

QLearningAnalysis

Nathan Shepherd

2022-04-08

```
Q_table <- read_csv("../StringQ_Qtable.csv")

## New names:
## * `` -> ...1

## Rows: 10000 Columns: 5
## -- Column specification -----
## Delimiter: ","
## chr (1): state
## dbl (4): ...1, act0, act1, argmax
##
## i Use `spec()` to retrieve the full column specification for this data.
## i Specify the column types or set `show_col_types = FALSE` to quiet this message.

qStats <- read_csv("../StringQ_stats.csv")

## Rows: 91506 Columns: 6
## -- Column specification -----
## Delimiter: ","
## dbl (6): state, timestep, episode, action, reward, duration
##
## i Use `spec()` to retrieve the full column specification for this data.
## i Specify the column types or set `show_col_types = FALSE` to quiet this message.

#View(Q_table)
#View(qStats)

summary(Q_table)

##      ...1      state          act0          act1
## Min.   : 0  Length:10000  Min.   :-328.1322  Min.   :-326.7142
## 1st Qu.:2500 Class  :character  1st Qu.: 0.0000  1st Qu.: 0.0000
## Median :5000 Mode   :character  Median : 0.0000  Median : 0.0000
## Mean   :5000                  Mean   :-0.1566  Mean   :-0.1556
## 3rd Qu.:7499                  3rd Qu.: 0.0000  3rd Qu.: 0.0000
## Max.   :9999                  Max.   : 8.2628  Max.   : 8.1181
##      argmax
## Min.   :0.0000
## 1st Qu.:0.0000
## Median :0.0000
## Mean   :0.0063
## 3rd Qu.:0.0000
## Max.   :1.0000
```

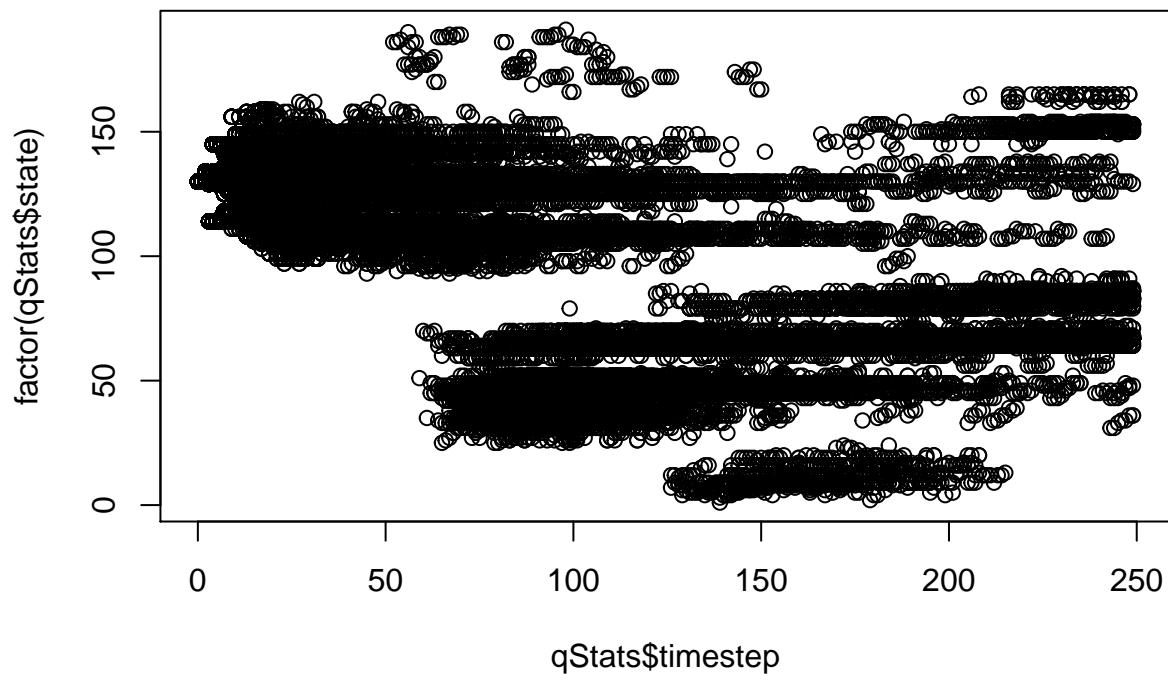
```

summary(qStats)

##      state      timestep      episode      action
## Min.   :3356   Min.   : 0.00   Min.   : 0.0   Min.   :0.0000
## 1st Qu.:4565   1st Qu.: 23.00   1st Qu.: 707.0  1st Qu.:0.0000
## Median :5456   Median : 58.00   Median : 951.0  Median :0.0000
## Mean    :5215   Mean   : 73.97   Mean   : 874.9  Mean   :0.4751
## 3rd Qu.:5555   3rd Qu.:109.00   3rd Qu.:1091.0 3rd Qu.:1.0000
## Max.    :6764   Max.   :249.00   Max.   :1200.0  Max.   :1.0000
##          reward      duration
## Min.   : 8.0   Min.   : 8.0
## 1st Qu.: 90.0  1st Qu.: 90.0
## Median :138.0  Median :138.0
## Mean   :148.9  Mean   :148.9
## 3rd Qu.:241.0  3rd Qu.:241.0
## Max.   :250.0  Max.   :250.0

plot(qStats$timestep, factor(qStats$state))

