Survey on ethics regarding AI-generated art

Contents

subtitle: "Data Acquisition and Survey Methods"
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```
ans <- read.delim("answers.csv", sep = ";")
names(ans) <- c("gender", "age", "program", "a1", "a2", "a3")

ans <- ans %>%
  # rename the answer cols and transform them
  mutate(
    revenue.deserved = str_extract(a1, "[:digit:]*") %>% as.numeric(),
    is.artist = a2 %>% as.factor(),
    would.boycott = a3 %>% as.factor()
    ) %>%
  select(-a1, -a2, -a3)

# recode the factor levels of the longer answers
levels(ans$is.artist) <- c("I'm an artist", "I enjoy creating art",
                           "I created some art,\nnot passionately", "I do not create art")
# reverse the levels
ans$is.artist <- ans$is.artist %>% fct_rev()
# rearrange the factor levels of the text answers
# levels(ans$is.artist) = c(4, 3, 2, 1) # the levels for is.artist arrange themselves perfectly somehow
# levels(ans$would.boycott) = c(0, 1, 2)

# fill the single NA value in the revenue.deserved column with the median value
ans <- ans %>% mutate(across(revenue.deserved, ~replace_na(., median(., na.rm=TRUE))))
```

```r
# assigning short variable names to the questions
q1_varname <- "Percentage of generated revenue granted to trained on artist"
