Implementing your SasModels in Futhark

It goes much faster

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Injecting Futhark into SasModels

Basic implementation strategy

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  Therefore we can implement FutKernel so it is initialized (and given q-values and other details) by SasModels.
- When running the computations themselves, the calculations are performed within a dynamically loaded, precompiled, highly optimized Futhark kernel, and the results are returned to SasModels.

Basic implementation strategy

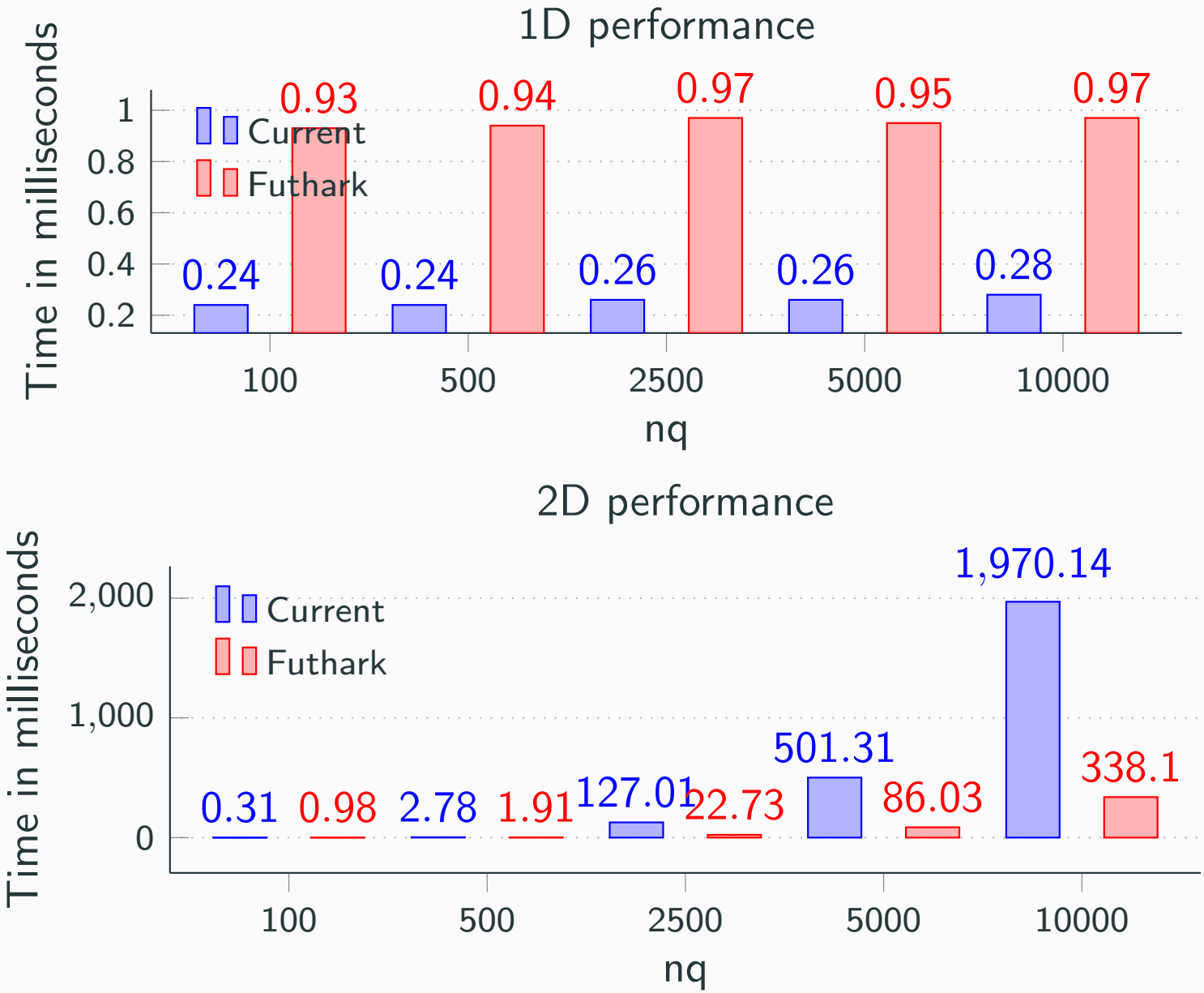
7 sasmodels/core.py — View

```
@@ -21,6 +21,7 @@
 from . import mixture
 from . import kernelpy
 from . import kerneldll
+from . import kernelfut
 from . import custom

 if os.environ.get("SAS_OPENCL", "").lower() == "none":
@@ -229,7 +230,11 @@ def build_model(model_info, dtype=None, platform="ocl"):
     numpy_dtype, fast, platform = parse_dtype(model_info, dtype, platform)

     source = generate.make_source(model_info)
-    if platform == "dll":
+
+    if type(model_info.Iq) is dict and model_info.Iq["model_is_futhark"]:
+        return kernelfut.FutModel(model_info, numpy_dtype)
+
+    elif platform == "dll":
         #print("building dll", numpy_dtype)
         return kerneldll.load_dll(source['dll'], model_info, numpy_dtype)
     else:
```

