

Binary Choice Analysis

Robert Hickman

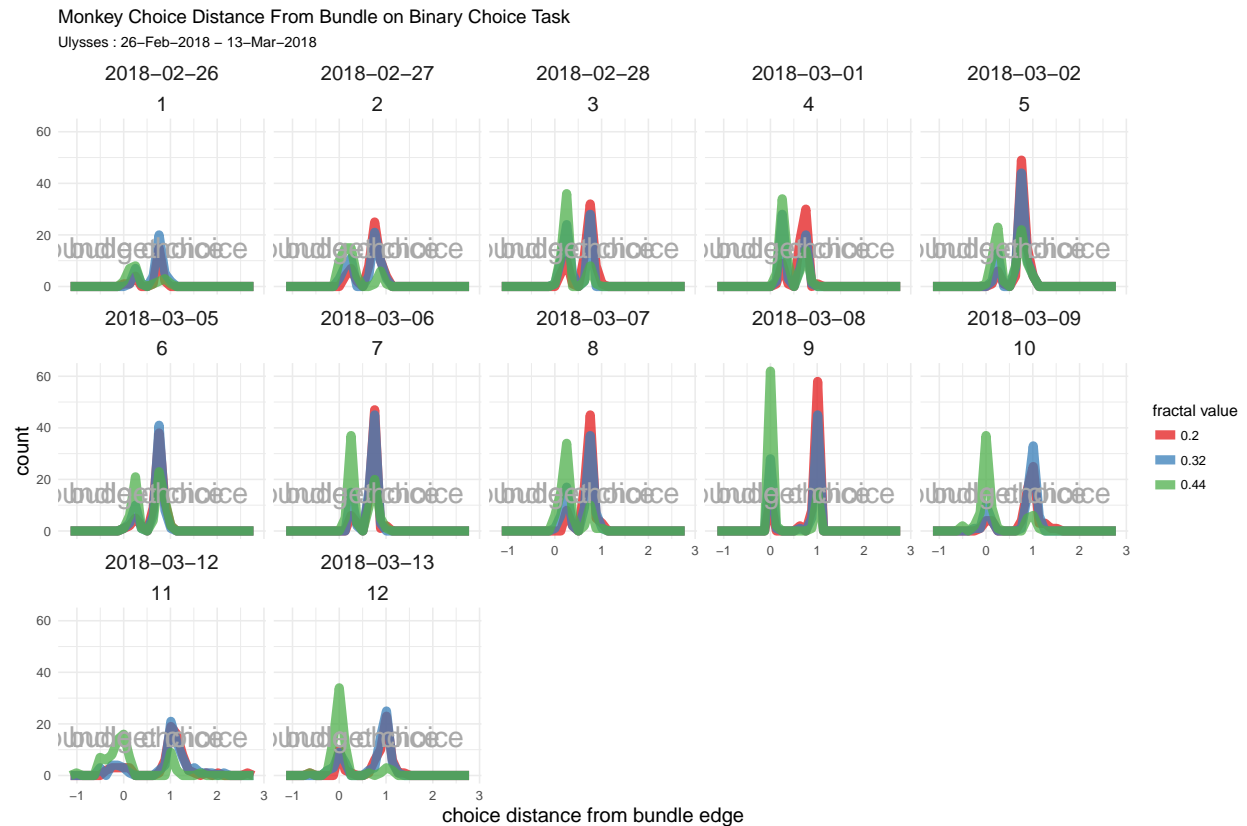
22 February 2018

```
monkey <- "Ulysses"  
today <- "13-Mar-2018"  
look_back <- "26-Feb-2018"
```

```
start_trial <- 0  
stop_trial <- "all"
```

```
merge_days <- TRUE
```

