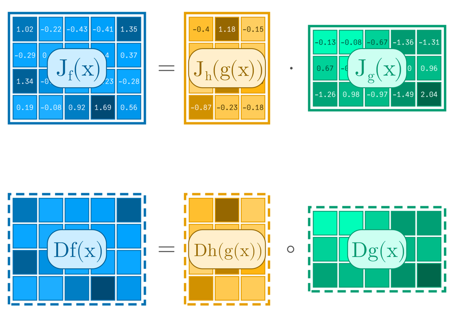
Leverging Sparsity for Fast Jacobians and Hessians

An Illustrated Guide to Automatic Sparse Differentiation

Adrian Hill[1,2], Guillaume Dalle[3], Alexis Montoison[4]

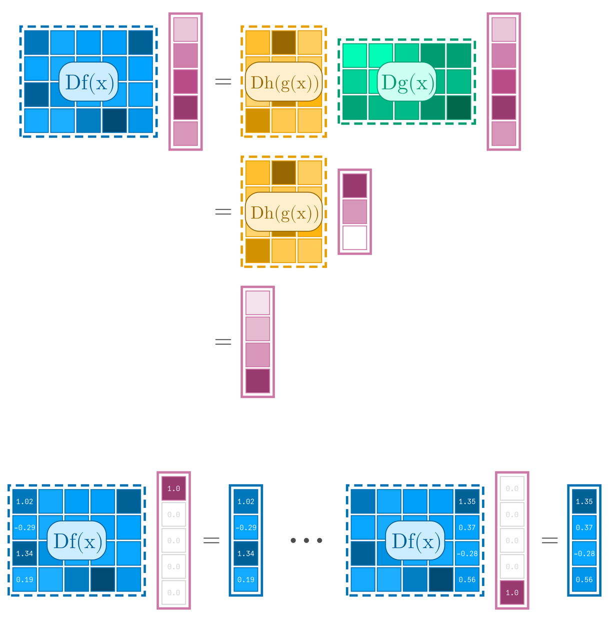
Matrices vs. Operators

Foobar



Forward and reverse mode

Foobar

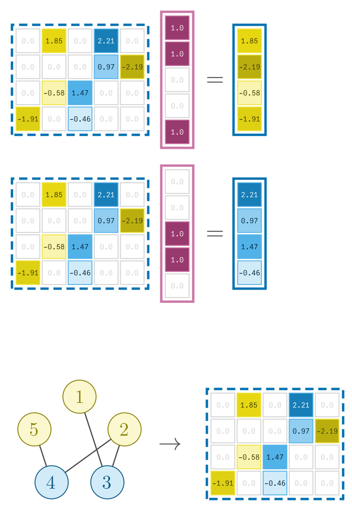


Stretching

Foobar

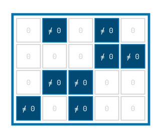
Automatic Sparse Differentiation

Foobar



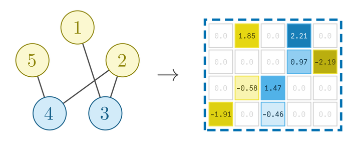
Pattern detection

Foobar



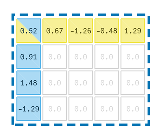
Coloring

Foobar



Bicoloring

Foobar



Demonstration

```julia
using DifferentiationInterface
using SparseConnectivityTracer: TracerSparsityDetector
using SparseMatrixColorings: GreedyColoringAlgorithm
import ForwardDiff

ad_backend = AutoForwardDiff()

asd_backend = AutoSparse(ad;
    TracerSparsityDetector(),
    GreedyColoringAlgorithm()
)

jacobian(f, ad_backend,  x)
jacobian(f, asd_backend, x)
```

Align them to the bottom.