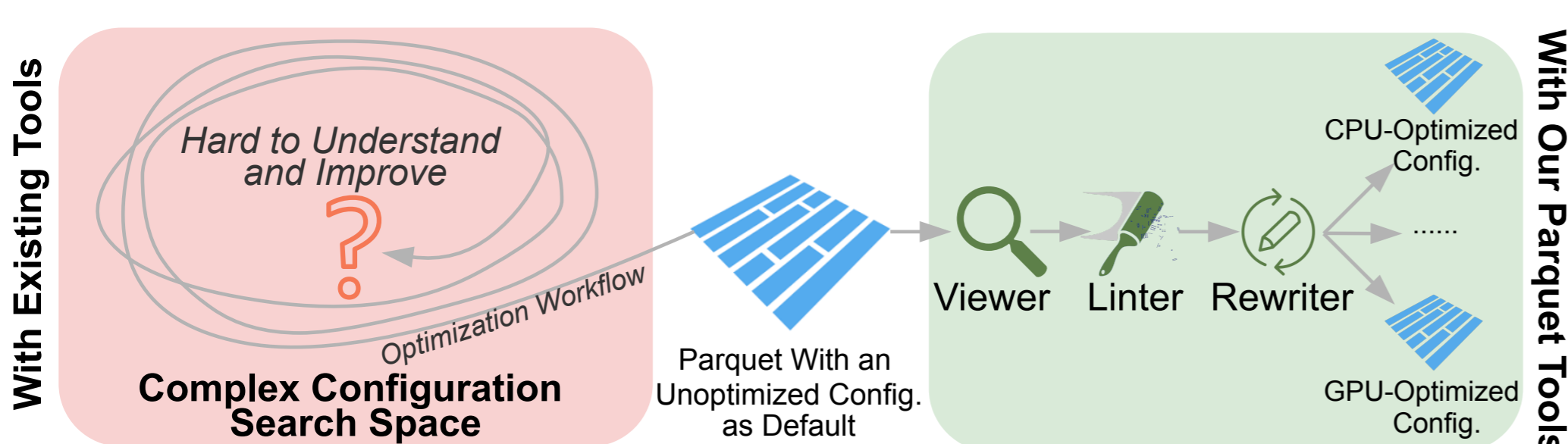


- Search for the min-size encoding per ColumnChunk
  - Insight 3:** Flexible encoding improves compression ratio
- Some compression gives zero size reduction
  - Insight 4:** Avoid these compression cases

## More: PystachIO, Our Distributed Disaggregated GPU Query Engine



## More: Automating Parquet Optimization Workflow



- Parquet tools:
  - Viewer: understanding configurations
  - Linter: gathering suggestions
  - Rewriter: applying suggested configurations
- To **new file formats**: Are there any tools available?

## Conclusion & Takeaway

- GPU-aware Parquet configuration matters: 4 Insights
- Parquet performs well once optimized
- GPU-optimized config. != CPU-optimized config.
- Understand & optimize Parquet **before** replacing it!

