Spacek et al., 2021, Figure 3-Supplement 1

Figure 3-Supplement 1a

Firing rate FMIs separated by cell types

```
# A mixed-effects model with any random intercept gives singular fits,
# we therefore revert to fitting an ordinary linear model

lmer.3_S1a = lm(grt_meanrate ~ sbc,
                  data = tb %>% drop_na(grt_meanrate))

display(lmer.3_S1a)
```

```
## lm(formula = grt_meanrate ~ sbc, data = tb %>% drop_na(grt_meanrate))
##             coef.est coef.se
## (Intercept) 0.05     0.05
## sbc         0.03     0.08
## ---
## n = 44, k = 2
## residual sd = 0.25, R-Squared = 0.00
```

```
anova(lmer.3_S1a)
```

```
## Analysis of Variance Table
##
## Response: grt_meanrate
##           Df  Sum Sq  Mean Sq F value Pr(>F)
## sbc        1 0.00786 0.007860  0.1213 0.7294
## Residuals 42 2.72196 0.064809
```

FMI sbc: 0.0796
FMI non-sbc: 0.0509
n = 44 neurons from 4 mice

Figure 3-Supplement 1b

Relation between firing rate FMI and recording depth

```r
# Random intercept for mice
lmer.3_S1b = lmer(grt_meanrate ~ depth  + (1 | mid),
                  data = tib %>% drop_na(grt_meanrate, depth))

display(lmer.3_S1b)
```

```
## lmer(formula = grt_meanrate ~ depth + (1 | mid), data = tib %>%
##     drop_na(grt_meanrate, depth))
##             coef.est coef.se
## (Intercept) 0.05     0.08
## depth       0.00     0.00
##
## Error terms:
##  Groups   Name        Std.Dev.
##  mid      (Intercept) 0.04
##  Residual             0.25
## ---
## number of obs: 42, groups: mid, 4
## AIC = 28.6, DIC = -17.3
## deviance = 1.6
```

```r
anova(lmer.3_S1b)
```

```
## Type III Analysis of Variance Table with Satterthwaite's method
##           Sum Sq    Mean Sq NumDF  DenDF F value Pr(>F)
## depth 5.0103e-06 5.0103e-06     1 38.898   1e-04 0.9929
```

Slope of -2.8e-06 ± 0.00063 (95%-confidence interval)
n = 42 neurons from 4 mice

Figure 3-Supplement 1c

Relation between firing rate FMI and direction selectivity

```
# Random intercept for series, nested in mice
lmer.3_S1c = lmer(grt_meanrate ~ dsi + (1 | sid/mid),
                  data = tib %>% drop_na(grt_meanrate, dsi))
```

```
## boundary (singular) fit: see ?isSingular
```

```
display(lmer.3_S1c)
```

```
## lmer(formula = grt_meanrate ~ dsi + (1 | sid/mid), data = tib %>%
##     drop_na(grt_meanrate, dsi))
##             coef.est coef.se
## (Intercept) 0.04     0.05
## dsi         0.11     0.19
##
## Error terms:
##  Groups   Name        Std.Dev.
##  mid:sid  (Intercept) 0.00
##  sid      (Intercept) 0.00
##  Residual             0.25
## ---
## number of obs: 44, groups: mid:sid, 8; sid, 8
## AIC = 18.4, DIC = -4.1
## deviance = 2.2
```

```
anova(lmer.3_S1c)
```

```
## Type III Analysis of Variance Table with Satterthwaite's method
##       Sum Sq  Mean Sq NumDF DenDF F value Pr(>F)
## dsi 0.022426 0.022426     1    42  0.3479 0.5585
```

Slope of 0.11 ± 0.37 (95%-confidence interval)
n = 44 neurons from 4 mice

Figure 3-Supplement 1d

Relation between firing rate FMI and receptive field location

```
# Random intercept for series, nested in mice
lmer.3_S1d = lmer(grt_meanrate ~ rfdist + (1 | mid/sid),
                  data = tib %>% drop_na(grt_meanrate, rfdist))
```

```
## boundary (singular) fit: see ?isSingular
```

```
display(lmer.3_S1d)
```

```
## lmer(formula = grt_meanrate ~ rfdist + (1 | mid/sid), data = tib %>%
##     drop_na(grt_meanrate, rfdist))
##             coef.est coef.se
## (Intercept) 0.05     0.14
## rfdist      0.00     0.01
##
## Error terms:
##  Groups   Name        Std.Dev.
##  sid:mid  (Intercept) 0.11
##  mid      (Intercept) 0.00
##  Residual             0.21
## ---
## number of obs: 36, groups: sid:mid, 8; mid, 4
## AIC = 15.2, DIC = -19.6
## deviance = -7.2
```

```
anova(lmer.3_S1d)
```

```
## Type III Analysis of Variance Table with Satterthwaite's method
##            Sum Sq    Mean Sq NumDF  DenDF F value Pr(>F)
## rfdist 0.00015649 0.00015649     1 16.113  0.0036 0.9529
```

