joss\_code

2025-07-22

library(outstandR)  
  
data("AC\_IPD\_binY\_contX")  
data("BC\_ALD\_binY\_contX")  
  
# individual-level data  
head(AC\_IPD\_binY\_contX)

## id PF\_cont\_1 PF\_cont\_2 EM\_cont\_1 EM\_cont\_2 trt y true\_eta  
## 1 1 0.0826453 0.71645068 0.66422255 -0.09202652 A 0 -1.58891404  
## 2 2 0.6957433 0.38608723 0.79875530 0.74880584 C 1 0.14986776  
## 3 3 0.6516889 0.50572444 0.39944706 -0.07230380 A 0 -1.43868552  
## 4 4 0.2165975 0.35783123 0.25957984 -0.55405590 A 0 -2.09172428  
## 5 5 0.2605580 -0.05826527 -0.10696235 0.33762456 A 0 -2.13936317  
## 6 6 0.1110818 0.64041589 0.04867791 0.34980415 C 1 -0.07910151

# aggregate-level data  
BC\_ALD\_binY\_contX

## # A tibble: 16 × 4  
## variable statistic value trt   
## <chr> <chr> <dbl> <chr>  
## 1 EM\_cont\_1 mean 0.651 <NA>   
## 2 EM\_cont\_1 sd 0.391 <NA>   
## 3 EM\_cont\_2 mean 0.592 <NA>   
## 4 EM\_cont\_2 sd 0.416 <NA>   
## 5 PF\_cont\_1 mean 0.653 <NA>   
## 6 PF\_cont\_1 sd 0.371 <NA>   
## 7 PF\_cont\_2 mean 0.583 <NA>   
## 8 PF\_cont\_2 sd 0.437 <NA>   
## 9 y mean 0.615 C   
## 10 y sd 0.490 C   
## 11 y sum 40 C   
## 12 y mean 0.274 B   
## 13 y sd 0.448 B   
## 14 y sum 37 B   
## 15 <NA> N 65 C   
## 16 <NA> N 135 B

lin\_form <- as.formula("y ~ PF\_cont\_1 + PF\_cont\_2 + trt + trt:EM\_cont\_1 + trt:EM\_cont\_2")  
  
outstandR\_maic <-  
 outstandR(AC\_IPD\_binY\_contX, BC\_ALD\_binY\_contX,  
 strategy = strategy\_maic(  
 formula = lin\_form,  
 family = binomial(link = "logit")))  
  
str(outstandR\_maic)

## List of 2  
## $ contrasts:List of 3  
## ..$ means :List of 3  
## .. ..$ AB: num 0.612  
## .. ..$ AC: num -0.832  
## .. ..$ BC: num -1.44  
## ..$ variances:List of 3  
## .. ..$ AB: num 0.235  
## .. ..$ AC: num 0.133  
## .. ..$ BC: num 0.102  
## ..$ CI :List of 3  
## .. ..$ AB: num [1:2] -0.339 1.562  
## .. ..$ AC: num [1:2] -1.547 -0.118  
## .. ..$ BC: num [1:2] -2.071 -0.817  
## $ absolute :List of 2  
## ..$ means :List of 2  
## .. ..$ A: Named num 0.244  
## .. .. ..- attr(\*, "names")= chr "mean\_A"  
## .. ..$ C: Named num 0.424  
## .. .. ..- attr(\*, "names")= chr "mean\_C"  
## ..$ variances:List of 2  
## .. ..$ A: Named num 0.00189  
## .. .. ..- attr(\*, "names")= chr "mean\_A"  
## .. ..$ C: Named num 0.0052  
## .. .. ..- attr(\*, "names")= chr "mean\_C"  
## - attr(\*, "CI")= num 0.95  
## - attr(\*, "ref\_trt")= chr "C"  
## - attr(\*, "scale")= chr "log\_odds"  
## - attr(\*, "model")= chr "binomial"  
## - attr(\*, "class")= chr [1:2] "outstandR" "list"

print(outstandR\_maic)