```



```

updated_states = Q_table %>% filter(act0 != 0 | act1 != 0)
updated_states = as.data.frame(updated_states)
summary(updated_states)

```

```

##     ...1      state      act0      act1
## Min.   :3356   Length:191   Min.   :-328.1322  Min.   :-326.714
## 1st Qu.:4466   Class  :character  1st Qu.: -2.8865  1st Qu.: -1.835
## Median :5346   Mode   :character  Median :  0.0098  Median :  0.000
## Mean    :5070                           Mean   : -8.1983  Mean   : -8.145
## 3rd Qu.:5649                           3rd Qu.:  0.0847  3rd Qu.:  0.000
## Max.    :6764                           Max.   :  8.2628  Max.   :  8.118
##          argmax
## Min.   :0.0000
## 1st Qu.:0.0000

```

```

## Median :0.0000
## Mean   :0.3298
## 3rd Qu.:1.0000
## Max.   :1.0000
pos_states = Q_table %>% filter(act0 > 0 | act1 > 0)
summary(pos_states)

```

```

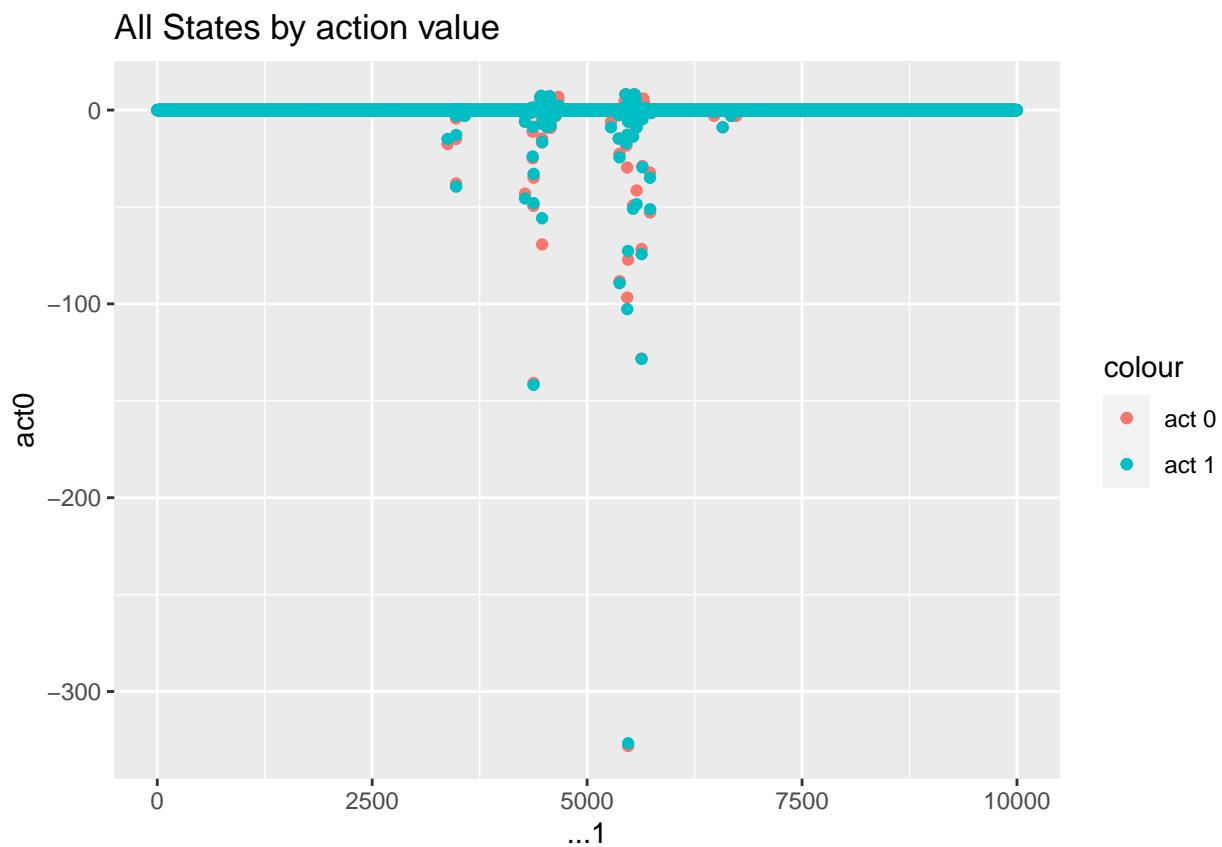
## ...1      state          act0          act1
## Min.   :3356  Length:121    Min.   :-6.32988  Min.   :-1.0453
## 1st Qu.:4543  Class  :character  1st Qu.: 0.01000  1st Qu.: 0.0000
## Median :4775   Mode   :character  Median  : 0.05896  Median  : 0.0000
## Mean    :5113                           Mean    : 0.97177  Mean    : 0.7427
## 3rd Qu.:5665                           3rd Qu.: 0.39558  3rd Qu.: 0.0000
## Max.   :6764                           Max.   : 8.26281  Max.   : 8.1181
## argmax
## Min.   :0.0000
## 1st Qu.:0.0000
## Median :0.0000
## Mean   :0.2066
## 3rd Qu.:0.0000
## Max.   :1.0000