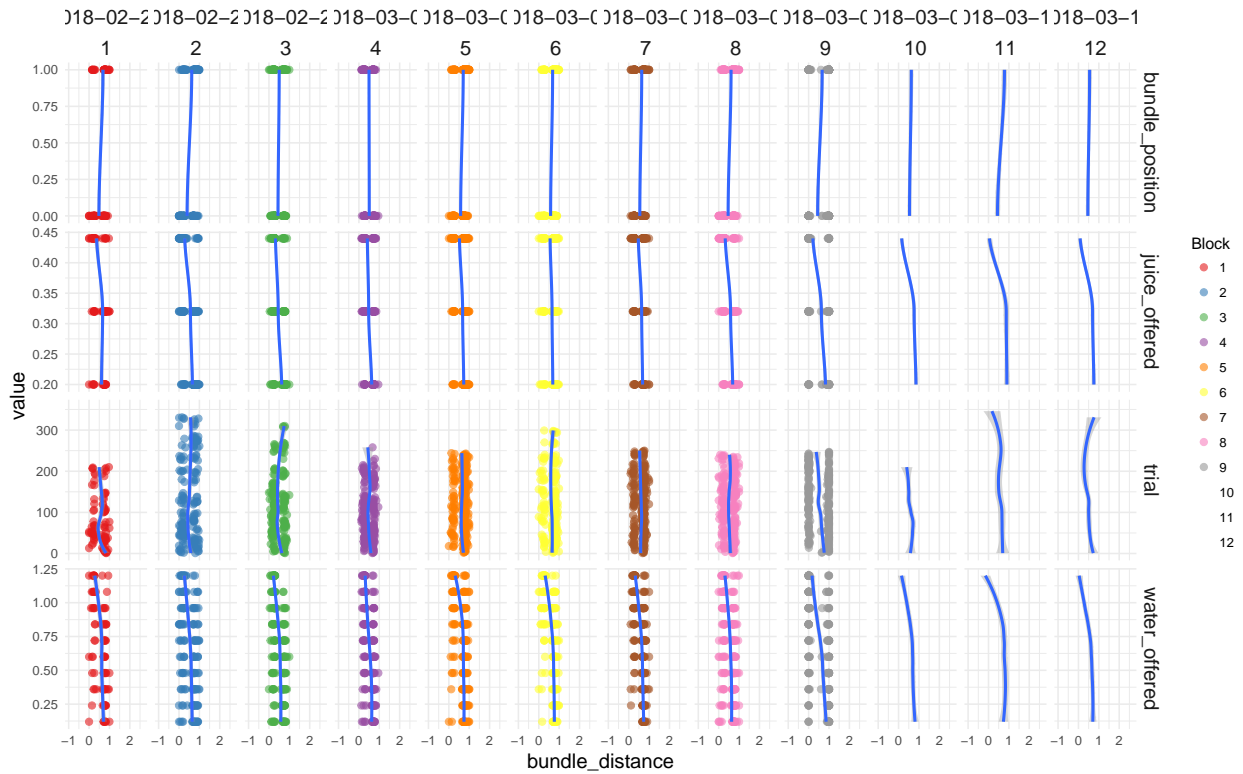
p1



p2

Monkey Choice Distance From Bundle on Binary Choice Task

Ulysses : 26-Feb-2018 – 13-Mar-2018



```
#generate a model of likelihood to choice for the fractal dependent on it's position,
#value and associated water
model <- glm(data = task_data,
             fractal_choice ~ bundle_position + water_offered + juice_offered + trial + date,
             family = "binomial")
```

```
#summarise the parameters
summary(model)
```

```
##
## Call:
## glm(formula = fractal_choice ~ bundle_position + water_offered +
##     juice_offered + trial + date, family = "binomial", data = task_data)
##
## Deviance Residuals:
##      Min       1Q   Median       3Q      Max
## -3.1293  -0.5700  -0.1702   0.5278   3.0868
##
## Coefficients:
##              Estimate Std. Error z value Pr(>|z|)
## (Intercept)   5.138e+01  2.262e+02  0.227  0.820287
## bundle_position -1.252e+00  1.231e-01 -10.166 < 2e-16 ***
## water_offered   5.128e+00  2.336e-01  21.956 < 2e-16 ***
## juice_offered   1.762e+01  8.097e-01  21.764 < 2e-16 ***
## trial          2.847e-03  7.645e-04   3.724  0.000196 ***
## date          -3.466e-03  1.286e-02  -0.270  0.787475
## ---
```

```

## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
## Null deviance: 3258.3  on 2424  degrees of freedom
## Residual deviance: 1833.9  on 2419  degrees of freedom
## (1059 observations deleted due to missingness)
## AIC: 1845.9
##
## Number of Fisher Scoring iterations: 6
#test for side bias with an exact binomial test
binom.test(c(nrow(task_data %>%
              .[c(bundle_position != fractal_choice)]),
            nrow(task_data %>%
              .[c(bundle_position == fractal_choice)])))

##
## Exact binomial test
##
## data:  c(nrow(task_data %>% .[c(bundle_position != fractal_choice)]),      nrow(task_data %>% .[c(bun
## number of successes = 1388, number of trials = 2425, p-value =
## 1.082e-12
## alternative hypothesis: true probability of success is not equal to 0.5
## 95 percent confidence interval:
##  0.5523965 0.5921707
## sample estimates:
## probability of success
## 0.5723711
#generate a model of likelihood to choice for the fractal dependent on it's position,
#value and associated water
model <- glm(data = dplyr::filter(task_data, block_no == max(block_no)),