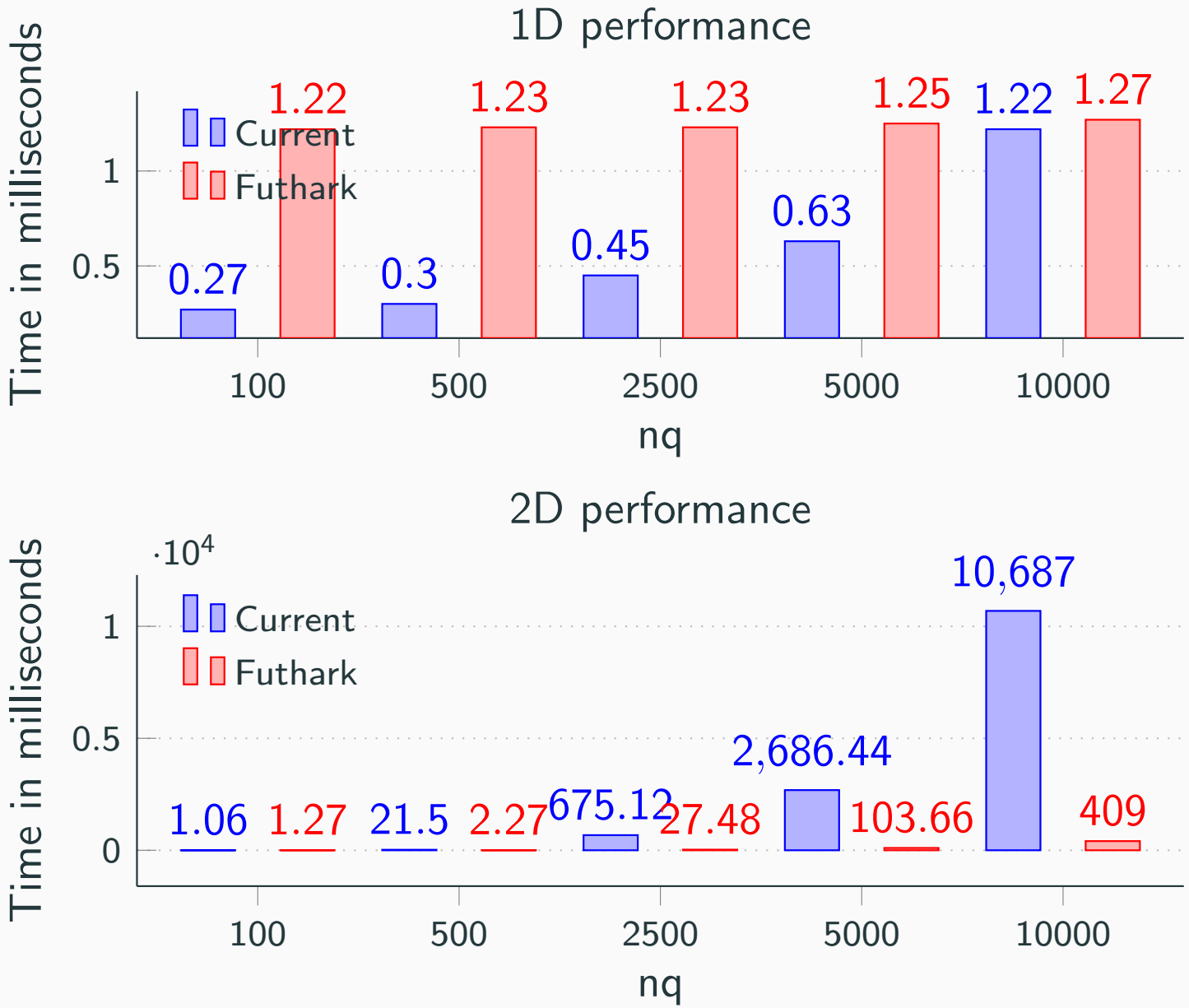
Figure 1: The complete contribution to already existing code