Slope of -0.00037 ± 0.012 (95%-confidence interval)
n = 36 neurons from 4 mice

Figure 3-Supplement 1e

Relation between firing rate FMI and firing rate

```
# Random intercept for series, nested in mice
lmer.3_S1e = lmer(grt_meanrate ~ grt_meanrate_raw + (1 | mid/sid),
                  data = tib %>% drop_na(grt_meanrate, grt_meanrate_raw))
```

```
## boundary (singular) fit: see ?isSingular
```

```
display(lmer.3_S1e)
```

```
## lmer(formula = grt_meanrate ~ grt_meanrate_raw + (1 | mid/sid),
##     data = tib %>% drop_na(grt_meanrate, grt_meanrate_raw))
##                  coef.est coef.se
## (Intercept)      0.04     0.06
## grt_meanrate_raw 0.00     0.00
##
## Error terms:
##  Groups   Name        Std.Dev.
##  sid:mid  (Intercept) 0.00
##  mid      (Intercept) 0.00
##  Residual             0.25
## ---
## number of obs: 44, groups: sid:mid, 8; mid, 4
## AIC = 27.2, DIC = -12.4
## deviance = 2.4
```

```
anova(lmer.3_S1e)
```

```
## Type III Analysis of Variance Table with Satterthwaite's method
##                     Sum Sq   Mean Sq NumDF DenDF F value Pr(>F)
## grt_meanrate_raw 0.0086593 0.0086593     1    42  0.1337 0.7165
```

Slope of 0.00094 ± 0.0051 (95%-confidence interval)
n = 44 neurons from 4 mice

Figure 3-Supplement 1f

Burst ratio FMIs separated by cell types

```
# Random intercept for series
lmer.3_S1f = lmer(grt_meanburstratio ~ sbc  + (1 | sid),
                  data = tb %>% drop_na(grt_meanburstratio))

display(lmer.3_S1f)
```

```
## lmer(formula = grt_meanburstratio ~ sbc + (1 | sid), data = tb %>%
##     drop_na(grt_meanburstratio))
##             coef.est coef.se
## (Intercept) -0.23     0.18
## sbc         -0.25     0.13
##
## Error terms:
##  Groups   Name        Std.Dev.
##  sid      (Intercept) 0.43
##  Residual             0.34
## ---
## number of obs: 42, groups: sid, 7
## AIC = 54.7, DIC = 38.7
## deviance = 42.7
```

```
anova(lmer.3_S1f)
```

```
## Type III Analysis of Variance Table with Satterthwaite's method
##      Sum Sq Mean Sq NumDF DenDF F value  Pr(>F)
## sbc 0.44786 0.44786     1 33.95  3.7691 0.06055 .
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

FMI sbc: -0.487
FMI non-sbc: -0.235
n = 42 neurons from 4 mice

Figure 3-Supplement 1g

Relation between burst ratio FMI and recording depth

```
# Random intercept for series, nested in mice
lmer.3_S1g = lmer(grt_meanburstratio ~ depth  + (1 | mid/sid),
                  data = tib %>% drop_na(grt_meanburstratio, depth))
```

```
## boundary (singular) fit: see ?isSingular
```

```
display(lmer.3_S1g)
```

```
## lmer(formula = grt_meanburstratio ~ depth + (1 | mid/sid), data = tib %>%
##     drop_na(grt_meanburstratio, depth))
##             coef.est coef.se
## (Intercept) -0.37     0.22
## depth        0.00     0.00
##
## Error terms:
##  Groups   Name        Std.Dev.
##  sid:mid  (Intercept) 0.46
##  mid      (Intercept) 0.00
##  Residual             0.37
## ---
## number of obs: 40, groups: sid:mid, 7; mid, 4
## AIC = 70.3, DIC = 31.2
## deviance = 45.8
```