q2_varname <- "Respondents' relationships to creating art"
q3_varname <- "Respondents' propensity to boycott unpaid AI-generated art training"
```

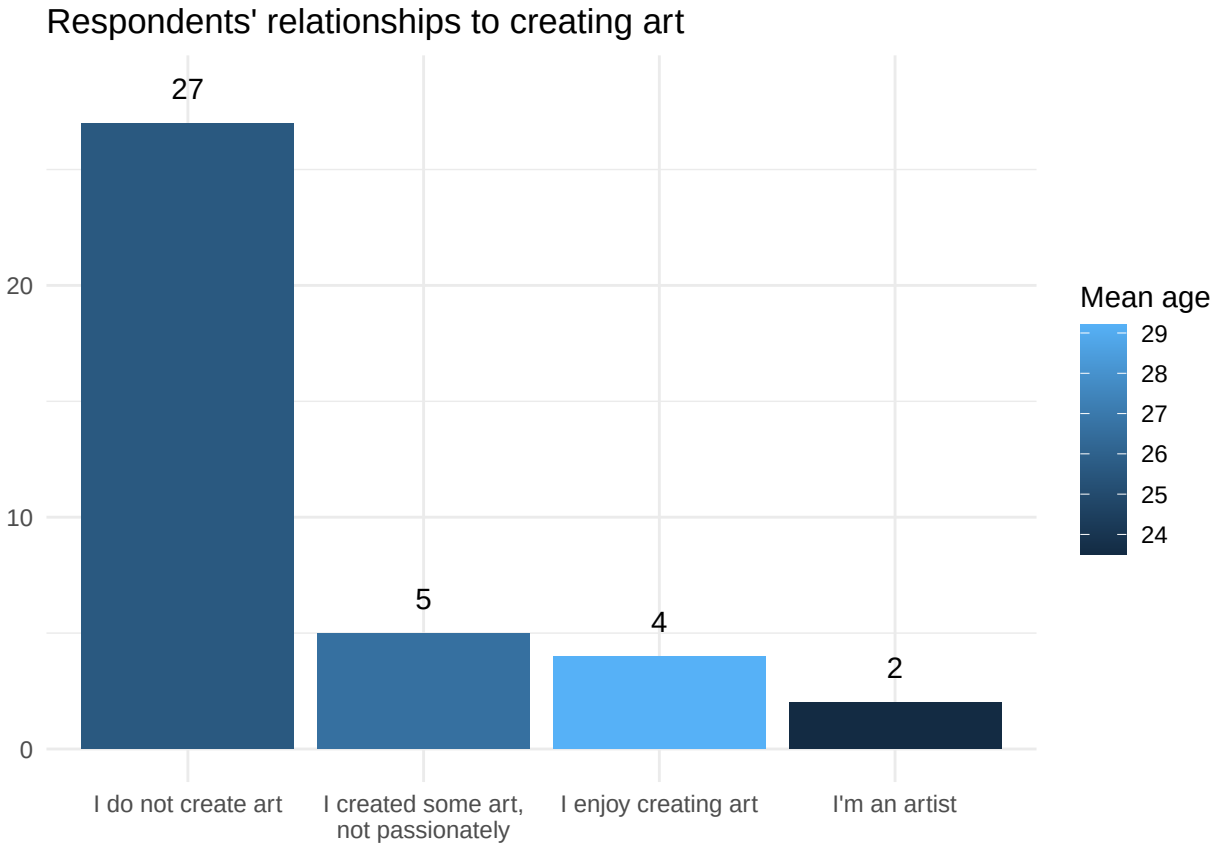
```
##   gender age                      program revenue.deserved
## 1 female  23 Data Science / MSc / TU Wien               90
## 2   male  21 Data Science / MSc / TU Wien               70
## 3 female  23 Data Science / MSc / TU Wien                0
## 4 female  24 Data Science / MSc / TU Wien               80
## 5   male  22 Data Science / MSc / TU Wien               20
## 6   male  25                 Data Science               90
##                             is.artist would.boycott
## 1                  I do not create art           Yes
## 2                  I do not create art            No
## 3                  I do not create art            No
## 4                  I do not create art           Yes
## 5 I created some art,\nnot passionately            No
## 6                  I do not create art            No
```

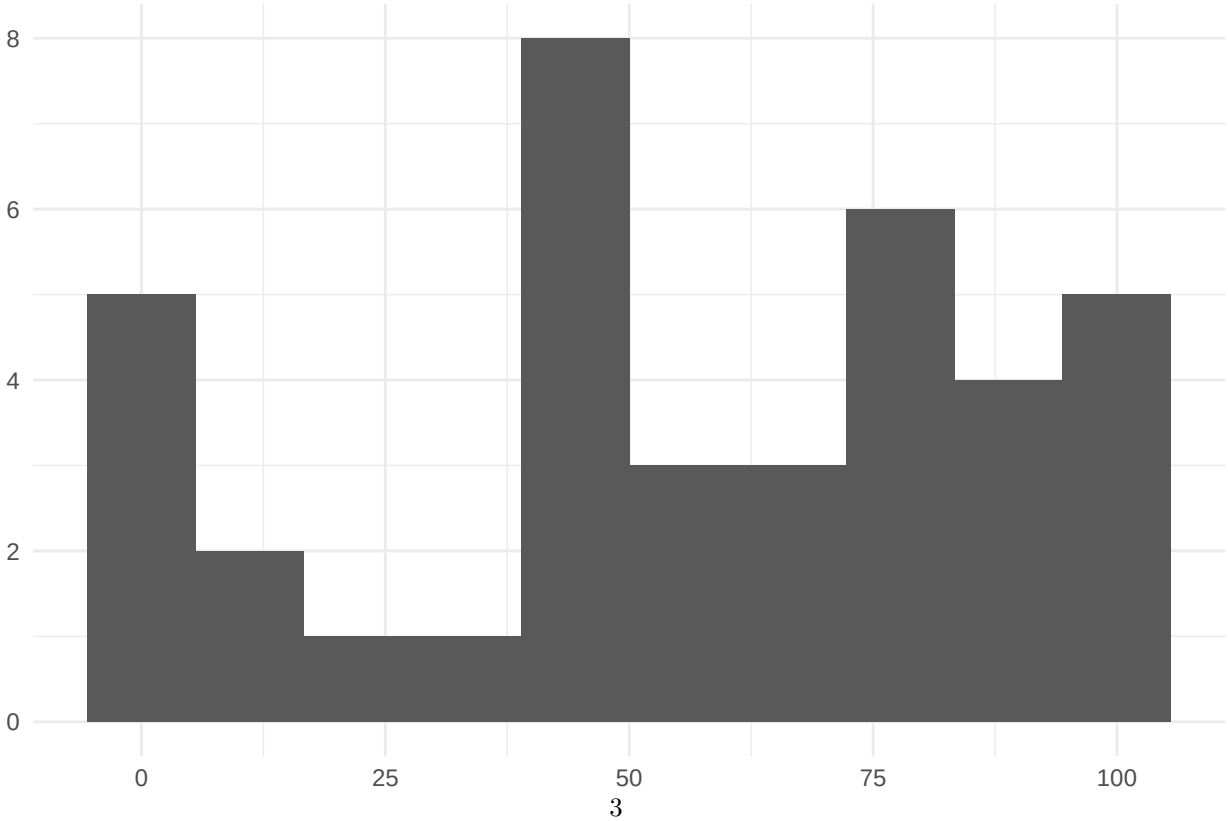
```
##     gender               age          program          revenue.deserved
##  Length:38          Min.   :21.00   Length:38          Min.   :  0.00
##  Class :character   1st Qu.:23.00   Class :character   1st Qu.: 40.00
##  Mode  :character   Median :24.00   Mode  :character   Median : 60.00
##                     Mean   :25.97                      Mean   : 56.89
##                     3rd Qu.:26.75                      3rd Qu.: 80.00
##                     Max.   :46.00                      Max.   :100.00
##                                  is.artist
##  I do not create art                  :27
##  I created some art,\nnot passionately: 5
##  I enjoy creating art                 : 4
##  I'm an artist                        : 2
##
##
##                           would.boycott
##  No                              :19
##  Only if I really like the artist: 8
##  Yes                             :11
##
##
##
```

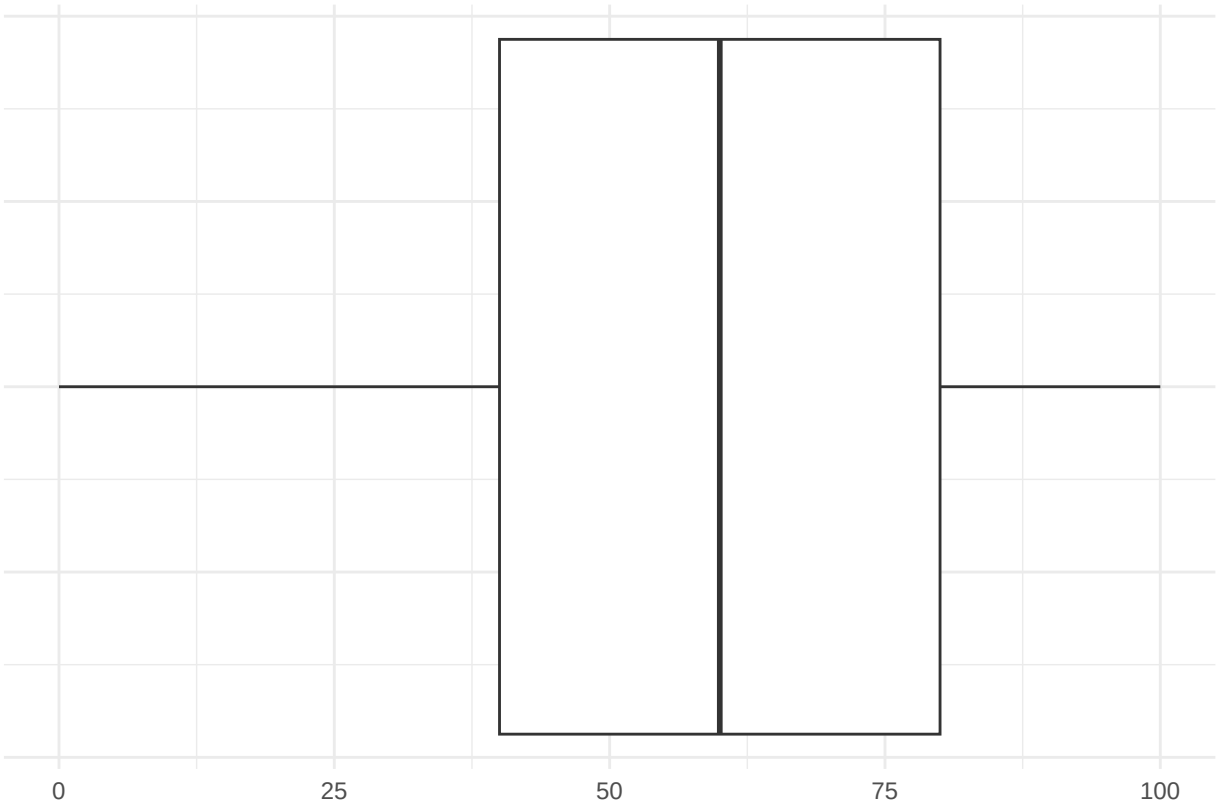
Research hypothesis 1

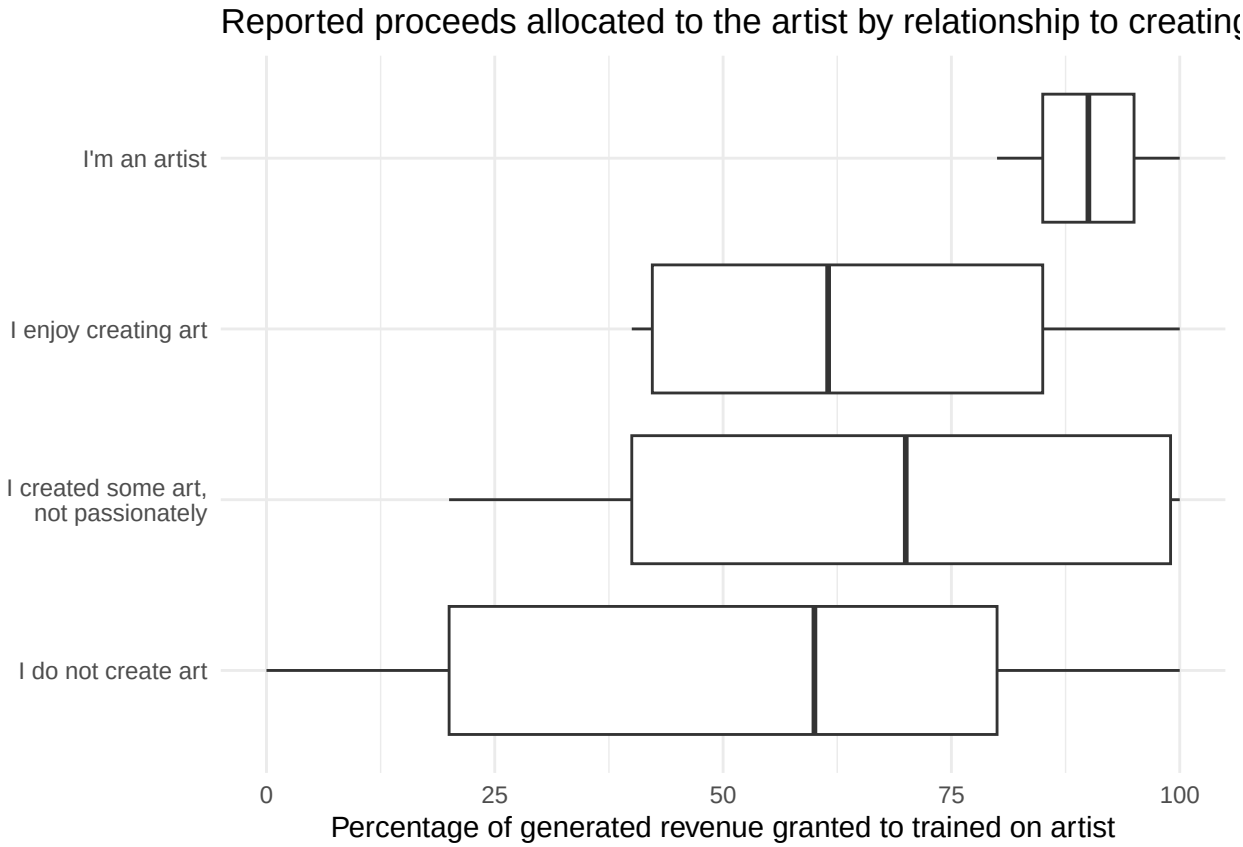
Artists/authors would credit other artists/authors to more money, if the model were trained on them, than non-artists/non-authors.

Exploring the nature of the data/responses






0
25
50
75
100
Percentage of generated revenue granted to trained on artist



Independence testing.

Hypothesis: If a generative model was trained entirely on the works of one artist, then other artists would credit a higher percentage of the proceeds of said model to the original artists

