

Counterfactual Testing Associational Model

```
# clear the working space
rm(list = ls())

library(here)
library(stats) # need this to calculate Mahalanobis Distance
library(parallel) # parallelize
library(dplyr)
library(FNN)
library(cluster)
library(ggplot2)
library(rpart)
library(caret)
```

Counterfactual Data Input

```
# we need the renaming function for cleaning
melor_2015 <- read.csv(here("data", "clustered_M15_CF_data2.csv"))
```

Counterfactual

Importing trained models

```
# Read the .rds models
base_reg <- readRDS(here("associational XGBOOST", "damage_fit_reg_base.rds"))
trunc_reg <- readRDS(here("associational XGBOOST", "trunc_damage_fit_reg.rds"))
clas_model <- readRDS(here("associational XGBOOST", "ass_XGBOOST_class.rds"))
```

Counterfactual predictions

```
source(here("R", "ass_hurdle_function.R"))

# setting threshold for classification step
threshold = 0.30

preds <- ass_hurdle_function(df = melor_2015, ass_clas_model = clas_model,
  ass_base_model = base_reg, ass_trunc_model = trunc_reg ,threshold = threshold)
```

```
# append the results to the counterfactual dataset
melor_2015 <- melor_2015 %>%
  mutate(damage_preds = preds)
```

Counterfactual results

```
# convert the Cluster column to factor
melor_2015$Cluster <- as.factor(melor_2015$Cluster)
```

```
# extract cluster_levels
cluster_levels <- levels(melor_2015$Cluster)
```

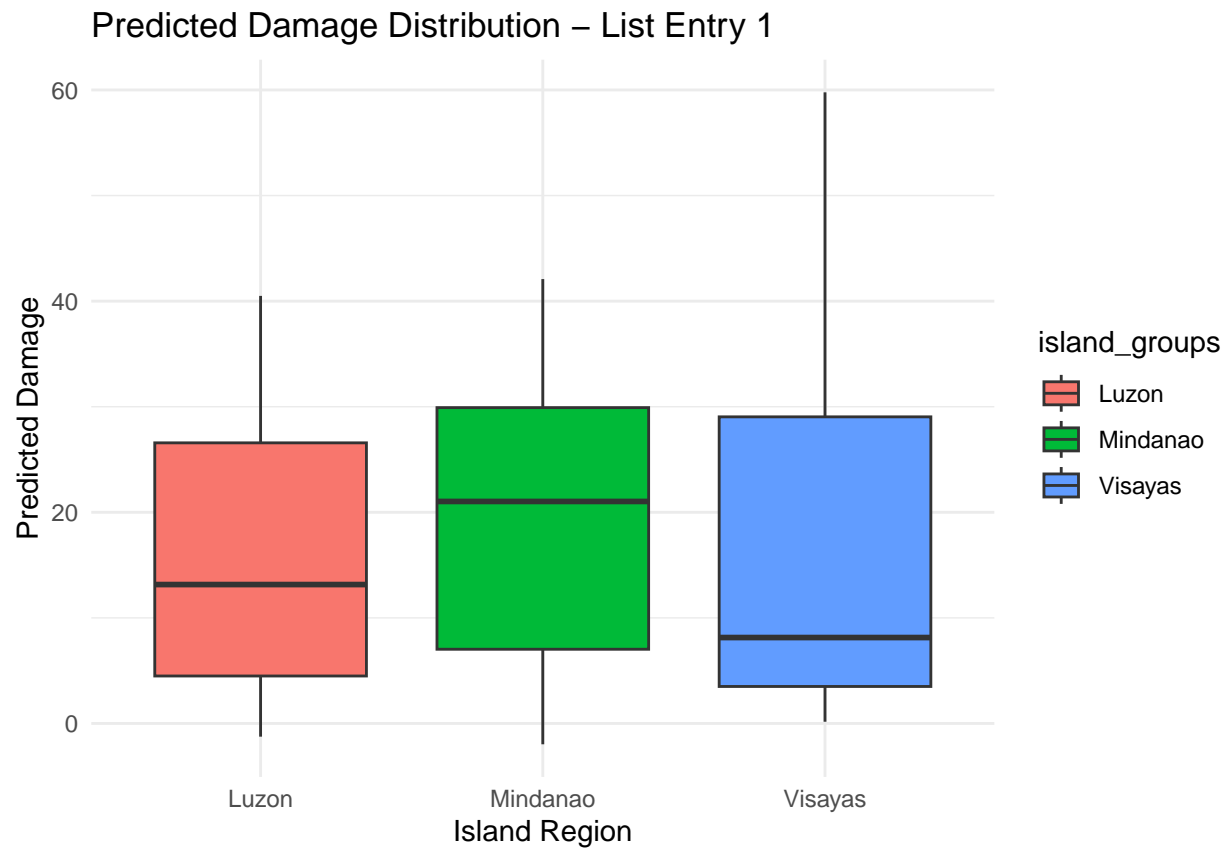
```
# Source function: counterfactual_results
source(here("R", "counterfactual_results.R"))
```

```
cf_results <- counterfactual_results(cf_data = melor_2015,
                                   cluster_levels = cluster_levels)
```