             fractal_choice ~ bundle_position + water_offered + as.factor(juice_offered) + trial + date,
             family = "binomial")

#summarise the parameters
summary(model)

##
## Call:
## glm(formula = fractal_choice ~ bundle_position + water_offered +
##      as.factor(juice_offered) + trial + date, family = "binomial",
##      data = dplyr::filter(task_data, block_no == max(block_no)))
##
## Deviance Residuals:
##      Min       1Q   Median       3Q      Max
## -3.11432  -0.23474  -0.02929   0.26912   2.36860
##
## Coefficients: (1 not defined because of singularities)
##              Estimate Std. Error z value Pr(>|z|)
## (Intercept)    -9.328333   1.652040  -5.647 1.64e-08 ***
## bundle_position -1.293595   0.549182  -2.355  0.01850 *
## water_offered    8.861292   1.527091   5.803 6.52e-09 ***
## as.factor(juice_offered)0.32  0.609132   0.602603   1.011  0.31210

```

```
## as.factor(juice_offered)0.44  7.985815    1.351538    5.909 3.45e-09 ***
## trial                        0.008568    0.003174    2.699 0.00695 **
## date                        NA          NA          NA      NA
```

```
## ---
```

```
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
##
```

```
## (Dispersion parameter for binomial family taken to be 1)
```

```
##
```

```
##      Null deviance: 279.536  on 201  degrees of freedom
```

```
## Residual deviance:  98.112  on 196  degrees of freedom
```

```
##      (148 observations deleted due to missingness)
```

```
## AIC: 110.11
```

```
##
```

```
## Number of Fisher Scoring iterations: 7
```

```
#test for side bias with an exact binomial test
```

```
binom.test(c(nrow(task_data %>%
              .[c(bundle_position != fractal_choice & block_no == max(block_no))]),
            nrow(task_data %>%
              .[c(bundle_position == fractal_choice & block_no == max(block_no))])))
```

```
##
```

```
## Exact binomial test
```

```
##
```

```
## data:  c(nrow(task_data %>% .[c(bundle_position != fractal_choice &      block_no == max(block_no))])
```

```
## number of successes = 112, number of trials = 202, p-value =
```

```
## 0.1393
```

```
## alternative hypothesis: true probability of success is not equal to 0.5
```

```
## 95 percent confidence interval:
```