Performance

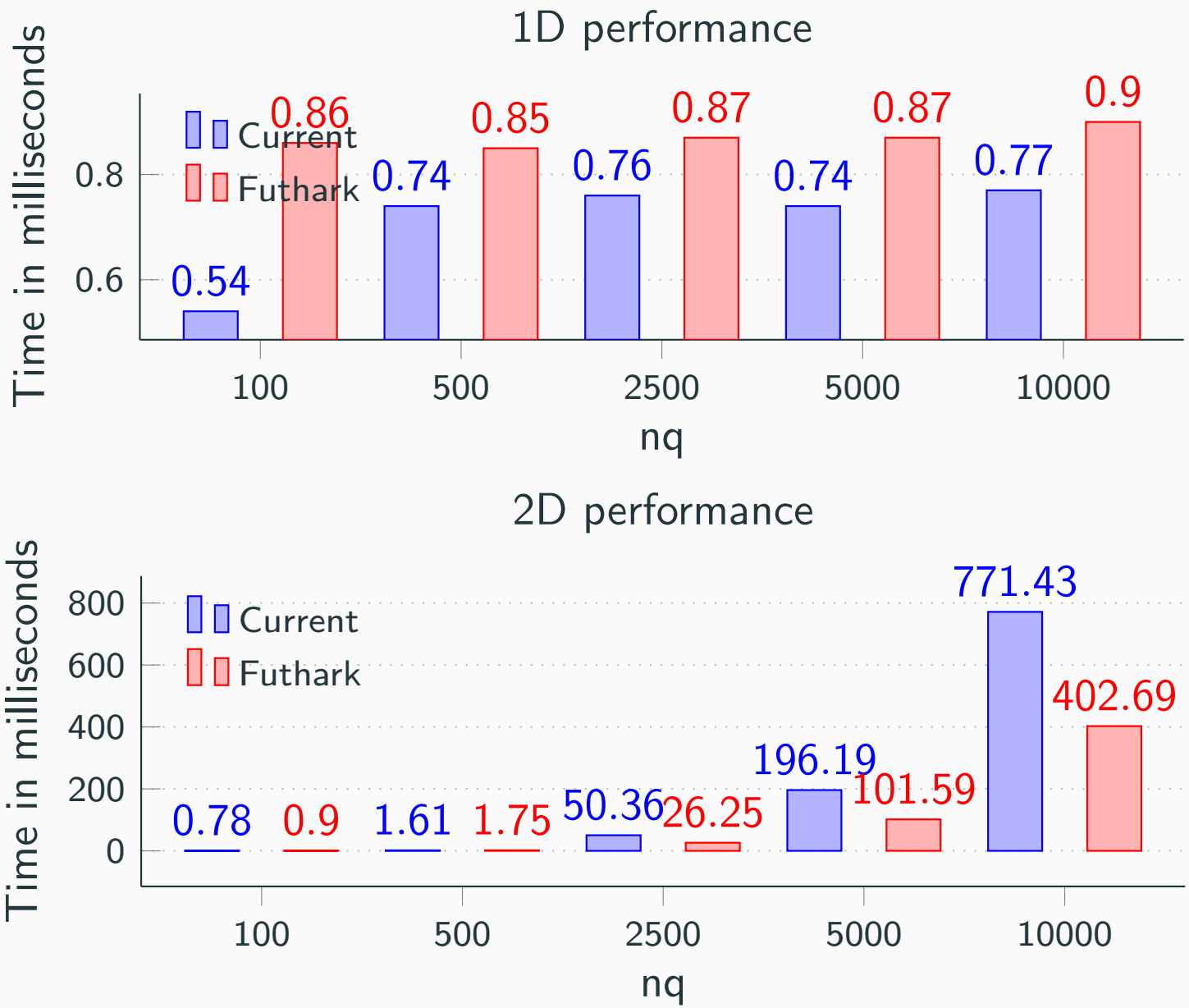
Average eval time for Line (trivial Python model)