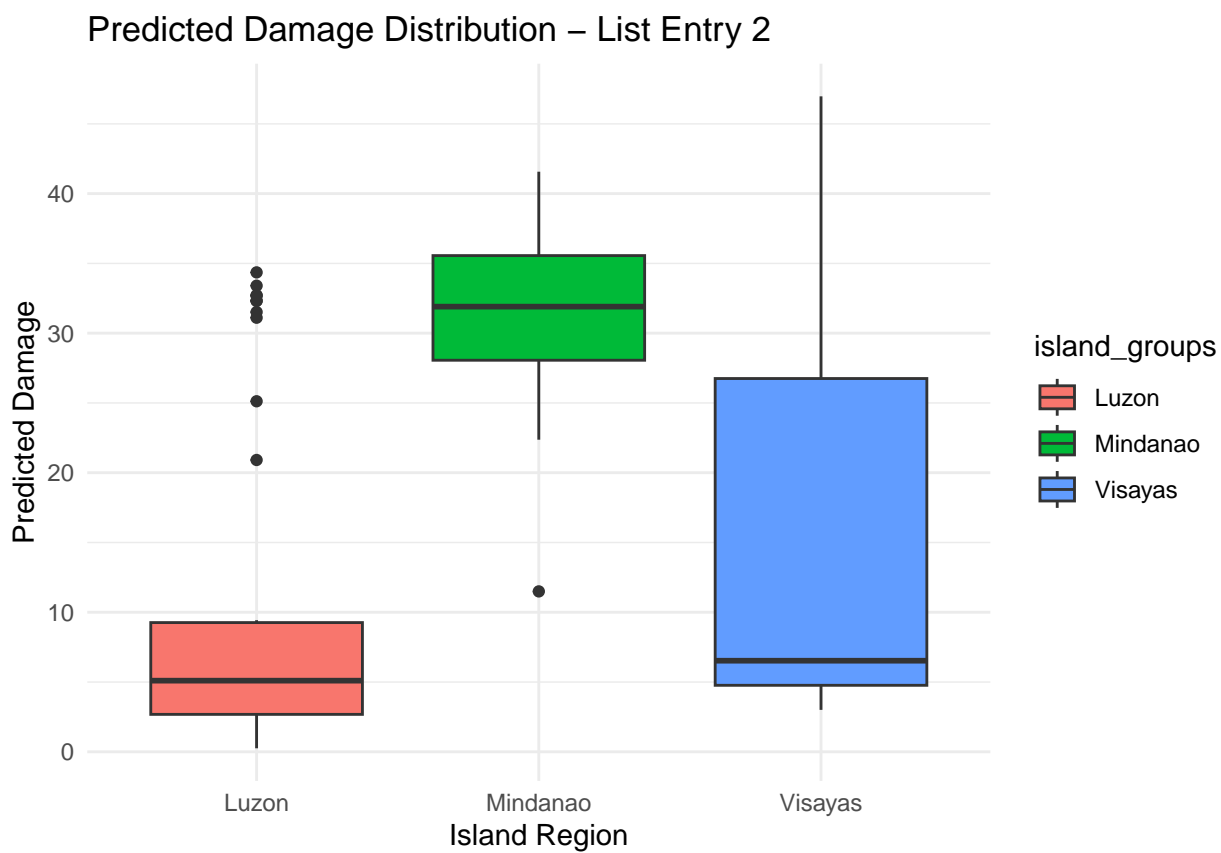
```
## currently evaluating cluster: 1currently evaluating cluster: 2currently evaluating cluster: 3current
```

```
# Check the list to confirm plots are stored
print(cf_results$plots)
```