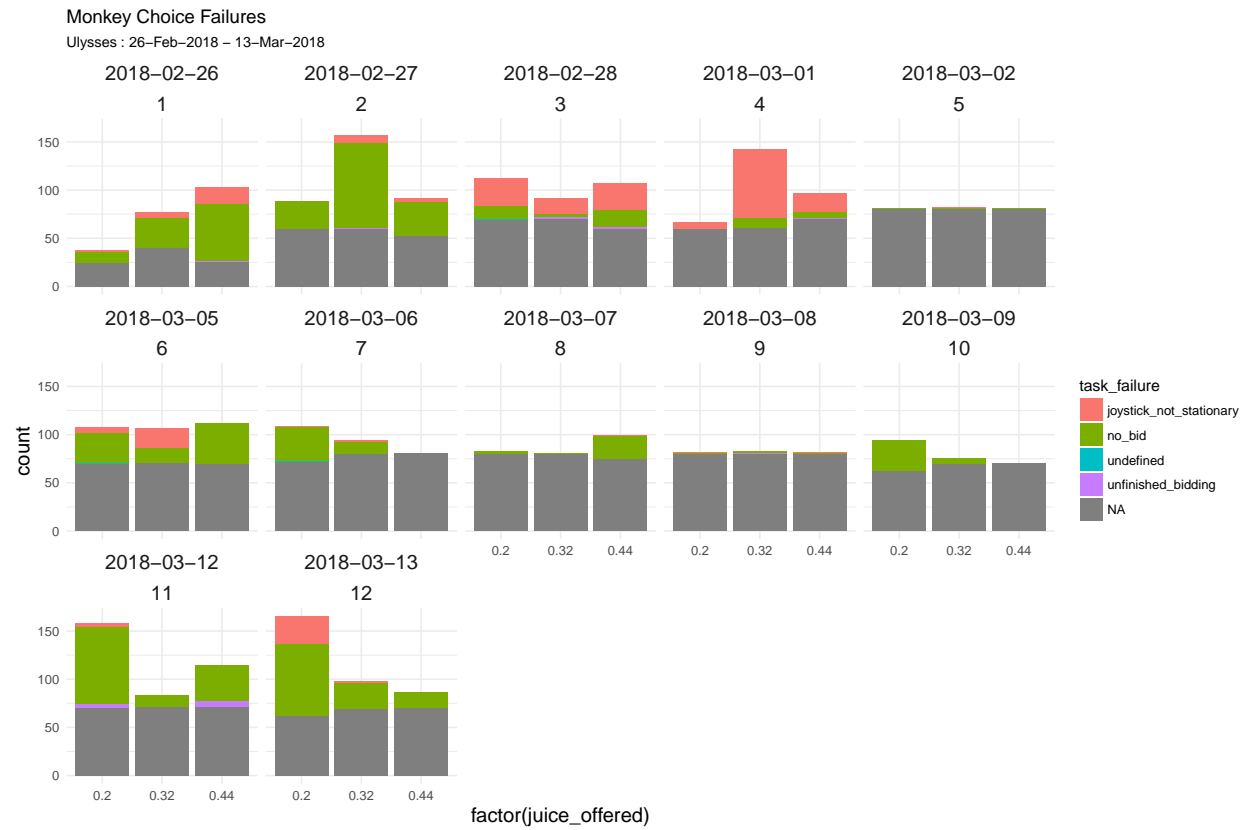
```
##  0.4830698 0.6242192
```

```
## sample estimates:
```

```
## probability of success
```

```
##          0.5544554
```