```
anova(lmer.3_S1g)
```

```
## Type III Analysis of Variance Table with Satterthwaite's method
##         Sum Sq  Mean Sq NumDF  DenDF F value Pr(>F)
## depth 0.064419 0.064419     1 37.102  0.4768 0.4942
```

Slope of 0.00043 ± 0.0012 (95%-confidence interval)
n = 40 neurons from 4 mice

Figure 3-Supplement 1h

Relation between burst ratio FMI and direction selectivity

```
# Random intercept for series, nested in mice
lmer.3_S1h = lmer(grt_meanburstratio ~ dsi + (1 | mid/sid),
                  data = tib %>% drop_na(grt_meanburstratio, dsi))

display(lmer.3_S1h)
```

```
## lmer(formula = grt_meanburstratio ~ dsi + (1 | mid/sid), data = tib %>%
##     drop_na(grt_meanburstratio, dsi))
##             coef.est coef.se
## (Intercept) -0.14     0.31
## dsi         -0.18     0.31
##
## Error terms:
##  Groups   Name        Std.Dev.
##  sid:mid  (Intercept) 0.36
##  mid      (Intercept) 0.50
##  Residual             0.35
## ---
## number of obs: 42, groups: sid:mid, 7; mid, 4
## AIC = 58.2, DIC = 44.7
## deviance = 46.5
```

```
anova(lmer.3_S1h)
```

```
## Type III Analysis of Variance Table with Satterthwaite's method
##       Sum Sq  Mean Sq NumDF  DenDF F value Pr(>F)
## dsi 0.040641 0.040641     1 35.931  0.3281 0.5703
```

Slope of -0.18 ± 0.63 (95%-confidence interval)
n = 42 neurons from 4 mice

Figure 3-Supplement 1i

Relation between burst ratio FMI and receptive field location

```
# Random intercept for series, nested in mice
lmer.3_S1i = lmer(grt_meanburstratio ~ rfdist + (1 | mid/sid),
                  data = tib %>% drop_na(grt_meanburstratio, rfdist))

display(lmer.3_S1i)
```

```
## lmer(formula = grt_meanburstratio ~ rfdist + (1 | mid/sid), data = tib %>%
##     drop_na(grt_meanburstratio, rfdist))
##             coef.est coef.se
## (Intercept)  0.06     0.42
## rfdist      -0.01     0.01
##
## Error terms:
##  Groups   Name        Std.Dev.
##  sid:mid  (Intercept) 0.40
##  mid      (Intercept) 0.47
##  Residual             0.36
## ---
## number of obs: 35, groups: sid:mid, 7; mid, 4
## AIC = 59.4, DIC = 33.7
## deviance = 41.5
```

```
anova(lmer.3_S1i)
```

```
## Type III Analysis of Variance Table with Satterthwaite's method
##         Sum Sq Mean Sq NumDF  DenDF F value Pr(>F)
## rfdist 0.11465 0.11465     1 24.154  0.8808 0.3573
```

Slope of -0.013 $\pm$ 0.028 (95%-confidence interval)
n = 35 neurons from 4 mice

Figure 3-Supplement 1j

Relation between burst ratio FMI and burst ratio

```
# Random intercept for series, nested in mice
lmer.3_S1j = lmer(grt_meanburstratio ~ grt_meanburstratio_raw + (1 | mid/sid),
                  data = tib %>% drop_na(grt_meanburstratio, grt_meanburstratio_raw))

display(lmer.3_S1j)
```

```
## lmer(formula = grt_meanburstratio ~ grt_meanburstratio_raw +
##     (1 | mid/sid), data = tib %>% drop_na(grt_meanburstratio,
##     grt_meanburstratio_raw))
##                        coef.est coef.se
## (Intercept)            -0.13     0.27
## grt_meanburstratio_raw -1.45     1.09
##
## Error terms:
##  Groups   Name        Std.Dev.
##  sid:mid  (Intercept) 0.37
##  mid      (Intercept) 0.41
##  Residual             0.35
## ---
## number of obs: 42, groups: sid:mid, 7; mid, 4
## AIC = 54.2, DIC = 45.3
## deviance = 44.7
```

```
anova(lmer.3_S1j)
```

```
## Type III Analysis of Variance Table with Satterthwaite's method
##                         Sum Sq Mean Sq NumDF  DenDF F value Pr(>F)
## grt_meanburstratio_raw 0.21482 0.21482     1 33.801  1.7787 0.1912
```

Slope of -1.45 ± 2.18 (95%-confidence interval)
n = 42 neurons from 4 mice