Decision theory: Assignment 1

Nicolas Taba (nicta839)

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Exercise 1

The process of counting independent increments is represented by a Poisson process (Meeting 2). We will use the following distribution:

$$p(k = 380|t = 2, \lambda = 5 \cdot s) = \frac{e^{-\lambda t}[\lambda t]^k}{k!}$$

where k is the realized number of customers during the time period (380), λ is the parameter that depends on the speed s (30, 40, 50) and the number of workers (5). The time interval for the relaization is $t = 2$. We take particular note here that we must take this time parameter into account in the lambda term because we are looking at 2 time units (2hours).

For the priors, we choose them to be 0.25 and 0.50 respectively for speeds 30, 50 and 40 as implied by the test of the exercise.

We set out to calculate the posterior probabilities.

```r
# setting up constants
t <- 2
k <- 380
s <- c(30, 40, 50)
w <- 5
priors <- c(0.25, 0.5, 0.25)
wt <- w*t
lik <- rep(0, 3)
post <- rep(0,3)
# calculating likelihoods and posteriors
for(i in 1:3){
  lik[i] <- dpois(x=k, lambda = (s[i]*wt))
  post[i] <- lik[i] * priors[i]
}

# normalize posterior
post_norm <- post/sum(post)

post_norm
```

```
## [1] 4.484136e-05 9.999550e-01 1.245395e-07
```

These are the expected normalized posterior probabilities of the exercise.

Exercise 2

(from next page on)