1 Eight Schools Model

```
data {
  int<lower=0> J;            // number of schools
  real y[J];                 // estimated treatment effect (school j)
  real<lower=0> sigma[J];    // std err of effect estimate (school j)
}
parameters {
  real mu;
  real theta[J];
  real<lower=0> tau;
}
model {
  theta ~ normal(mu, tau);
  y ~ normal(theta,sigma);
}
```

2 Funnel Model

```
parameters {
  real y;
  vector[9] x;
}
model {
  y ~ normal(0,3);
  x ~ normal(0,exp(y/2));
}
```

3 Gaussian Process

```
// Fit a Gaussian process's hyperparameters
// for squared exponential prior

data {
  int<lower=1> N;
  vector[N] x;
  vector[N] y;
}
transformed data {
  vector[N] mu;
  for (i in 1:N)
    mu[i] <- 0;
}
parameters {
  real<lower=0> eta_sq;
```

```
  real<lower=0> rho_sq;
  real<lower=0> sigma_sq;
}
model {
  matrix[N,N] Sigma;

  // off-diagonal elements
  for (i in 1:(N-1)) {
    for (j in (i+1):N) {
      Sigma[i,j] <- eta_sq * exp(-rho_sq * pow(x[i] - x[j],2));
      Sigma[j,i] <- Sigma[i,j];
    }
  }

  // diagonal elements
  for (k in 1:N)
    Sigma[k,k] <- eta_sq + sigma_sq; // + jitter

  eta_sq ~ cauchy(0,5);
  rho_sq ~ cauchy(0,5);
  sigma_sq ~ cauchy(0,5);

  y ~ multi_normal(mu,Sigma);
}
```