

Peer Review

Review of: "Evaluation of Bfloat16, Posit, and Takum Arithmetics in Sparse Linear Solvers"

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While reviewing the paper, I noted several points that could be clarified or improved:

1. MatrixDepot.jl issue:

The authors propose a manual approach using the files ``src/TestMatricesGenerator.jl`` and ``src/TestMatrices.jl``.

I suggest considering the use of `SuiteSparseMatrixCollection.jl`, which appears to already provide the required functionality.

2. Float128 Computation:

Regarding the solution computed in Float128, was this done using the `Quadmath.jl` package?

Moreover, did the authors convert the sparse matrix to a dense format?

Sparse linear solvers in Julia rely on the SuiteSparse libraries (CHOLMOD, SPQR, UMFPACK), which support only a limited number of precisions, so I suppose that the matrix was converted.

3. Householder reflections / Givens rotations:

Is SPQR using Householder reflections or Givens rotations?

I only see Householder rotations in the article; is it a mistake?

4. Benchmark Code Availability:

The paper does not provide a direct link to the benchmark code. I located it on GitHub at <https://github.com/takum-arithmetic/MuFoLAB>.

Including this information in the manuscript would aid reproducibility.

5. Precision Libraries:

It is important to specify which Julia libraries were used for the various numerical precisions.

I was not aware of the existence of Float8s.jl, Posits.jl, and Takums.jl, and it would be great to explain that you relied on these libraries.

6. Incomplete LU Preconditioner in GMRES:

When using an incomplete LU preconditioner with GMRES, what level of fill-in is allowed; is it ILU(o)?

Also, what precision is used for the preconditioner?

These details could significantly impact solver performance and accuracy.

Overall, I find the paper quite interesting, especially as it introduces new numerical precisions that I was not previously aware of. I will probably experiment with these new precisions in the future for my library Krylov.jl.

While the work is promising, many details need further clarification and polishing.

Some improvements in the presentation would enhance the paper's overall impact.

Declarations

Potential competing interests: No potential competing interests to declare.