```

```

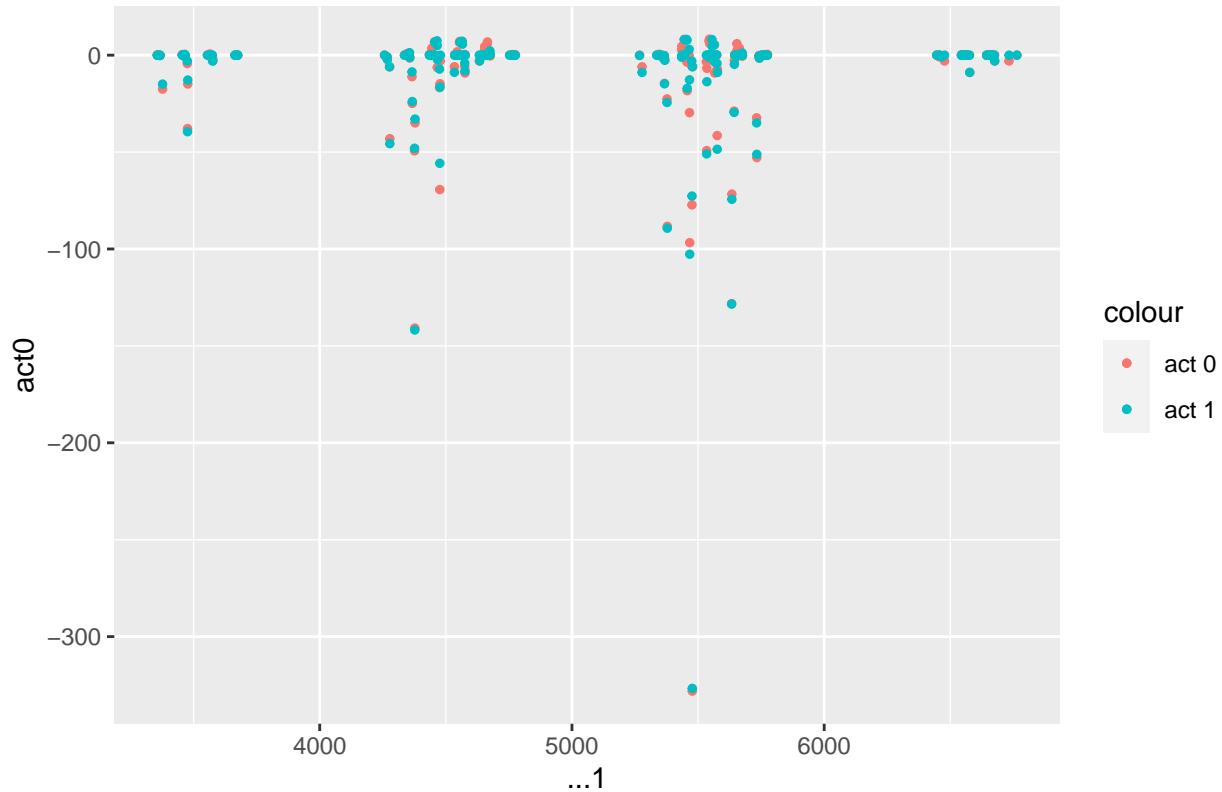
ggplot(Q_table, aes(x=...1)) +
  geom_point(aes(y=act0, colour="act 0")) +
  geom_point(aes(y=act1, colour="act 1")) +
  labs(title="All States by action value")

