setwd("C:/R files BHMRA")

library(R2OpenBUGS); library(MCMCvis)

Sys.setenv(BUGSDIR="c:\\users\\p congdon\\documents\\WINBUGS14")

attach("DS\_4\_11\_M1.Rdata")

attach("DS\_4\_11\_M2.Rdata")

#

# Polya Urn

#

**model1 <- function() {**  # prediction

pnew[1] <- alph/(alph+n);

bnew[1] ~ dgamma(c.g,d.g)

for (k in 2:nP) {pnew[k] <- 1/(alph+n);

bnew[k] <- b[k-1]}

# out-of-sample prediction

Snew ~ dcat(pnew[1:nP]);

b.new <- bnew[Snew]

y.new ~ dpois(b.new)

for (i in 1:n) {y[i] ~ dpois(b[i]);

yrep[i] ~ dpois(b[i]);

# predictive checks using replicate samples

exc[i] <- step(y[i]-yrep[i]-0.001)+0.5\* equals(yrep[i],y[i])}

# urn prior

b[1] ~ dgamma(c.g,d.g);

newclus[1] <- 1

for (i in 2:n) {bstar[i,1] ~ dgamma(c.g,d.g)

p[i,1] <- alph/(alph+i-1);

S[i] ~ dcat(p[i,1:n])

newclus[i] <- equals(S[i],1);

b[i] <- bstar[i,S[i]]

for (k in 1:i-1) {bstar[i,k+1] <- b[k];

p[i,k+1] <- 1/(alph+i-1)}

for (k in i:n-1) {bstar[i,k+1] <- 0;

p[i,k+1] <- 0}}

K <- sum(newclus[]);

alph ~ dexp(1)

c.g ~ dexp(1) %\_% I(0.5,);

d.g ~ dexp(1)}

**# initial values and estimation**

inits1 <- list(alph=1,c.g=1,d.g=1)

inits2 <- list(alph=2,c.g=5,d.g=5)

inits <- list(inits1,inits2)

pars <- c("alph","c.g","d.g","K","exc","b","b.new","y.new")

n.iters=20000; n.burnin =1000; n.chains=2

R <- bugs(DS\_4\_11\_M1,inits,pars,n.iters,model1,n.chains, n.burnin,debug=T,codaPkg = F, bugs.seed=10)

R$summary

**# estimated random effects**

b.pmn=apply(R$sims.list$b,2,mean)

hist(b.pmn,breaks=20,xlab="Posterior mean b",main=NULL)

**# exceedance checks**

exc.pmn=apply(R$sims.list$exc,2,mean)

sum(exc.pmn > 0.9)+ sum(exc.pmn < 0.1)

**# predicted new outcome (y.new), 38000 samples**

samp.ynew =R$sims.list$y.new

hist(samp.ynew,breaks=20,xlab="New Outcome",main="Figure 4.2 Predictive Samples, New Outcome,Eye Tracking Data",xlim=c(0,50),col="gray")

#

# PT-prior

#

**model2 <- function() {** for (i in 1:n) {

y[i] ~ dpois(mu[i]);

log(mu[i]) <- beta+sigma\*b[i]

b[i] <- bstar[B[M,i]]

yrep[i] ~ dpois(mu[i]);

# predictive checks

exc[i] <- step(y[i]-yrep[i]-0.001)+0.5\*equals(yrep[i],y[i])}

# priors

beta ~ dnorm(0,0.01)

tau ~ dexp(1)

sigma <- 1/sqrt(tau)

# Polya Tree Process for b[]

for (m in 2:M) { c[m] <- 0.1\*pow(m,2)}

for (i in 1:n) { V[1,i] ~ dbern(0.5)

for (m in 2:M) { p[m,i] ~ dbeta(c[m],c[m])

V[m,i] ~ dbern(p[m,i])}

# level 1 choice (convert V=0,1 to B=1,2)

B[1,i] <- V[1,i]+1

# choices at level 2 and above

for (m in 2:M) { B[m,i] <- sum(BC[m,i,1:m-1])+V[m,i]+1

for (k in 1:m-1) {BC[m,i,k] <- V[m-k,i]\*pow(2,k)}} }

# Sample within ordinates of base distribution

bstar[1] ~ dnorm(0,1) %\_% I(,U[1]);

bstar[M2] ~ dnorm(0,1) %\_% I(L[M2],)

for (i in 2:M2-1) {w[i] ~ dbeta(1,1)

bstar[i] <- (1-w[i])\*L[i]+w[i]\*U[i]} }

**# initial values and estimation**

inits1 = list(beta=0,tau=1)

inits2 = list(beta=0.5,tau=2)

inits = list(inits1,inits2)

pars = c("sigma","exc","b","beta")

n.iters=20000; n.burnin =1000; n.chains=2

R = bugs(DS\_4\_11\_M2,inits,pars,n.iters,model2,n.chains, n.burnin,debug=T,

codaPkg = F,bugs.seed=10)

R$summary

**# estimated random effects**

b.pmn=apply(R$sims.list$b,2,mean)

hist(b.pmn,breaks=20,xlab="Posterior mean b", main="Figure 4.3 Estimated Random Effects, Eye Tracking Data",col="gray")

**# exceedance checks**

exc.pmn=apply(R$sims.list$exc,2,mean)

sum(exc.pmn > 0.9)+ sum(exc.pmn < 0.1)