HTW

Thomas Gorman   Rob Goldstone

2023-10-11

In project 1, we applied model-based techniques to quantify and control for the similarity between training and testing experience, which in turn enabled us to account for the difference between varied and constant training via an extended version of a similarity based generalization model. In project 2, we will go a step further, implementing a full process model capable of both 1) producing novel responses and 2) modeling behavior in both the learning and testing stages of the experiment. Project 2 also places a greater emphasis on extrapolation performance following training - as varied training has often been purported to be particularly beneficial in such situations.

````{r}
#| label: tbl-example
#| tbl-cap: "Example"
#| tbl-subcap:
#|   - "Cars1"
#|   - "Pressure1"
library(knitr)
kable(head(cars))
kable(head(pressure))

pacman::p_load(tidyverse,tidybayes,brms, lme4, bayesplot,bayestestR,parameters,marginaleffect
               emmeans, equatiomatic, here, pacman,  broom,
              broom.mixed,lme4,emmeans,here,knitr)




walk(c(here("Functions/Display_Functions.R"), here("Functions/org_functions.R"),
      here("Functions/Table_Functions.R")), source)
````

Table 1: Example

(a) Cars1

speed	dist
4	2
4	10
7	4
7	22
8	16
9	10

(b) Pressure1

temperature	pressure
0	0.0002
20	0.0012
40	0.0060
60	0.0300
80	0.0900
100	0.2700

Methods

Participants

Data was collected from 647 participants (after exclusions). The results shown below consider data from subjects in our initial experiment, which consisted of 196 participants (106 constant, 90 varied). The follow-up experiments entailed minor manipulations: 1) reversing the velocity bands that were trained on vs. novel during testing; 2) providing ordinal rather than numerical feedback during training (e.g. correct, too low, too high). The data from these subsequent experiments are largely consistently with our initial results shown below.

Procedure

```{r}
#| label: tbl-examplelllll
#| tbl-cap: "Example"
#| tbl-subcap:
#|   - "Cars1l"
#|   - "Pressure1l"
```

Table 2: Example

(a) Cars1l

speed	dist
4	2
4	10
7	4
7	22
8	16
9	10

(b) Pressure1l

temperature	pressure
0	0.0002
20	0.0012
40	0.0060
60	0.0300
80	0.0900
100	0.2700

```
library(knitr)
kable(head(cars))
kable(head(pressure))
```

extra

```
pacman::p_load(tidyverse,knitr,tidybayes,brms, lme4, bayesplot,bayestestR,parameters,marginal
               emmeans, equatiomatic, here, pacman,  broom,
              broom.mixed,lme4,emmeans,here,
               wesanderson,glue, ggdist,ggforce,patchwork,gghalves,ggh4x,
               install = TRUE,
               update = FALSE
              )
```

```{r}
#| label: tbl-example2vvv
#| tbl-cap: "Example"
```

Table 3: Example

(a) Cars2vv

speed	dist
4	2
4	10
7	4
7	22
8	16
9	10

(b) Pressure2vv

temperature	pressure
0	0.0002
20	0.0012
40	0.0060
60	0.0300
80	0.0900
100	0.2700

```
#| tbl-subcap:
#|   - "Cars2vv"
#|   - "Pressure2vv"
library(knitr)
kable(head(cars))
kable(head(pressure))
```

Analyses Strategy

All data processing and statistical analyses were performed in R version 4.31 Team (2020).
To assess differences between groups, we used Bayesian Mixed Effects Regression. Model
fitting was performed with the brms package in R Bürkner (2017), and descriptive stats and
tables were extracted with the BayestestR package (**?**). Mixed effects regression enables us
to take advantage of partial pooling, simultaneously estimating parameters at the individual
and group level. Our use of Bayesian, rather than frequentist methods allows us to directly
quantify the uncertainty in our parameter estimates, as well as circumventing convergence
issues common to the frequentist analogues of our mixed models. For each model, we report
the median values of the posterior distribution, and 95% credible intervals.

load data

```r
library(here)
library(dplyr)
here::set_here(path='..')
```

File .here already exists in /Users/thomasgorman/Library/CloudStorage/GoogleDrive-tegorman13

```r
test <- readRDS(here("data/e1_08-21-23.rds")) |> filter(expMode2 == "Test")
#options(brms.backend="cmdstanr",mc.cores=4)
e1Sbjs <- test |> group_by(id,condit) |> summarise(n=n())
testAvg <- test %>% group_by(id, condit, vb, bandInt,bandType,tOrder) %>%
  summarise(nHits=sum(dist==0),vx=mean(vx),dist=mean(dist),sdist=mean(sdist),n=n(),Percent_H
```

```r
```{r}
#| label: tbl-htw
#| tbl-cap: "Example"
#| tbl-subcap:
#|   - "Cars2"
#|   - "Pressure2"
library(knitr)
kable(head(e1Sbjs))
kable(head(testAvg))
```
```

source functions

Test tables

```r
# library(gt)
```

Bürkner, P.-C. (2017). Brms: An R Package for Bayesian Multilevel Models Using Stan. *Journal of Statistical Software*, *80*, 1–28. https://doi.org/10.18637/jss.v080.i01

Team, R. C. (2020). *R: A Language and Environment for Statistical Computing.* R: A Language and Environment for Statistical Computing.

Table 4: Example

(a) Cars2

id	condit	n
1	Varied	63
2	Varied	55
3	Constant	58
4	Varied	63
5	Constant	63
6	Varied	63

(b) Pressure2

id	condit	vb	bandInt	bandType	tOrder	nHits	vx	dist	sdist	
1	Varied	100-300	100	Extrapolation	trainFirst	0	564.8623	264.8623	264.86235	1
1	Varied	350-550	350	Extrapolation	trainFirst	1	791.2064	243.6982	243.69821	1
1	Varied	600-800	600	Extrapolation	trainFirst	2	984.5210	233.5615	209.09513	1
1	Varied	800-1000	800	Trained	trainFirst	2	1060.7720	155.5877	102.60470	
1	Varied	1000-1200	1000	Trained	trainFirst	1	1187.2458	296.8225	118.81533	
1	Varied	1200-1400	1200	Trained	trainFirst	2	1378.7755	136.2681	83.08371	

Table 5: Testing Deviation - Empirical Summary

```
result <- test_summary_table(test, "dist","Deviation", mfun = list(mean = mean, median = medi


result$constant |>kable(booktabs = TRUE,
                       linesep = "\\addlinespace[0.5em]")
                       #caption = paste("Summary of Deviation- Constant"))
# |>
#   kable_styling(font_size = ifelse(fmt_out == "latex", 8.5, NA))

result$varied |> kable(booktabs = TRUE,
                       linesep = "\\addlinespace[0.5em]")
                       #caption = paste("Summary of Deviation- Varied"))
```

Table 6: Example

```{r}
#| label: tbl-example2bbb
#| tbl-cap: "Example"
#| tbl-subcap:
#|   - "Cars2bb"
#|   - "Pressure2bb"
# library(knitr)
# kable(head(cars))
# kable(head(pressure))
```