```



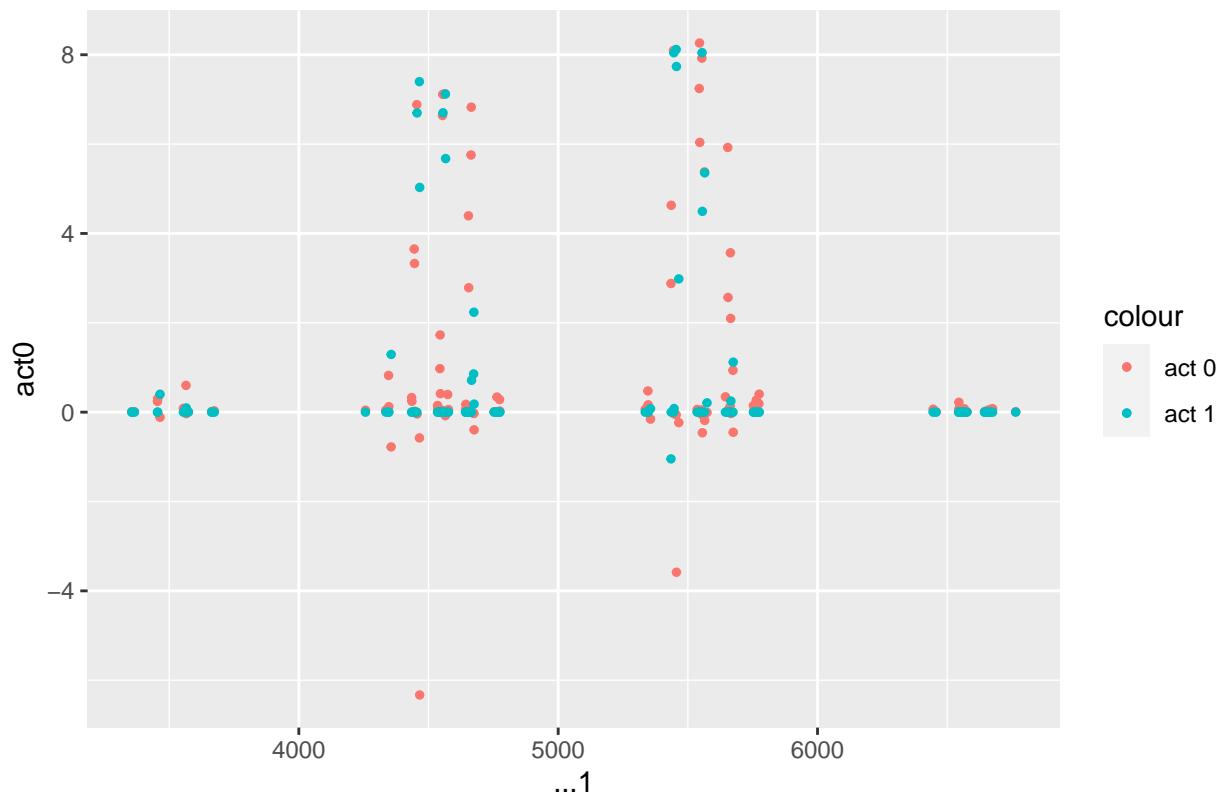
```
ggplot(updated_states,aes(x=...1)) +
  geom_point(aes(y=act0, colour="act 0"), size=1) +
  geom_point(aes(y=act1, colour="act 1"), size=1) +
  labs(title="Updated States by Action value")
```