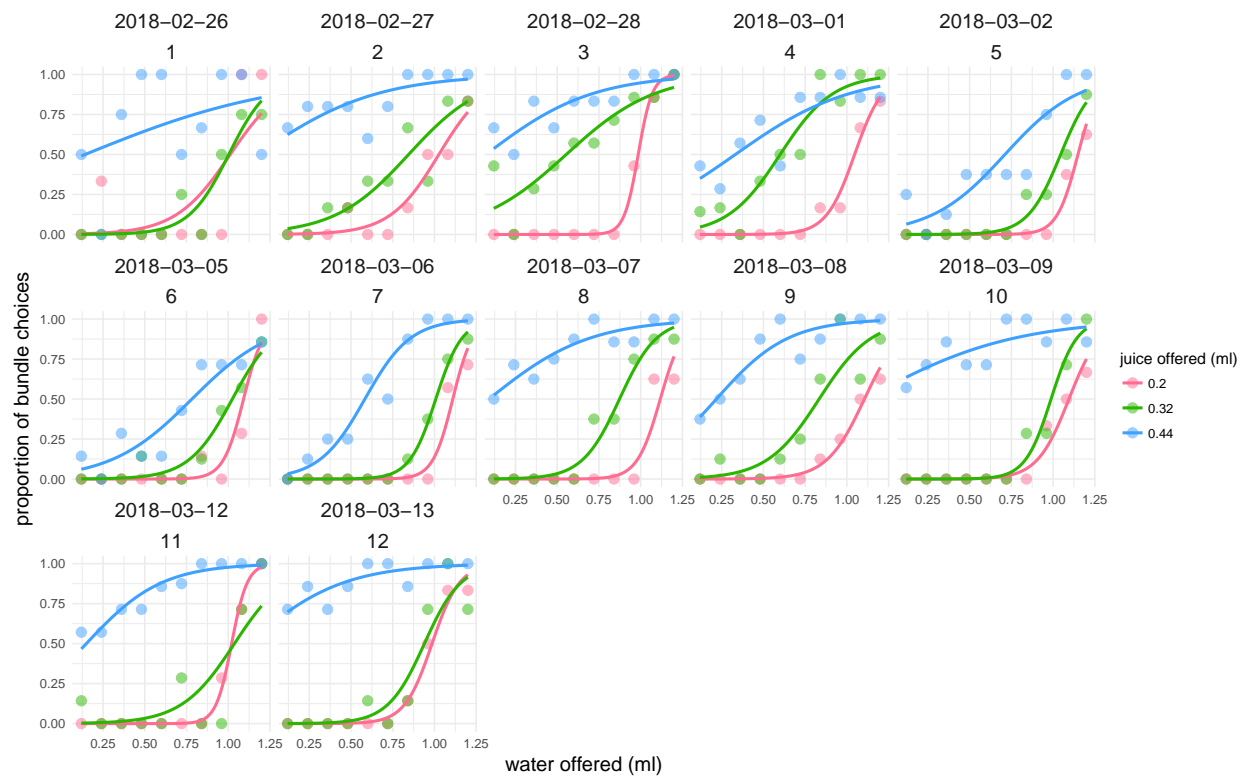
```
p3
```



p4

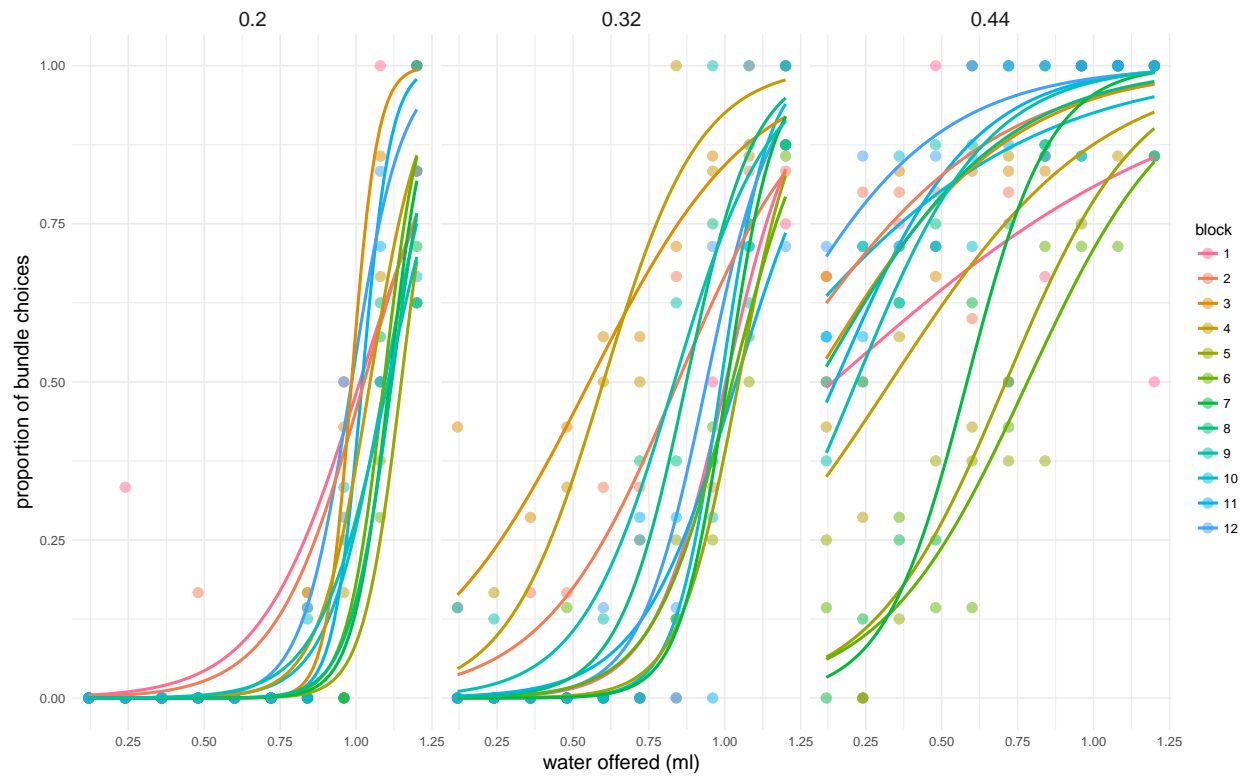
Monkey Bundle Choice Binoimial Curves