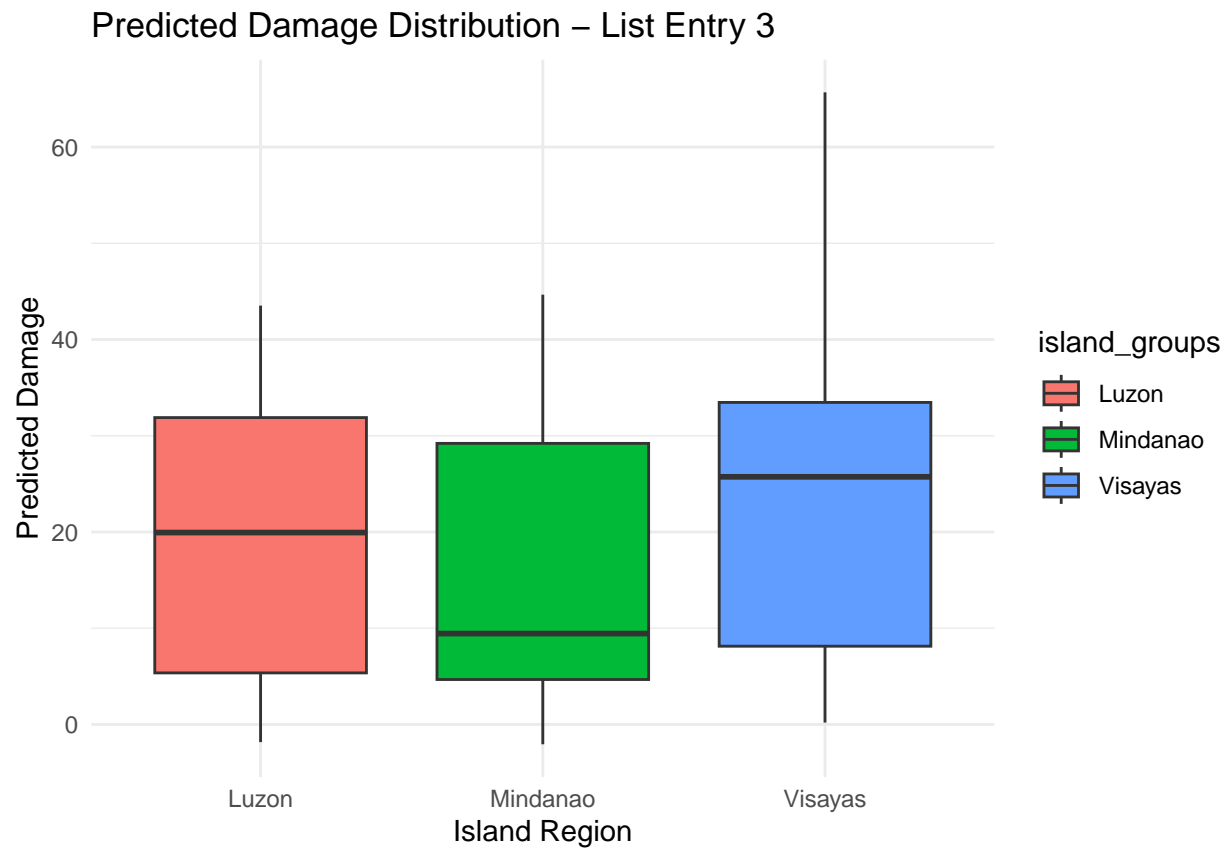
```
## [[1]]
```



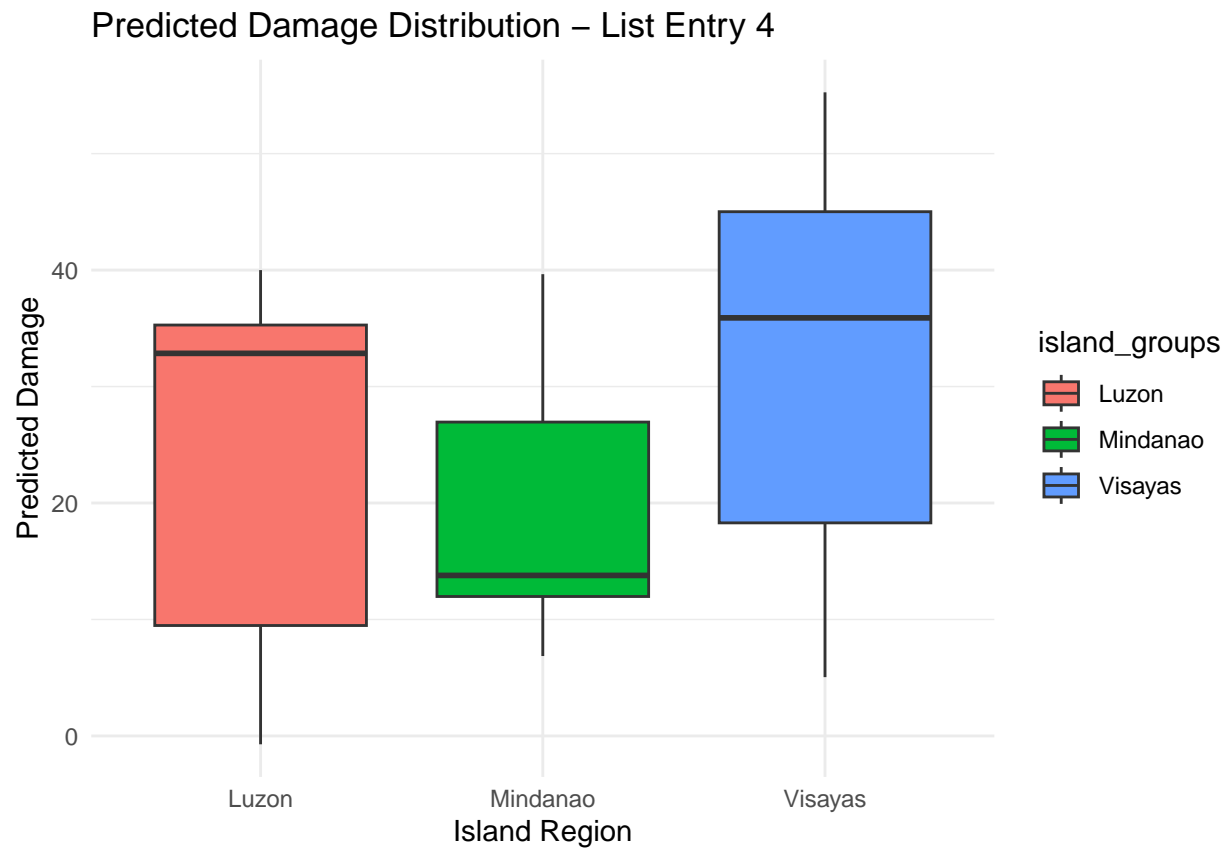
```
##  
## [[2]]
```



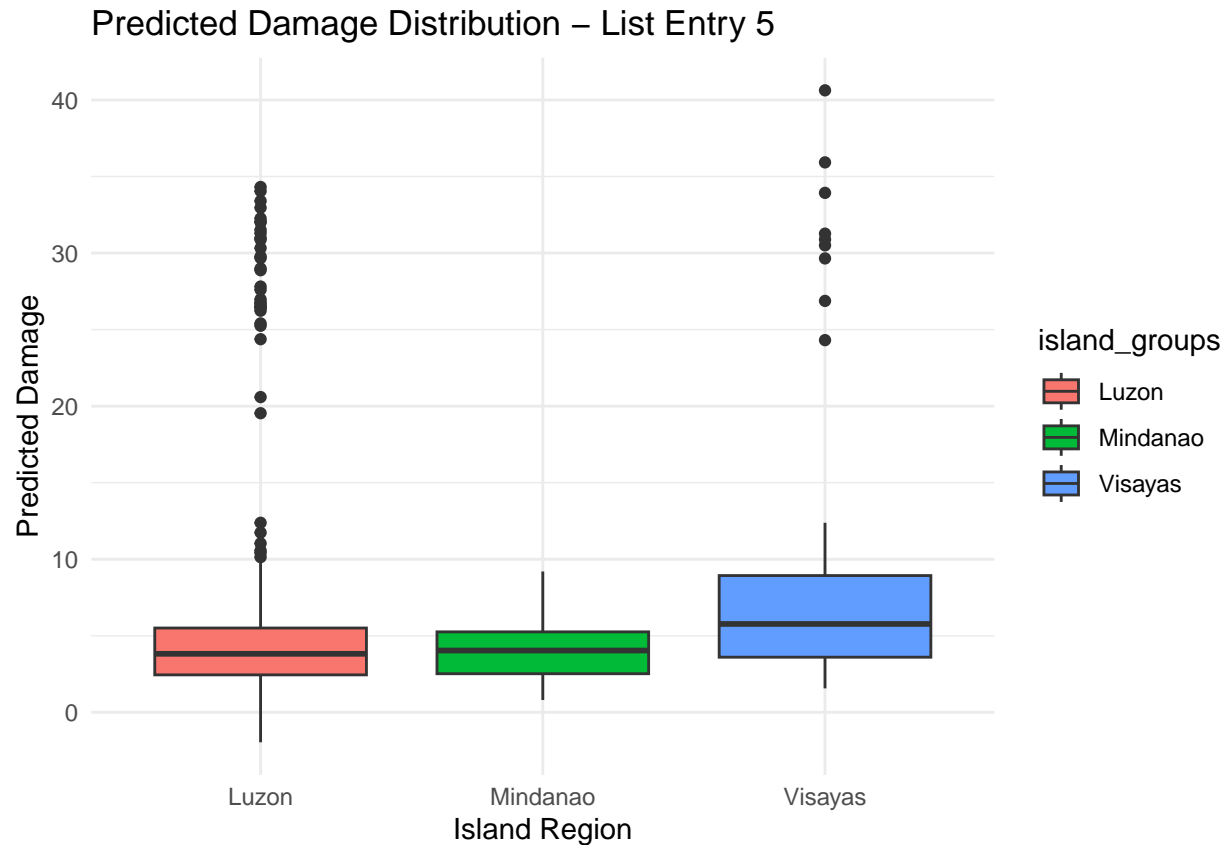
```
##  
## [[3]]
```



```
##  
## [[4]]
```



```
##  
## [[5]]
```



```
print(cf_results$median)
```

```
## [[1]]
## # A tibble: 3 x 2
##   island_groups median_damage
##   <chr>          <dbl>
## 1 Luzon          13.2
## 2 Mindanao       21.0
## 3 Visayas        8.14
##
## [[2]]
## # A tibble: 3 x 2
##   island_groups median_damage
##   <chr>          <dbl>
## 1 Luzon          5.10
## 2 Mindanao       31.9
## 3 Visayas        6.53
##
## [[3]]
## # A tibble: 3 x 2
##   island_groups median_damage
##   <chr>          <dbl>
## 1 Luzon          19.9
## 2 Mindanao        9.45
## 3 Visayas       25.7
```

```