```
k <- 5
# cut the revenue.deserved values into k levels: low to high
ans$revenue.deserved.cat = split_quantile(ans$revenue.deserved, type=k)
table(ans$revenue.deserved.cat, ans$is.artist) %>%
  print() %>%
  chisq.test()
```

```
##
##     I do not create art I created some art,\nnot passionately
##   1                   7                                     1
##   2                   6                                     1
##   3                   5                                     1
##   4                   5                                     0
##   5                   4                                     2
##
##     I enjoy creating art I'm an artist
##   1                    0             0
##   2                    2             0
##   3                    0             0
##   4                    1             1
```

```
##   5                   1             1
```

```
## Warning in chisq.test(.): Chi-squared approximation may be incorrect
```

```
##
##  Pearson's Chi-squared test
##
## data:  .
## X-squared = 8.6727, df = 12, p-value = 0.7306
```

```
# what if we replicated that data with the same results?
table(ans$revenue.deserved.cat, ans$is.artist) %>%
  chisq.test(simulate.p.value = TRUE)
```

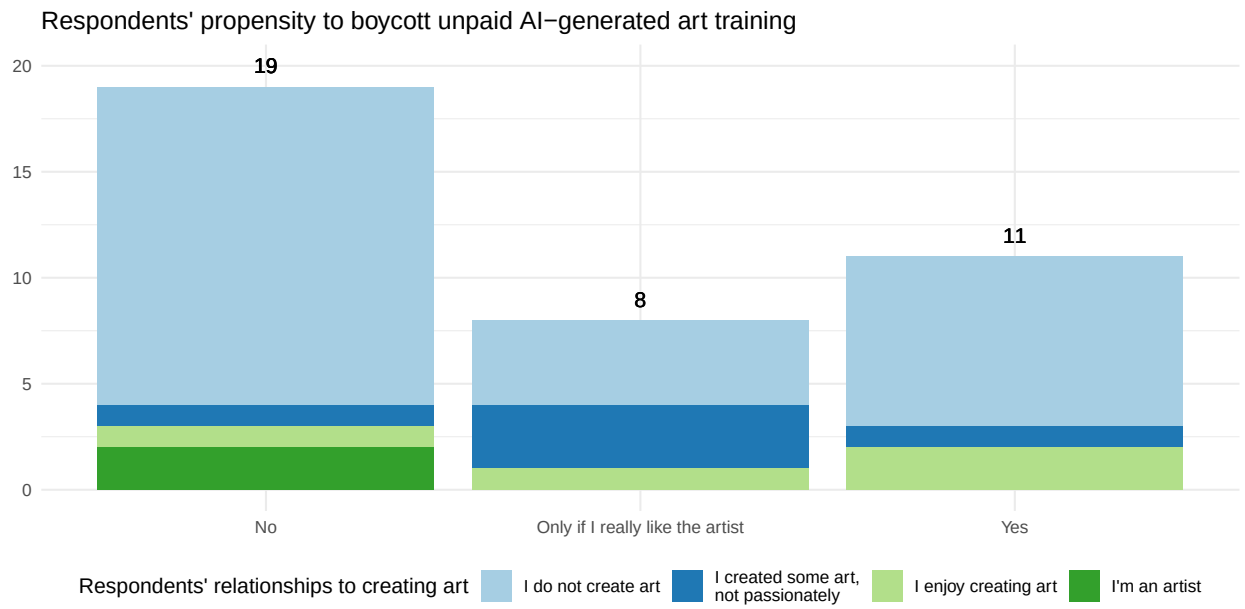
```
##
##  Pearson's Chi-squared test with simulated p-value (based on 2000
##  replicates)
##
## data:  .
## X-squared = 8.6727, df = NA, p-value = 0.8121
```

We conducted chi-squared tests to examine the independence of the percentage of revenue a respondent would grant an artist, that the generative model had been trained on and the respondent's relationship to creating art themselves. We recoded the granted.revenue variable to the quintiles. To correct for the low sample size, we run the test with replicates. The resulting p-values were ~0.7 and ~0.8, which exceed the conventional significance level of 0.05. As a result, there is insufficient evidence to reject the null hypothesis of independence, even when using replicates. A bigger pool of respondents may have yielded different results, after all, only 6 of the respondents claimed to be somewhat passionate about creating art.

Research hypothesis 2

Artists/authors are, compared to non-artists/non-authors, more inclined to boycott art that was created by a model that trained on an artist, if the artist doesn't get any money out of it

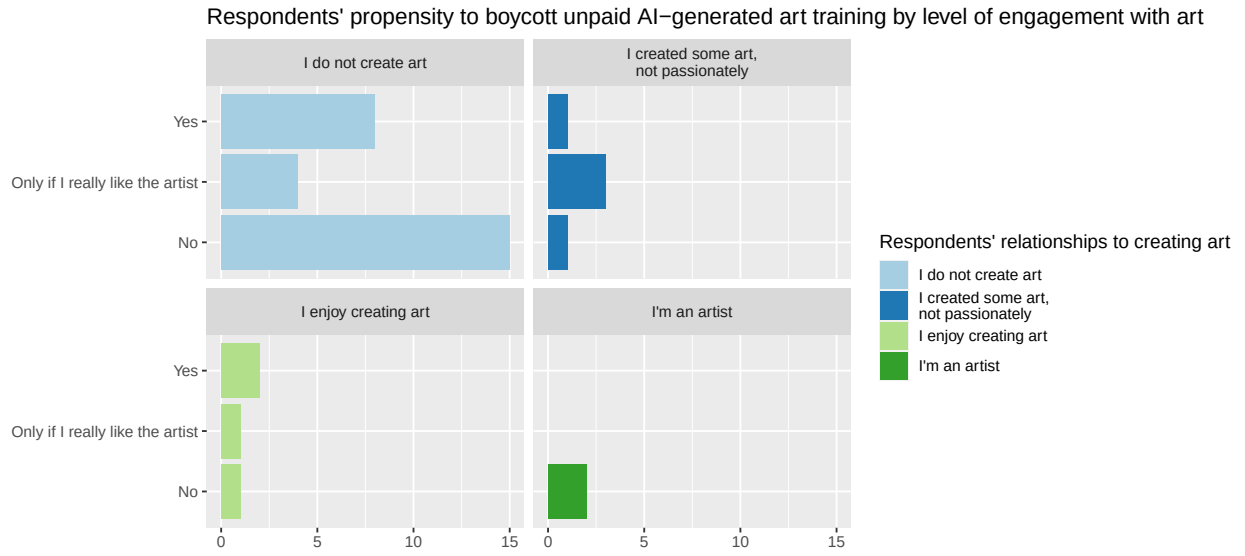
```
## `summarise()` has grouped output by 'would.boycott'. You can override using the
## `.groups` argument.
```



Turns out, exactly half of the respondents would consider boycotting a piece of AI-generated art, if the trained-on artist was not compensated for his contribution. Some of them only if they already really liked the artist.

Maybe more surprisingly, the two respondents claiming to be artists themselves answered not to be wanting to boycott such art.