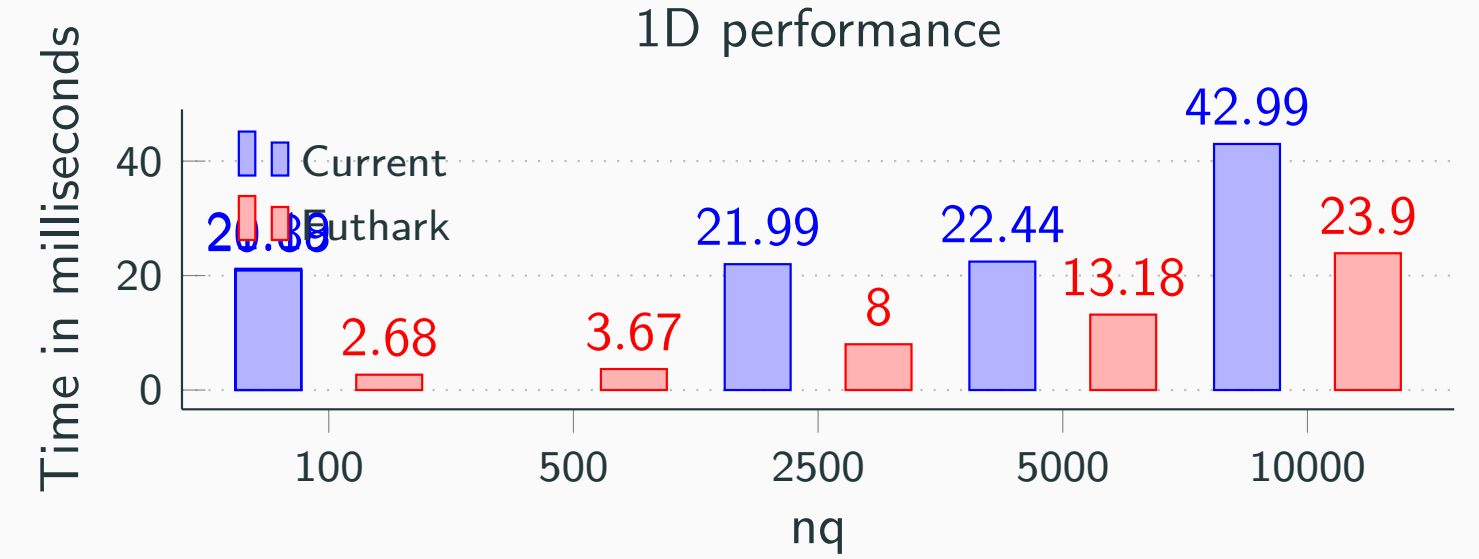
Average eval time for Broad Peak (Python model)

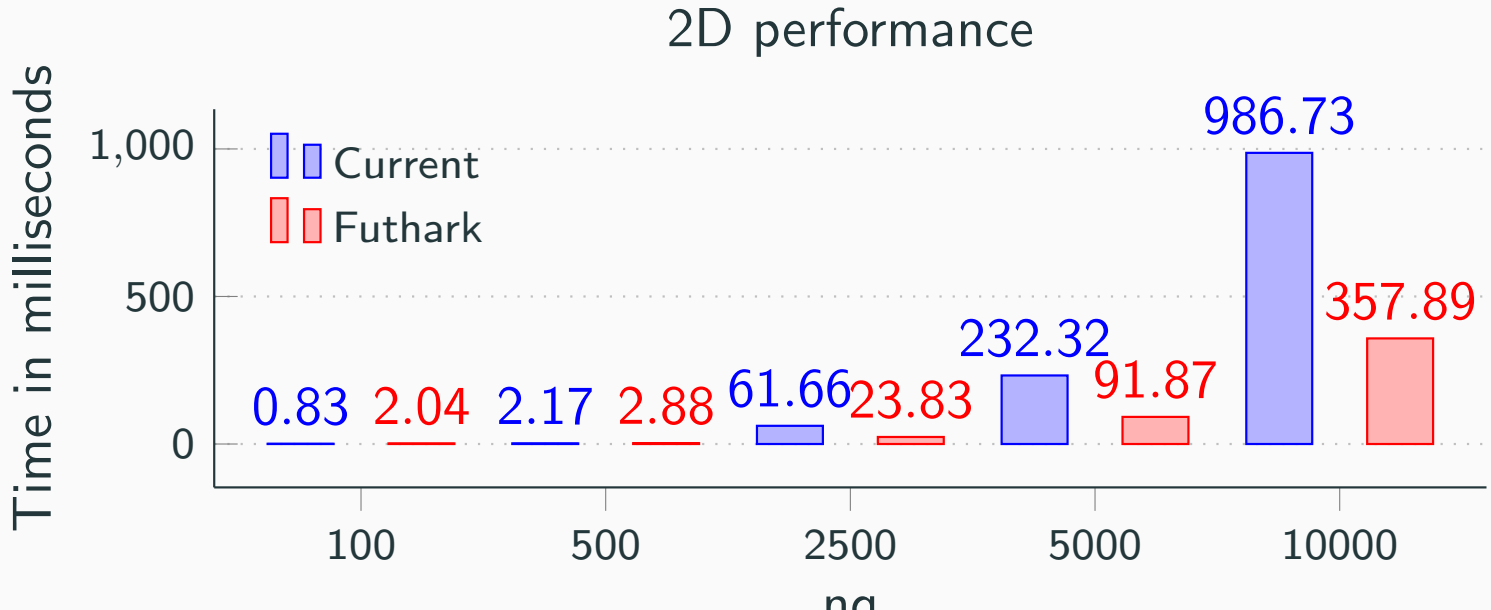


Average eval time for DAB (trivial OpenCL model)



Average eval time for core shell parallelepiped (OpenCL model)





Future work

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SasModels in Futhark is not feature complete yet. We still need to implement:

- Polydispersion
- Magnetism
- Mixture models
- Futhark-side refactorings
- (various quality-of-life stuff)

We expect further experiments with more complicated models to show even larger performance boosts when using Futhark.