## Object of class 'outstandR'   
## Model: binomial   
## Scale: log\_odds   
## Common treatment: C   
## Individual patient data study: AC   
## Aggregate level data study: BC   
## Confidence interval level: 0.95   
##   
## Contrasts:  
##   
## # A tibble: 3 × 5  
## Treatments Estimate Std.Error lower.0.95 upper.0.95  
## <chr> <dbl> <dbl> <dbl> <dbl>  
## 1 AB 0.612 0.235 -0.339 1.56   
## 2 AC -0.832 0.133 -1.55 -0.118  
## 3 BC -1.44 0.102 -2.07 -0.817  
##   
## Absolute:  
##   
## # A tibble: 2 × 5  
## Treatments Estimate Std.Error lower.0.95 upper.0.95  
## <chr> <dbl> <dbl> <lgl> <lgl>   
## 1 A 0.244 0.00189 NA NA   
## 2 C 0.424 0.00520 NA NA

outstandR\_stc <-  
 outstandR(AC\_IPD\_binY\_contX, BC\_ALD\_binY\_contX,  
 strategy = strategy\_stc(  
 formula = lin\_form,  
 family = binomial(link = "logit")))  
  
outstandR\_gcomp\_ml <-  
 outstandR(AC\_IPD\_binY\_contX, BC\_ALD\_binY\_contX,  
 strategy = strategy\_gcomp\_ml(  
 formula = lin\_form,  
 family = binomial(link = "logit")))  
  
outstandR\_gcomp\_stan <-  
 outstandR(AC\_IPD\_binY\_contX, BC\_ALD\_binY\_contX,  
 strategy = strategy\_gcomp\_stan(  
 formula = lin\_form,  
 family = binomial(link = "logit")))