```
ggplot(ans, aes(y=would.boycott, fill=is.artist)) +
  geom_bar() +
    scale_fill_brewer(palette="Paired") +
  labs(y = NULL, x=NULL,
       title=q3_varname %>% paste( "by level of engagement with art"),
       fill=q2_varname
       ) +
  facet_wrap(~ is.artist)
```



Independence testing.

Null hypothesis: If the artist the generative model was trained on were not granted any of the revenue generated by the art, other artists would be more likely to boycott that piece of art.

From looking at the above barplots, we cannot make out a clear pattern of who is more likely to boycott art visually.

```
# cut the revenue.deserved values into k levels: low to high
table(ans$would.boycott, ans$is.artist) %>%
  print() %>%
  chisq.test()
```

```
##
##                                   I do not create art
##   No                                               15
##   Only if I really like the artist                  4
##   Yes                                               8
##
##                                   I created some art,\nnot passionately
##   No                                                                   1
##   Only if I really like the artist                                     3
##   Yes                                                                  1
##
##                                   I enjoy creating art I'm an artist
##   No                                                 1              2
##   Only if I really like the artist                   1              0
##   Yes                                                2              0

## Warning in chisq.test(.): Chi-squared approximation may be incorrect

##
##  Pearson's Chi-squared test
##
## data:  .
## X-squared = 8.453, df = 6, p-value = 0.2068
```

```
# what if we replicated that data with the same results?
table(ans$would.boycott, ans$is.artist) %>%
  chisq.test(simulate.p.value = TRUE)
```

