

Approximate Bayesian Computation

Dominik Klepl

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In this notebook we take the best model structure from previous notebooks and use ABC to estimate the posterior distribution of the parameters instead of just point estimates.

We create a grid of possible values of the parameters and we try all value combinations in this 3D grid. Generate data from each model, if the simulated data is close enough to the sample data then we accept the parameters.

```
pacman::p_load(ggplot2, ggthemes, tidyr, patchwork, plotly, viridis)
```

Load data

```
data = read.csv("data/x_y.csv", header = F)
colnames(data) = c("x", "y")
```

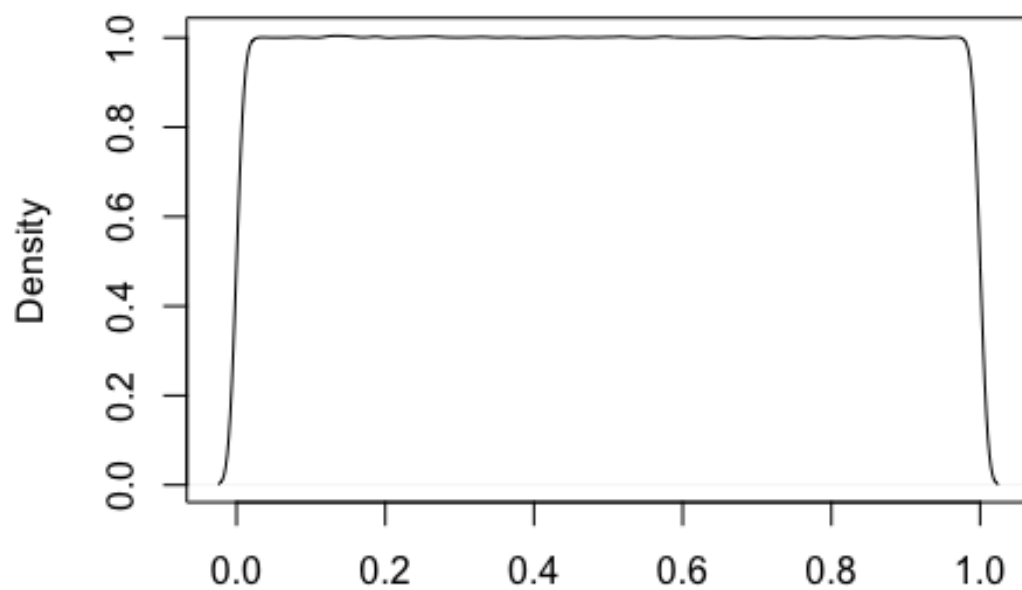
Priors

MLE theta is 0.502, 2.004 and 2 Create priors for all 3 parameters And bind samples from priors to a matrix for easier manipulation later.

Plot priors

```
plot(density(prior_x1))
```

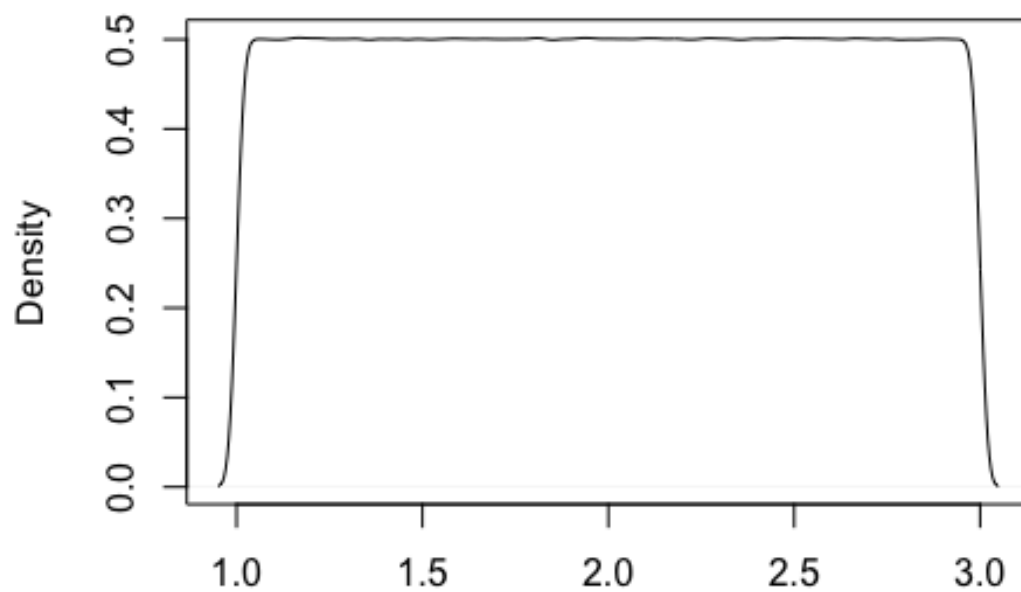
density.default(x = prior_x1)