##   
## SAMPLING FOR MODEL 'bernoulli' NOW (CHAIN 1).  
## Chain 1:   
## Chain 1: Gradient evaluation took 6.9e-05 seconds  
## Chain 1: 1000 transitions using 10 leapfrog steps per transition would take 0.69 seconds.  
## Chain 1: Adjust your expectations accordingly!  
## Chain 1:   
## Chain 1:   
## Chain 1: Iteration: 1 / 2000 [ 0%] (Warmup)  
## Chain 1: Iteration: 200 / 2000 [ 10%] (Warmup)  
## Chain 1: Iteration: 400 / 2000 [ 20%] (Warmup)  
## Chain 1: Iteration: 600 / 2000 [ 30%] (Warmup)  
## Chain 1: Iteration: 800 / 2000 [ 40%] (Warmup)  
## Chain 1: Iteration: 1000 / 2000 [ 50%] (Warmup)  
## Chain 1: Iteration: 1001 / 2000 [ 50%] (Sampling)  
## Chain 1: Iteration: 1200 / 2000 [ 60%] (Sampling)  
## Chain 1: Iteration: 1400 / 2000 [ 70%] (Sampling)  
## Chain 1: Iteration: 1600 / 2000 [ 80%] (Sampling)  
## Chain 1: Iteration: 1800 / 2000 [ 90%] (Sampling)  
## Chain 1: Iteration: 2000 / 2000 [100%] (Sampling)  
## Chain 1:   
## Chain 1: Elapsed Time: 0.203 seconds (Warm-up)  
## Chain 1: 0.196 seconds (Sampling)  
## Chain 1: 0.399 seconds (Total)  
## Chain 1:   
##   
## SAMPLING FOR MODEL 'bernoulli' NOW (CHAIN 2).  
## Chain 2:   
## Chain 2: Gradient evaluation took 1.6e-05 seconds  
## Chain 2: 1000 transitions using 10 leapfrog steps per transition would take 0.16 seconds.  
## Chain 2: Adjust your expectations accordingly!  
## Chain 2:   
## Chain 2:   
## Chain 2: Iteration: 1 / 2000 [ 0%] (Warmup)  
## Chain 2: Iteration: 200 / 2000 [ 10%] (Warmup)  
## Chain 2: Iteration: 400 / 2000 [ 20%] (Warmup)  
## Chain 2: Iteration: 600 / 2000 [ 30%] (Warmup)  
## Chain 2: Iteration: 800 / 2000 [ 40%] (Warmup)  
## Chain 2: Iteration: 1000 / 2000 [ 50%] (Warmup)  
## Chain 2: Iteration: 1001 / 2000 [ 50%] (Sampling)  
## Chain 2: Iteration: 1200 / 2000 [ 60%] (Sampling)  
## Chain 2: Iteration: 1400 / 2000 [ 70%] (Sampling)  
## Chain 2: Iteration: 1600 / 2000 [ 80%] (Sampling)  
## Chain 2: Iteration: 1800 / 2000 [ 90%] (Sampling)  
## Chain 2: Iteration: 2000 / 2000 [100%] (Sampling)  
## Chain 2:   
## Chain 2: Elapsed Time: 0.214 seconds (Warm-up)  
## Chain 2: 0.199 seconds (Sampling)  
## Chain 2: 0.413 seconds (Total)  
## Chain 2:   
##   
## SAMPLING FOR MODEL 'bernoulli' NOW (CHAIN 3).  
## Chain 3:   
## Chain 3: Gradient evaluation took 1.7e-05 seconds  
## Chain 3: 1000 transitions using 10 leapfrog steps per transition would take 0.17 seconds.  
## Chain 3: Adjust your expectations accordingly!  
## Chain 3:   
## Chain 3:   
## Chain 3: Iteration: 1 / 2000 [ 0%] (Warmup)  
## Chain 3: Iteration: 200 / 2000 [ 10%] (Warmup)  
## Chain 3: Iteration: 400 / 2000 [ 20%] (Warmup)  
## Chain 3: Iteration: 600 / 2000 [ 30%] (Warmup)  
## Chain 3: Iteration: 800 / 2000 [ 40%] (Warmup)  
## Chain 3: Iteration: 1000 / 2000 [ 50%] (Warmup)  
## Chain 3: Iteration: 1001 / 2000 [ 50%] (Sampling)  
## Chain 3: Iteration: 1200 / 2000 [ 60%] (Sampling)  
## Chain 3: Iteration: 1400 / 2000 [ 70%] (Sampling)  
## Chain 3: Iteration: 1600 / 2000 [ 80%] (Sampling)  
## Chain 3: Iteration: 1800 / 2000 [ 90%] (Sampling)  
## Chain 3: Iteration: 2000 / 2000 [100%] (Sampling)  
## Chain 3:   
## Chain 3: Elapsed Time: 0.202 seconds (Warm-up)  
## Chain 3: 0.201 seconds (Sampling)  
## Chain 3: 0.403 seconds (Total)  
## Chain 3:   
##   
## SAMPLING FOR MODEL 'bernoulli' NOW (CHAIN 4).  
## Chain 4:   
## Chain 4: Gradient evaluation took 1.6e-05 seconds  
## Chain 4: 1000 transitions using 10 leapfrog steps per transition would take 0.16 seconds.  
## Chain 4: Adjust your expectations accordingly!  
## Chain 4:   
## Chain 4:   
## Chain 4: Iteration: 1 / 2000 [ 0%] (Warmup)  
## Chain 4: Iteration: 200 / 2000 [ 10%] (Warmup)  
## Chain 4: Iteration: 400 / 2000 [ 20%] (Warmup)  
## Chain 4: Iteration: 600 / 2000 [ 30%] (Warmup)  
## Chain 4: Iteration: 800 / 2000 [ 40%] (Warmup)  
## Chain 4: Iteration: 1000 / 2000 [ 50%] (Warmup)  
## Chain 4: Iteration: 1001 / 2000 [ 50%] (Sampling)  
## Chain 4: Iteration: 1200 / 2000 [ 60%] (Sampling)  
## Chain 4: Iteration: 1400 / 2000 [ 70%] (Sampling)  
## Chain 4: Iteration: 1600 / 2000 [ 80%] (Sampling)  
## Chain 4: Iteration: 1800 / 2000 [ 90%] (Sampling)  
## Chain 4: Iteration: 2000 / 2000 [100%] (Sampling)  
## Chain 4:   
## Chain 4: Elapsed Time: 0.197 seconds (Warm-up)  
## Chain 4: 0.205 seconds (Sampling)  
## Chain 4: 0.402 seconds (Total)  
## Chain 4:

outstandR\_mim <-  
 outstandR(AC\_IPD\_binY\_contX, BC\_ALD\_binY\_contX,  
 strategy = strategy\_mim(  
 formula = lin\_form,  
 family = binomial(link = "logit")))

##   
## SAMPLING FOR MODEL 'bernoulli' NOW (CHAIN 1).  
## Chain 1:   
## Chain 1: Gradient evaluation took 2.9e-05 seconds  
## Chain 1: 1000 transitions using 10 leapfrog steps per transition would take 0.29 seconds.  
## Chain 1: Adjust your expectations accordingly!  
## Chain 1:   
## Chain 1:   
## Chain 1: Iteration: 1 / 2000 [ 0%] (Warmup)  
## Chain 1: Iteration: 200 / 2000 [ 10%] (Warmup)  
## Chain 1: Iteration: 400 / 2000 [ 20%] (Warmup)  
## Chain 1: Iteration: 600 / 2000 [ 30%] (Warmup)  
## Chain 1: Iteration: 800 / 2000 [ 40%] (Warmup)  
## Chain 1: Iteration: 1000 / 2000 [ 50%] (Warmup)  
## Chain 1: Iteration: 1001 / 2000 [ 50%] (Sampling)  
## Chain 1: Iteration: 1200 / 2000 [ 60%] (Sampling)  
## Chain 1: Iteration: 1400 / 2000 [ 70%] (Sampling)  
## Chain 1: Iteration: 1600 / 2000 [ 80%] (Sampling)  
## Chain 1: Iteration: 1800 / 2000 [ 90%] (Sampling)  
## Chain 1: Iteration: 2000 / 2000 [100%] (Sampling)  
## Chain 1:   
## Chain 1: Elapsed Time: 0.204 seconds (Warm-up)  
## Chain 1: 0.199 seconds (Sampling)  
## Chain 1: 0.403 seconds (Total)  
## Chain 1:   
##   
## SAMPLING FOR MODEL 'bernoulli' NOW (CHAIN 2).  
## Chain 2:   
## Chain 2: Gradient evaluation took 1.6e-05 seconds  
## Chain 2: 1000 transitions using 10 leapfrog steps per transition would take 0.16 seconds.  
## Chain 2: Adjust your expectations accordingly!  
## Chain 2:   
## Chain 2:   
## Chain 2: Iteration: 1 / 2000 [ 0%] (Warmup)  
## Chain 2: Iteration: 200 / 2000 [ 10%] (Warmup)  
## Chain 2: Iteration: 400 / 2000 [ 20%] (Warmup)  
## Chain 2: Iteration: 600 / 2000 [ 30%] (Warmup)  
## Chain 2: Iteration: 800 / 2000 [ 40%] (Warmup)  
## Chain 2: Iteration: 1000 / 2000 [ 50%] (Warmup)  
## Chain 2: Iteration: 1001 / 2000 [ 50%] (Sampling)  
## Chain 2: Iteration: 1200 / 2000 [ 60%] (Sampling)  
## Chain 2: Iteration: 1400 / 2000 [ 70%] (Sampling)  
## Chain 2: Iteration: 1600 / 2000 [ 80%] (Sampling)  
## Chain 2: Iteration: 1800 / 2000 [ 90%] (Sampling)  
## Chain 2: Iteration: 2000 / 2000 [100%] (Sampling)  
## Chain 2:   
## Chain 2: Elapsed Time: 0.217 seconds (Warm-up)  
## Chain 2: 0.198 seconds (Sampling)  
## Chain 2: 0.415 seconds (Total)  
## Chain 2:   
##   
## SAMPLING FOR MODEL 'bernoulli' NOW (CHAIN 3).  