Ulysses : 26-Feb-2018 – 13-Mar-2018



p5

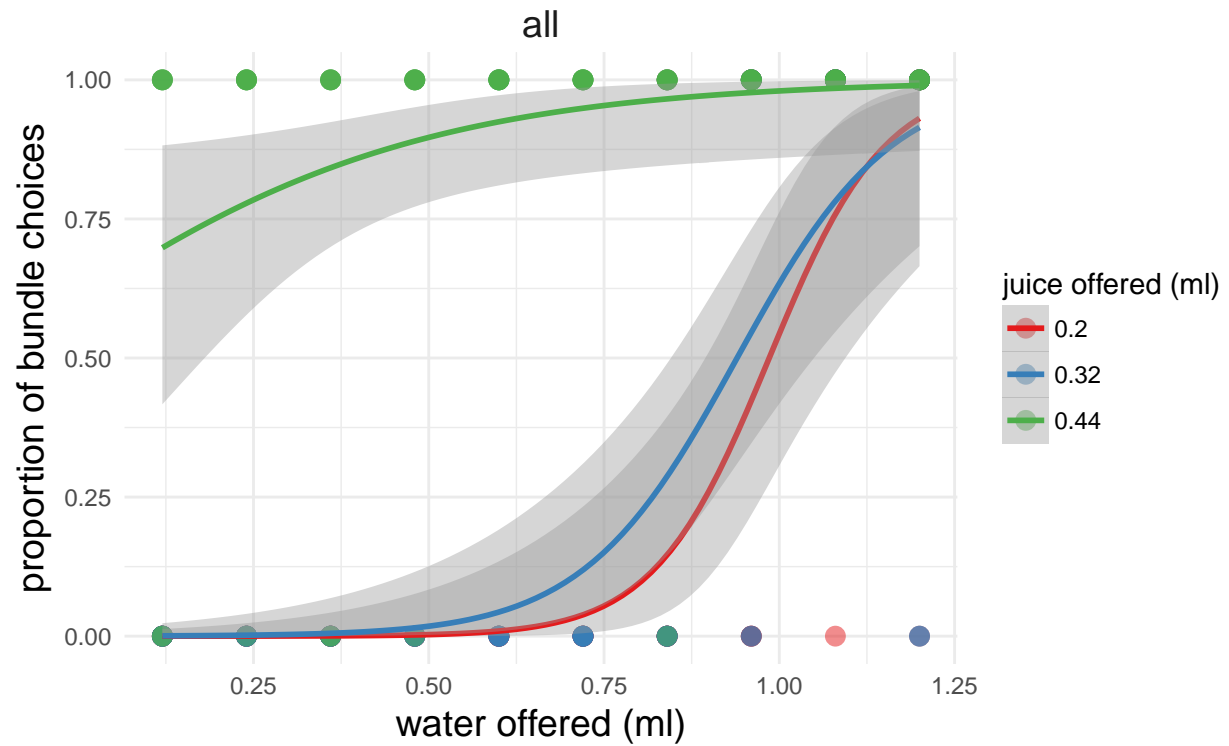
Monkey Bundle Choice Binoimial Curves
 Ulysses : 26-Feb-2018 – 13-Mar-2018