##
## [[4]]
## # A tibble: 3 x 2
##   island_groups median_damage
##   <chr>           <dbl>
## 1 Luzon           32.8
## 2 Mindanao        13.8
## 3 Visayas         35.9
##
## [[5]]
## # A tibble: 3 x 2
##   island_groups median_damage
##   <chr>           <dbl>
## 1 Luzon           3.82
## 2 Mindanao        4.04
## 3 Visayas         5.77
```

```
print(cf_results$averages)
```

```
## [[1]]
## # A tibble: 3 x 2
##   island_groups mean_damage
##   <chr>           <dbl>
## 1 Luzon          15.9
## 2 Mindanao       19.4
## 3 Visayas        17.2
##
## [[2]]
## # A tibble: 3 x 2
##   island_groups mean_damage
##   <chr>           <dbl>
## 1 Luzon          10.4
## 2 Mindanao       30.5
## 3 Visayas        18.8
##
## [[3]]
## # A tibble: 3 x 2
##   island_groups mean_damage
##   <chr>           <dbl>
## 1 Luzon          18.8
## 2 Mindanao       15.4
## 3 Visayas        22.4
##
## [[4]]
## # A tibble: 3 x 2
##   island_groups mean_damage
##   <chr>           <dbl>
## 1 Luzon          23.8
## 2 Mindanao       19.3
## 3 Visayas        33.0
##
## [[5]]
## # A tibble: 3 x 2
##   island_groups mean_damage
```



```
##      <chr>                <dbl>
## 1 Luzon                   5.45
## 2 Mindanao                4.13
## 3 Visayas                 10.2
```

Output the counterfactual predictions

Saving the counterfactual predictions for mapping differences between this associational model with in QGIS.

```
# prep

CF_output <- melor_2015 %>%
  select(Mun_Code, damage_preds) %>%
  rename(ass_CF_M15 = damage_preds)

write.csv2(CF_output, file = here("associational XGBOOST", "ass_CF_M15.csv"))
```

OLD CODE