Google Summer of Code 2021: qutip-tensorflow

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A little bit of background

QuTiP 5 will come with a new dispatching system that includes by two backends:

- `Dense` matrices (similar to numpy's `ndarray`).
- `CSR` matrices (similar to scipy's `csr` array).

qutip-tensorflow

A plug-in for QuTiP 5 that includes a TensorFlow linear-algebra backend.

- Allows operating with a GPU in QuTiP.
- QuTiP now benefits from TensorFlow's auto differentiation and minimization algorithms.
- We also include a small set of benchmarks.

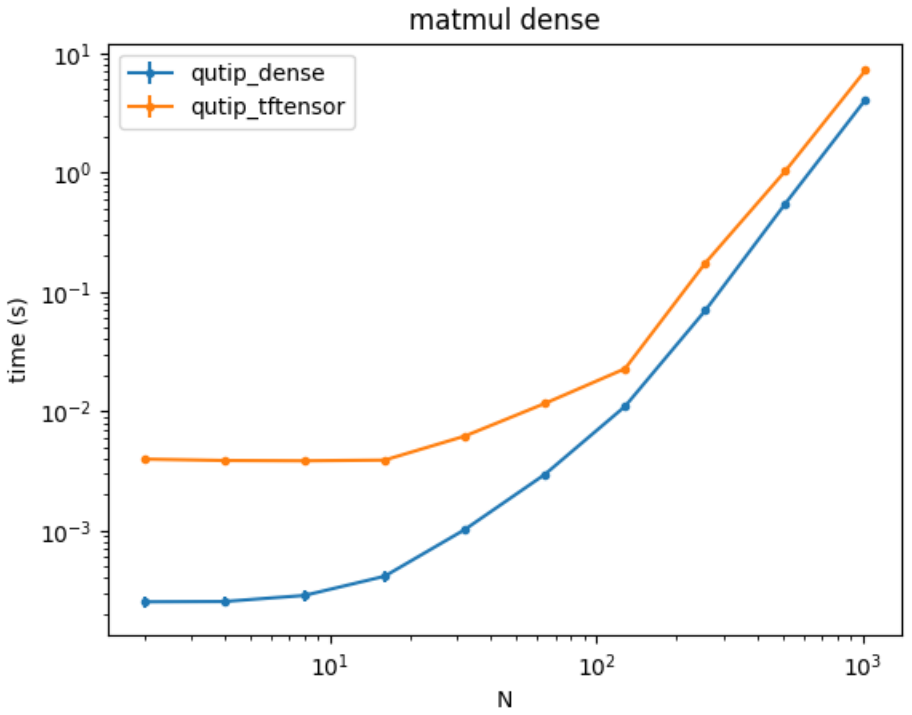
Benchmark - complex128

Small set of benchmarks can be run locally.

Useful to asses if speedups can be achieved.

Hardware:

- GPU: gtx 970
- CPU: intel i7-6700



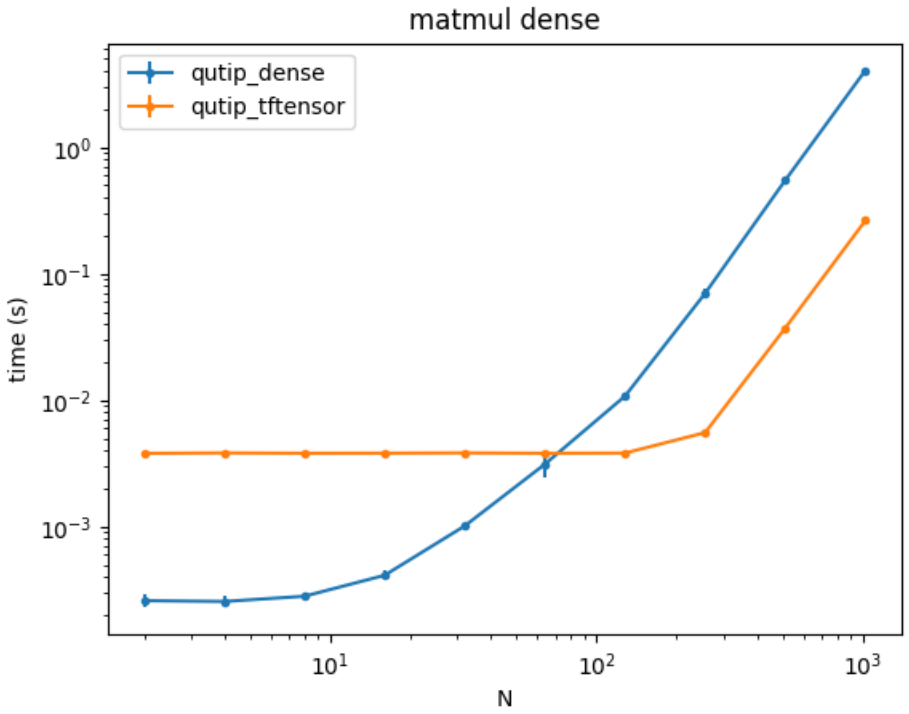
Benchmark - complex64

At the loss of considerable accuracy, complex64 achieves noticeable higher operation speeds.

Complex64 is *not* supported yet but it may be supported in the near future.

Hardware:

- GPU: gtx 970
- CPU: intel i7-6700



Auto differentiation and minimization algorithms.

Auto differentiation is supported using TensorFlow's `GradientTape`.
Example of minimization algorithms that can be used:

- Adams
- SGD
- ...

See the example for auto differentiation and minimization included in `qutip_tensorflow/examples`.

Mentors

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Shahnawaz Ahmed

Simon Cross

Thank you for your time!

Operating with a GPU

At the loss of considerable accuracy, complex64 achieves noticeable higher operation speeds.

Hardware:

- GPU: gtx 970
- CPU: intel i7-6700