```
##
##  Pearson's Chi-squared test with simulated p-value (based on 2000
##  replicates)
##
## data:  .
## X-squared = 8.453, df = NA, p-value = 0.2194
```

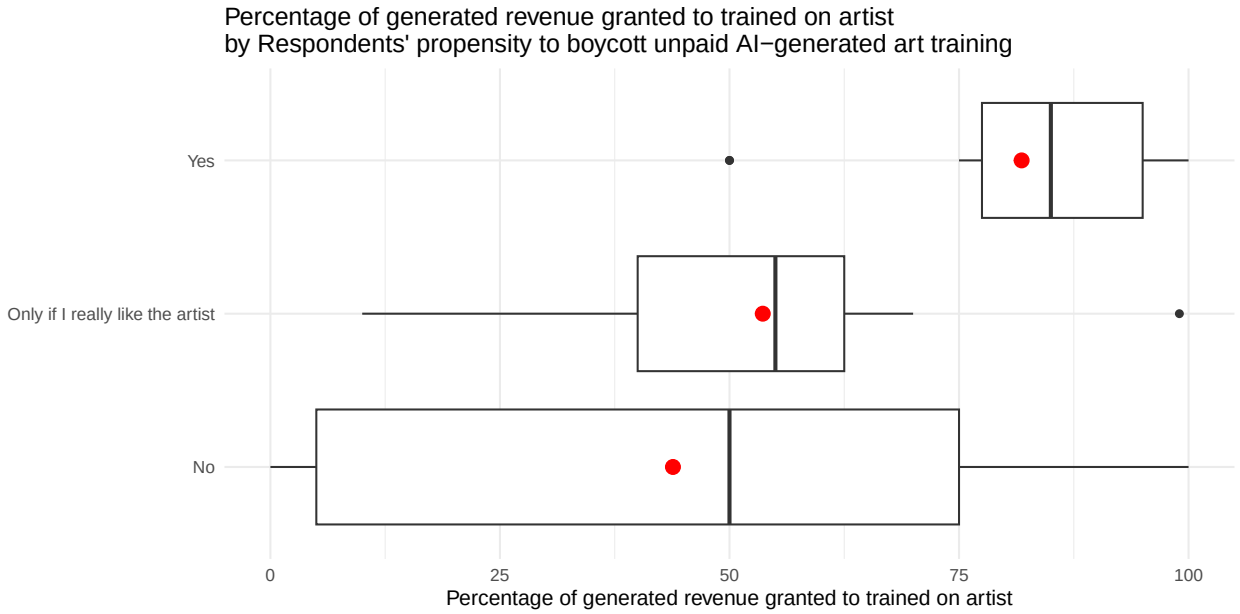
Research hypothesis 3

Hypothesis: There is no statistical connection between people who would grant artists/authors more money (question 1) and people who would boycott an AI-generated piece of art, that the trained-on artist did not make any money from, meaning that respondents, while they may agree with the ethical worries of artists regarding AI-generated art, they do not act upon those values.

Exploring the data

```
ans %>%
  ggplot(aes(x=revenue.deserved, y=would.boycott)) +
    geom_boxplot() +
    theme_minimal() +
    ylab(NULL) +
    stat_summary(fun.y=mean, geom="point", shape=20, size=5, color="red") +
    ggtitle(q1_varname %>% paste("\nby", q3_varname)) +
    xlab(q1_varname)
```

```
## Warning: The ‘fun.y‘ argument of ‘stat_summary()‘ is deprecated as of ggplot2 3.3.0.
## i Please use the ‘fun‘ argument instead.
## This warning is displayed once every 8 hours.
## Call ‘lifecycle::last_lifecycle_warnings()‘ to see where this warning was
## generated.
```



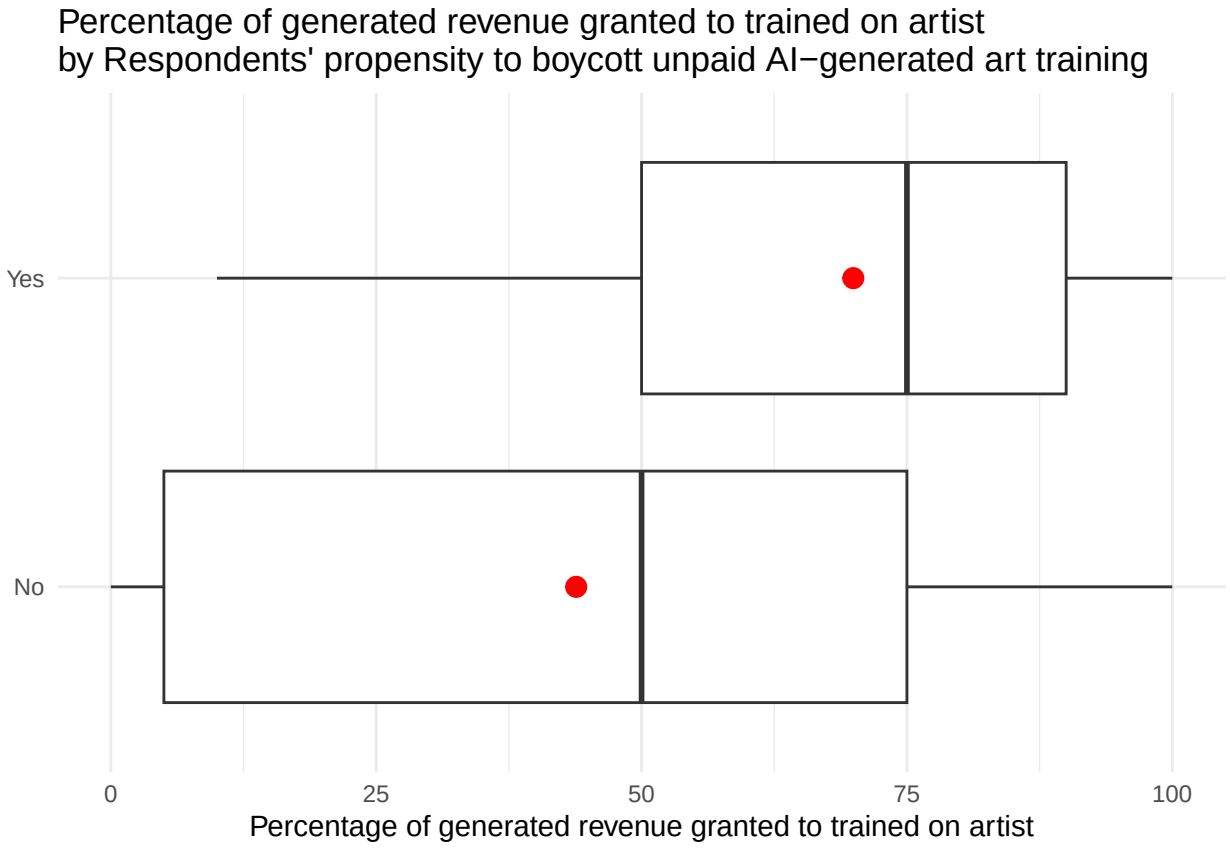
Looking at the parallel boxplots, we can make out a difference in distribution for revenue percentages credited to trained-on artists for the boycotters and non-boycotters. The median and mean (red dots) values for the respondents willing to boycott such art are higher than for the ones not willing to. The respondents who would not boycott art created from unpaid training is all over, while the respondents who would boycott it, appear to be credit the artists more of the generated revenue.

A different perspective on the answer options would be, that perhaps the difference in distributions is only there, because of the separation of “Yes” answers. Regardless, when joining the answers, “Yes” and “Only if I really like the artist”, the overall distribution of the answers in regards of granted revenue looks not so similar.

```
ans$would.boycott.2 <- ans$would.boycott %>% fct_lump_min(16, other_level="Yes")

ans %>%
ggplot(aes(x=revenue.deserved, y=would.boycott.2)) +
```

```
  geom_boxplot() +
  theme_minimal() +
  stat_summary(fun.y=mean, geom="point", shape=20, size=5, color="red") +
  ylab(NULL) +
  ggtitle(q1_varname %>% paste("\nby", q3_varname)) +
  xlab(q1_varname)
```



The differences in mean are as follows:

```
## # A tibble: 3 x 2
##   would.boycott                     `Mean credited revenue`
##   <fct>                                               <dbl>
## 1 No                                                   43.8
## 2 Only if I really like the artist                     53.6
## 3 Yes                                                  81.8
```

```
## # A tibble: 2 x 2
##   would.boycott.2 `Mean credited revenue`
##   <fct>                             <dbl>
## 1 No                                 43.8
## 2 Yes                                69.9
```

Testing the differences in means

Null-Hypothesis: There is no statistical difference in the means of the percentage of revenue credited to artists as comparing the groupy of respondents willing and not willing to boycott art, whose generative-model was trained on said artists.

Starting out by testing the difference in means of the two groups:
Respondents that would boycott and those that would not.

The response values are not normally distributed, therefore we use a non-parametric test, namely a Wilcoxon test.

```
wilcox.test(
  filter(ans, would.boycott.2=="Yes")$revenue.deserved,
  filter(ans, would.boycott.2=="No")$revenue.deserved,
  paired = TRUE,
  alternative = "two.sided",
  exact = FALSE
  )
```

```
##
##  Wilcoxon signed rank test with continuity correction
##
## data:  filter(ans, would.boycott.2 == "Yes")$revenue.deserved and filter(ans, would.boycott.2 == "No
## V = 135, p-value = 0.03268
## alternative hypothesis: true location shift is not equal to 0
```

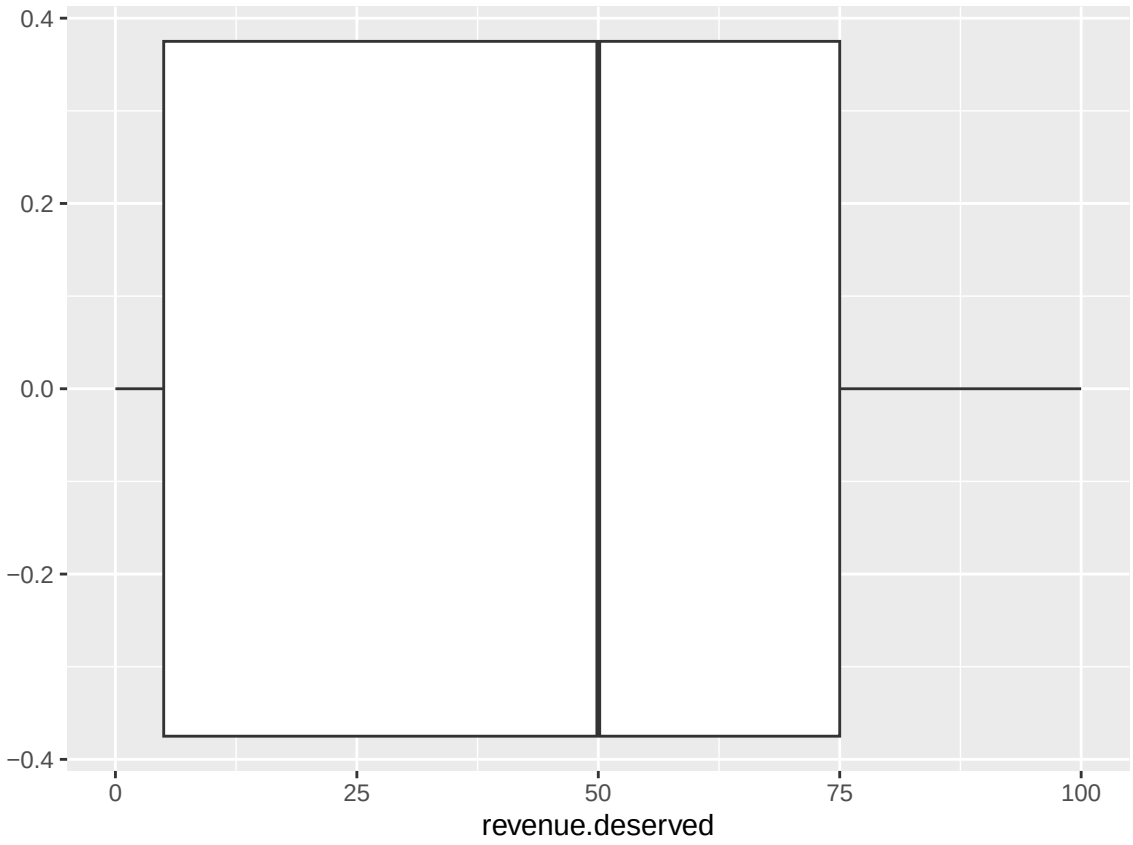
The test yields a p-value of <0.033, which lets us reject the Null-Hypothesis that there is no difference in means of granted revenue percentage between the groups.
We can therefore confirm that for our sample, the respondents that are inclined to boycott a piece of art, if the original, trained-on artist did not get compensated, would also grant them a higher portion of the revenue that would have been generated from said piece of art.

Exploring the non-boycotting group further

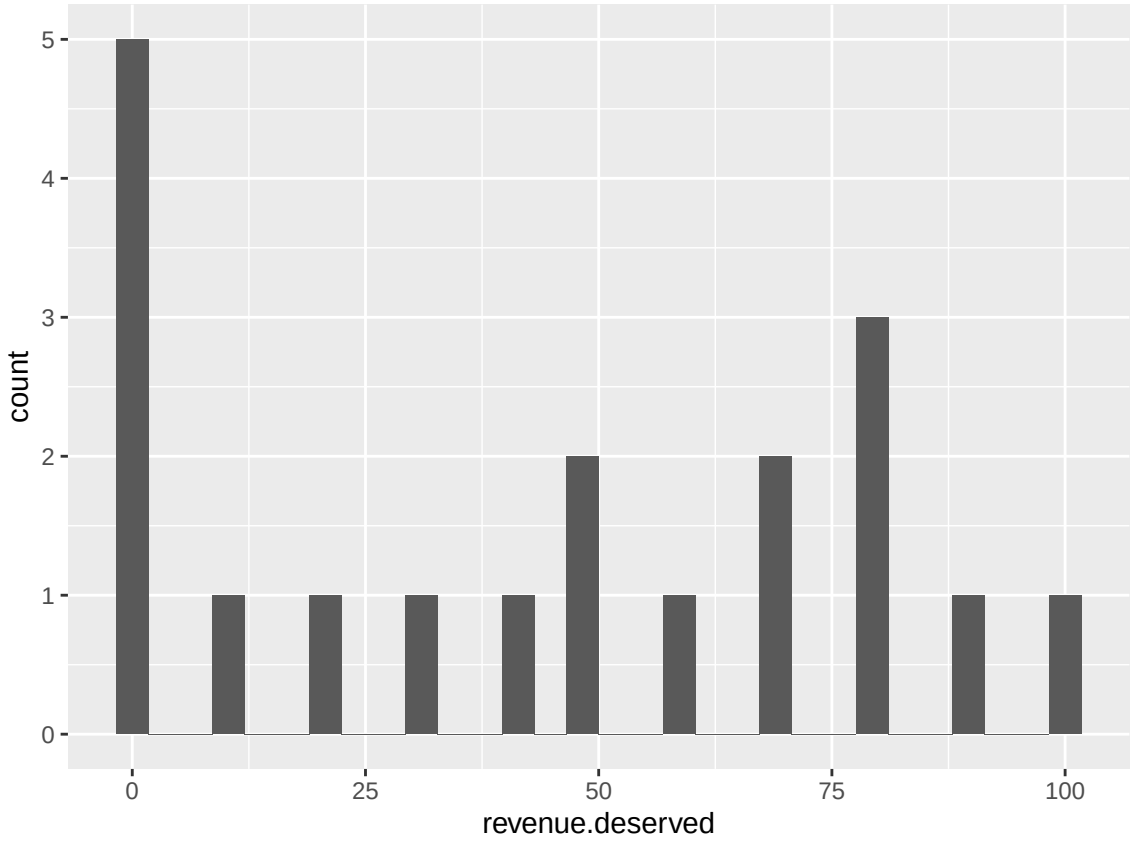
The results is not surprising, we in fact were trying to make out, whether respondents that would grant the artists a greater portion of the generated revenue would even consider boycotting the AI-generated piece, determining if the ethical values would be even acted upon.

```
non.boycotter <- ans %>%
  filter(would.boycott == "No")

p1 <- non.boycotter %>%
  ggplot(aes(x=revenue.deserved)) +
  geom_boxplot()
p2 <- non.boycotter %>%
  ggplot(aes(x=revenue.deserved)) +
  geom_histogram()
```




```
## `stat_bin()` using `bins = 30`. Pick better value with `binwidth`.
```



The non-boycotters' percentages of revenue granted to trained-on artists, is quite evenly distributed. Seeing as we are only looking at a total of 19 respondents, we are far from being able to make a generalizing statement to answer the original question.