p6

Today's Monkey Bundle Choice Binoimial Curves

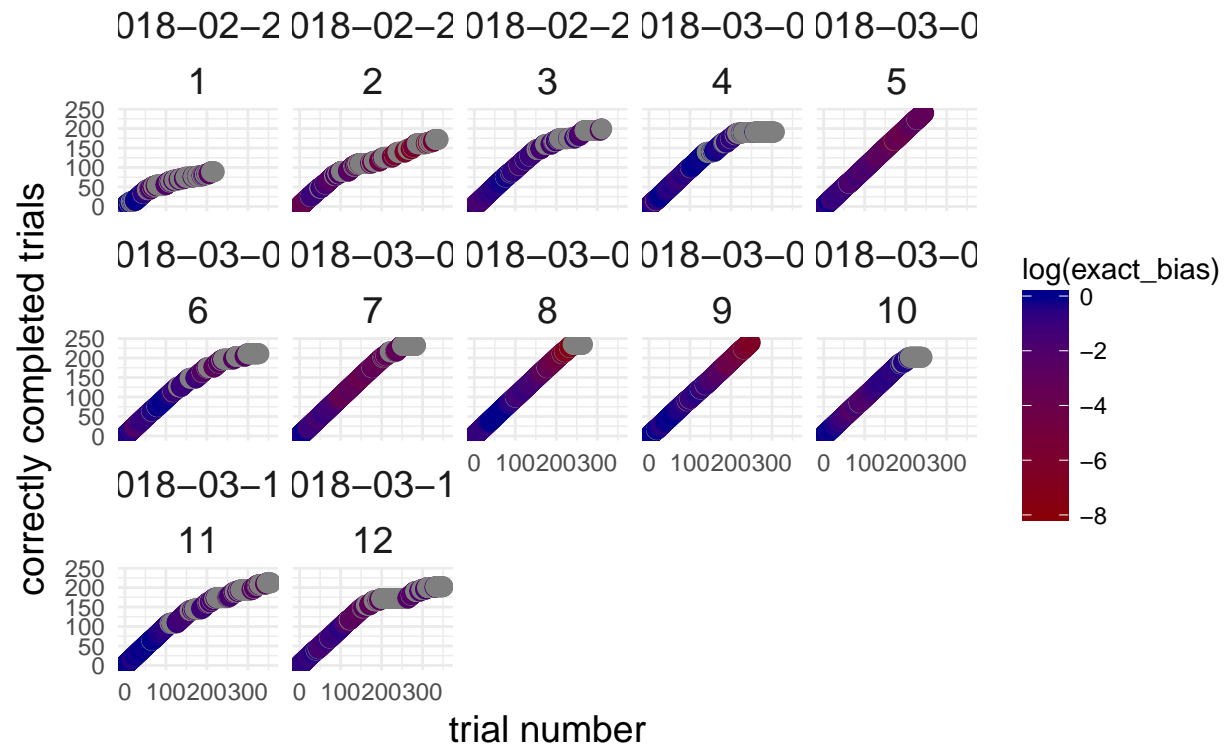
Ulysses : 13-Mar-2018



p7

Monkey Trial Progression and Bias

Ulysses : 26-Feb-2018 – 13-Mar-2018



p8

Monkey Trial Progression and Bias

Ulysses : 26-Feb-2018 – 13-Mar-2018