N = 30000000 Bandwidth = 0.008303

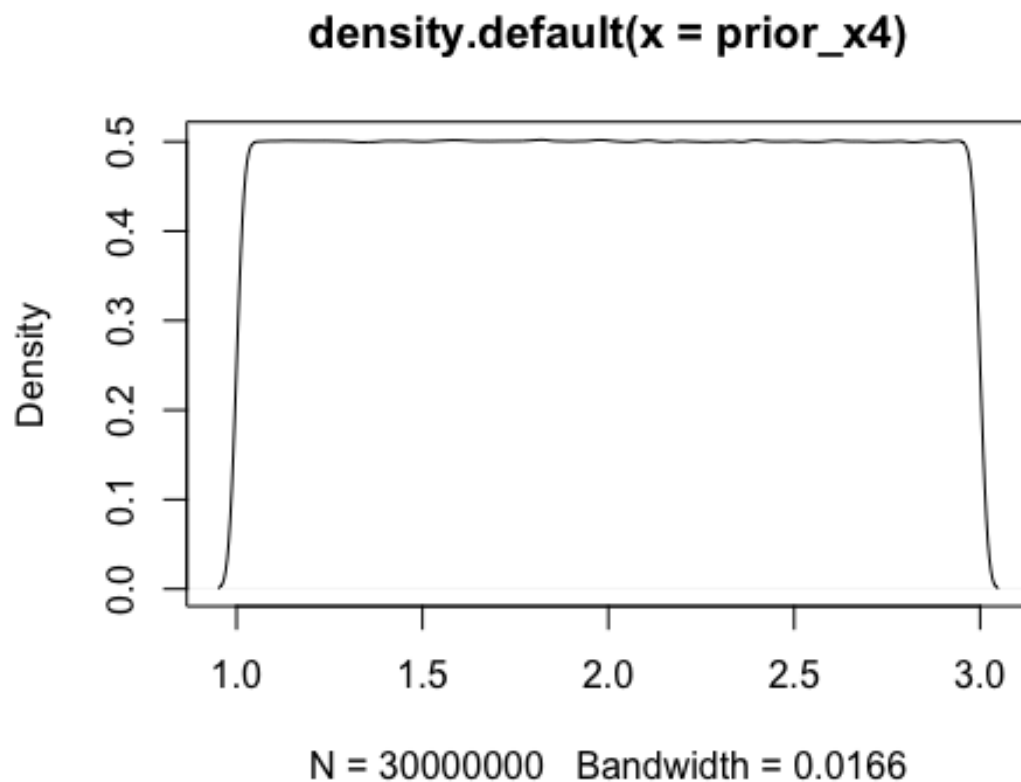
```
plot(density(prior_x2))
```

density.default(x = prior_x2)



N = 30000000 Bandwidth = 0.0166

```
plot(density(prior_x4))
```



Create X matrix with predictors as columns

```
X = cbind(data$x,  
          data$x^2,  
          data$x^4  
        )
```

Rejection ABC

Iterate over rows of priors matrix (candidate theta values), generate data using candidate theta and measure distance between simulated and real data. If distance < tolerance, append the parameter combination to posterior samples. We can use MSE as tolerance for the rejection algorithm.