Updated States by Action value

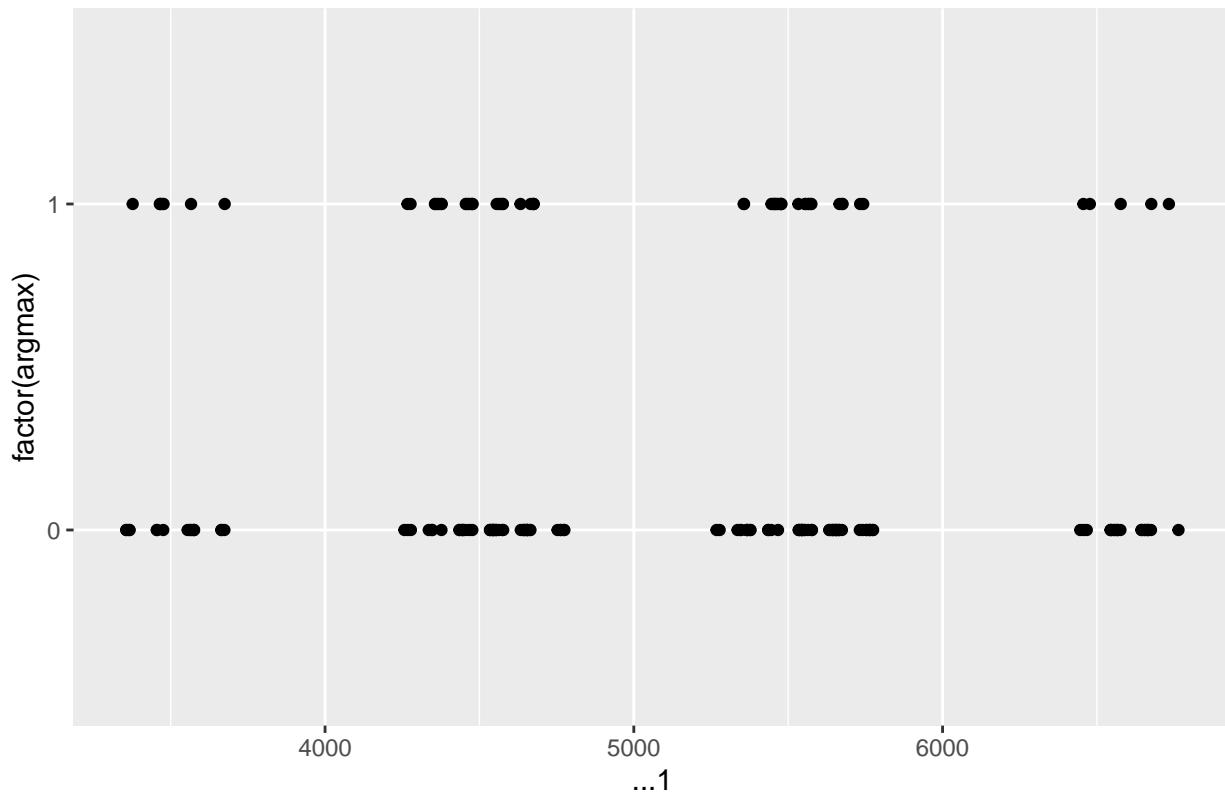


```
ggplot(pos_states,aes(x=...1)) +
  geom_point(aes(y=act0, colour="act 0"), size=1) +
  geom_point(aes(y=act1, colour="act 1"), size=1) +
  labs(title="Positive States by Action value")
```