## Chain 3:   
## Chain 3: Gradient evaluation took 1.6e-05 seconds  
## Chain 3: 1000 transitions using 10 leapfrog steps per transition would take 0.16 seconds.  
## Chain 3: Adjust your expectations accordingly!  
## Chain 3:   
## Chain 3:   
## Chain 3: Iteration: 1 / 2000 [ 0%] (Warmup)  
## Chain 3: Iteration: 200 / 2000 [ 10%] (Warmup)  
## Chain 3: Iteration: 400 / 2000 [ 20%] (Warmup)  
## Chain 3: Iteration: 600 / 2000 [ 30%] (Warmup)  
## Chain 3: Iteration: 800 / 2000 [ 40%] (Warmup)  
## Chain 3: Iteration: 1000 / 2000 [ 50%] (Warmup)  
## Chain 3: Iteration: 1001 / 2000 [ 50%] (Sampling)  
## Chain 3: Iteration: 1200 / 2000 [ 60%] (Sampling)  
## Chain 3: Iteration: 1400 / 2000 [ 70%] (Sampling)  
## Chain 3: Iteration: 1600 / 2000 [ 80%] (Sampling)  
## Chain 3: Iteration: 1800 / 2000 [ 90%] (Sampling)  
## Chain 3: Iteration: 2000 / 2000 [100%] (Sampling)  
## Chain 3:   
## Chain 3: Elapsed Time: 0.2 seconds (Warm-up)  
## Chain 3: 0.2 seconds (Sampling)  
## Chain 3: 0.4 seconds (Total)  
## Chain 3:   
##   
## SAMPLING FOR MODEL 'bernoulli' NOW (CHAIN 4).  
## Chain 4:   
## Chain 4: Gradient evaluation took 1.6e-05 seconds  
## Chain 4: 1000 transitions using 10 leapfrog steps per transition would take 0.16 seconds.  
## Chain 4: Adjust your expectations accordingly!  
## Chain 4:   
## Chain 4:   
## Chain 4: Iteration: 1 / 2000 [ 0%] (Warmup)  
## Chain 4: Iteration: 200 / 2000 [ 10%] (Warmup)  
## Chain 4: Iteration: 400 / 2000 [ 20%] (Warmup)  
## Chain 4: Iteration: 600 / 2000 [ 30%] (Warmup)  
## Chain 4: Iteration: 800 / 2000 [ 40%] (Warmup)  
## Chain 4: Iteration: 1000 / 2000 [ 50%] (Warmup)  
## Chain 4: Iteration: 1001 / 2000 [ 50%] (Sampling)  
## Chain 4: Iteration: 1200 / 2000 [ 60%] (Sampling)  
## Chain 4: Iteration: 1400 / 2000 [ 70%] (Sampling)  
## Chain 4: Iteration: 1600 / 2000 [ 80%] (Sampling)  
## Chain 4: Iteration: 1800 / 2000 [ 90%] (Sampling)  
## Chain 4: Iteration: 2000 / 2000 [100%] (Sampling)  
## Chain 4:   
## Chain 4: Elapsed Time: 0.197 seconds (Warm-up)  
## Chain 4: 0.206 seconds (Sampling)  
## Chain 4: 0.403 seconds (Total)  
## Chain 4: