

KL-Regularized Least Squares

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Load physics data

The file `PhysicsData.npz` contains the matrix and vectors generated by the script `PhysicsData.jl`, where we get the output from `generate_data`:

- `A` is the first output argument `A`
- `b` is the second output argument `data0`
- `x0` is the third input argument, which seems to be the ground truth distribution.

```
data = npzread("PhysicsData.npz", ["A", "b", "x0"])
@unpack A, b, x0 = data
klprob = KLLSData(A, b)
```

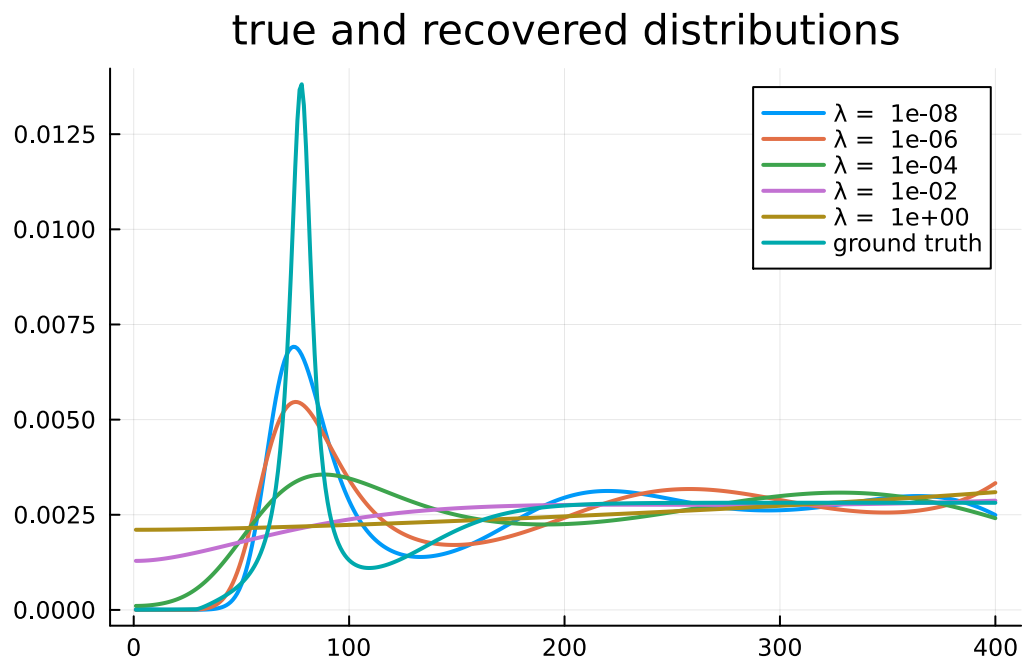
Solve over a range of regularization parameters

Solve the problem for a range of logarithmically spaced regularization parameters λ between 10^{-8} and 1.

```
stats = map(exp10.(range(-8, stop=0, length=5))) do λ
    klprob.λ = λ
    p, y, stats = newtoncg(klprob)
    (λ=λ, p=p, iters=stats.iter, ∇dNrm=stats.dual_feas)
end;
```

Comparison to ground truth

```
lab = hcat([@sprintf("λ = %6.0e", λ) for λ in getfield.(stats, :λ)]...)
default(lw=2, title="true and recovered distributions")
plot(getfield.(stats, :p), lab = lab)
plot!(x0, label="ground truth")
```



The curve corresponding to the smallest parameter λ ($1e-8$) best approximates the modes of the ground-truth distribution, but smaller values of λ don't make help.

These tests use a uniform prior. Does the data generator make a prior available? If so, this could be used to improve the results.