Positive States by Action value

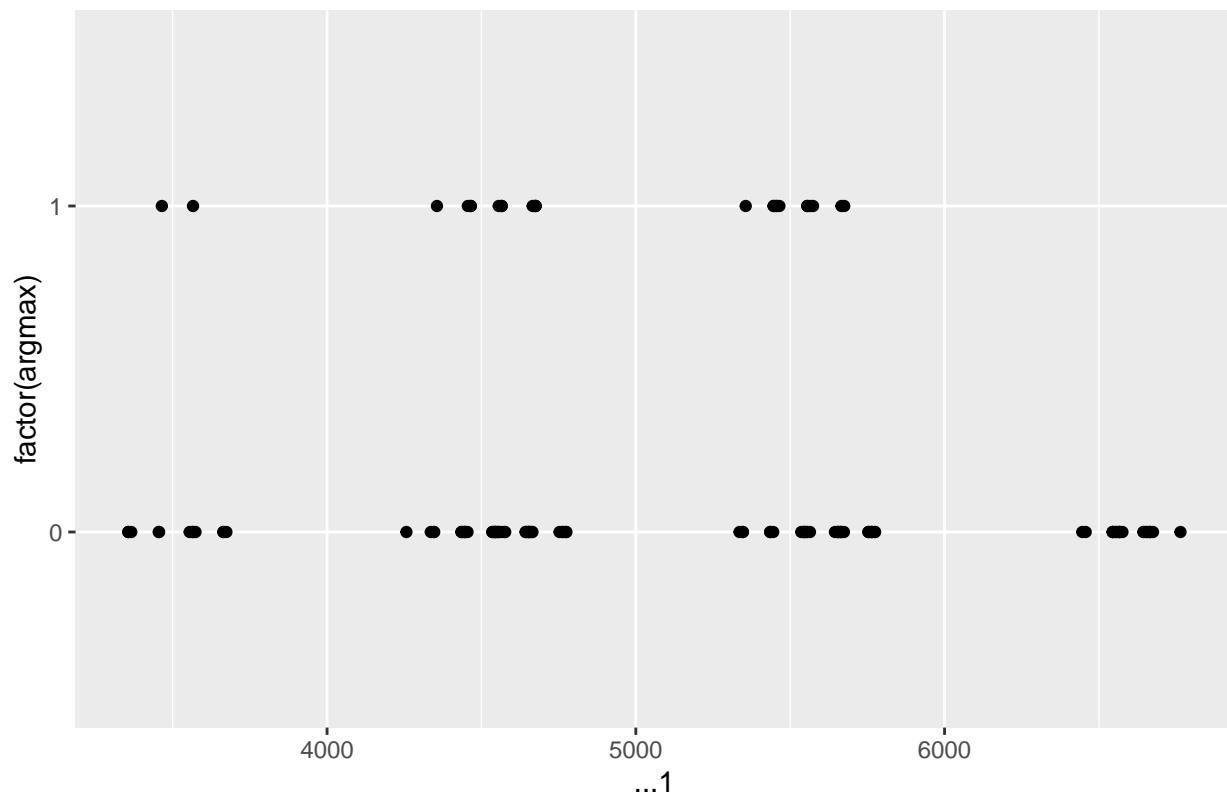


Updated States by Best Action

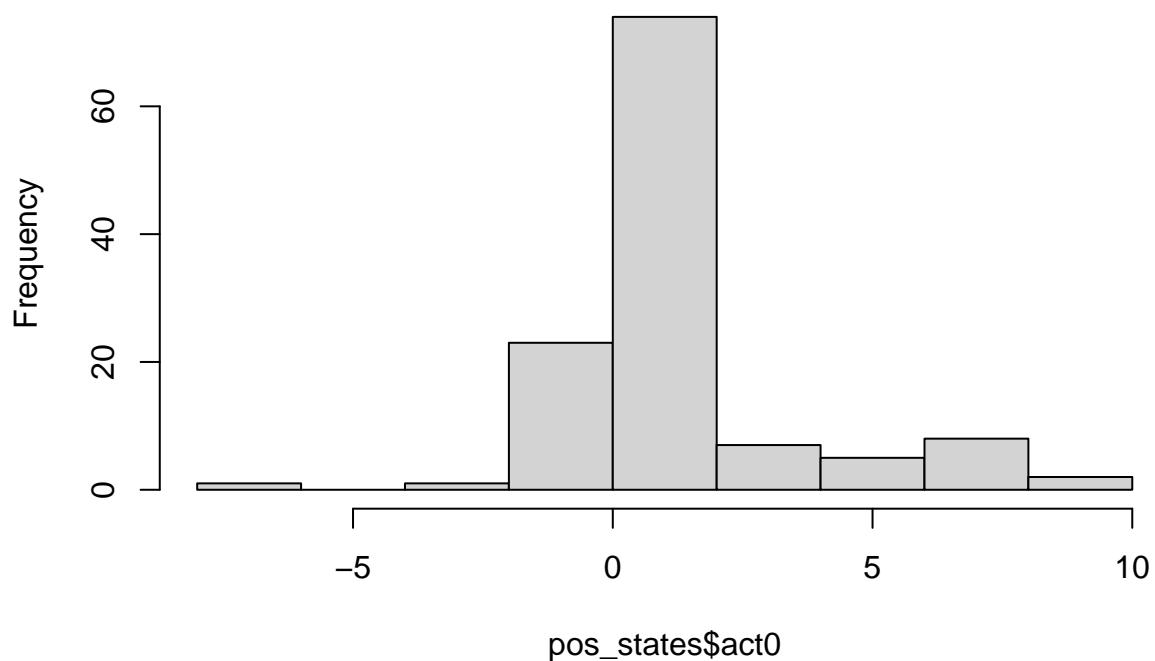


```
ggplot(pos_states, aes(x=...1, y=factor(argmax)) ) +  
  geom_point() + labs(title="Positive States by Best Action")
```

Positive States by Best Action



Histogram of `pos_states$act0`



```
hist(pos_states$act1)
```

Histogram of pos_states\$act1

