SpaceTx cell type calling – combined “consensus” mapping

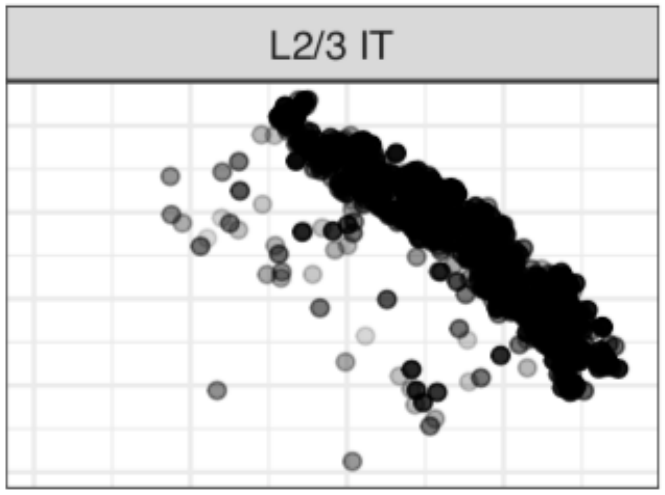
September 11, 2020

Renee Zhang

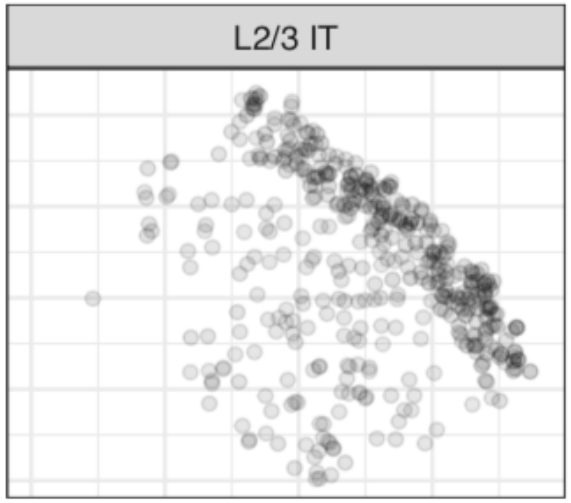
Intro

- Intuition: some of the computational methods may map “better” for some cell types, and some methods may map “better” for some other cell types
- Here, “better” means cleaner mapping in the spatial plot for those cell types with known layering knowledge, e.g. L2/3, etc.
- By combining all methods, can we arrive at a mapping that are overall “better”/cleaner in all cell types, by borrowing the strength of each individual method? → “Consensus” mapping
- Challenge: the quantitative (“probabilistic”) cell type calling methods have different distributional property, i.e. some skewed to 1, some skewed to 0, etc.

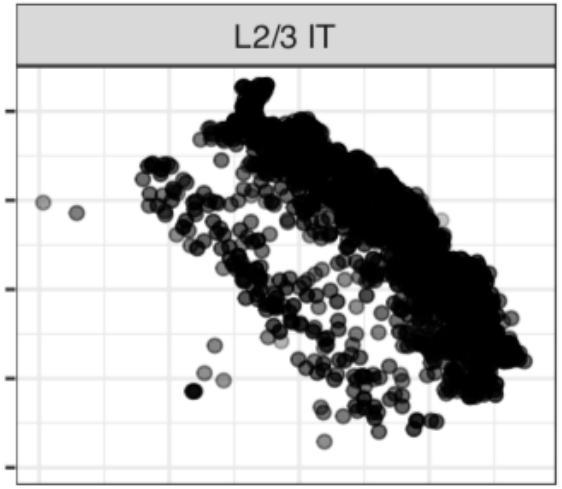
Eesh



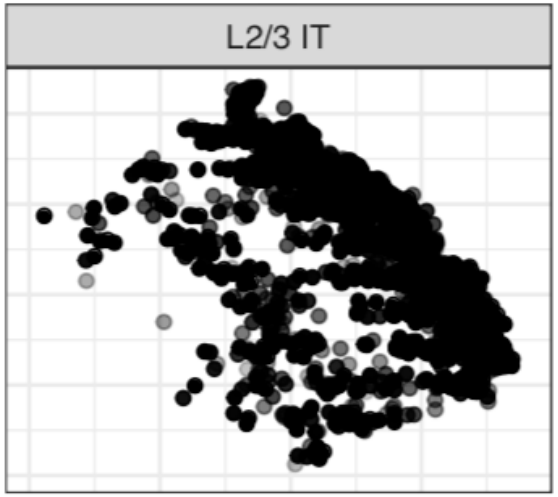
Gabriele



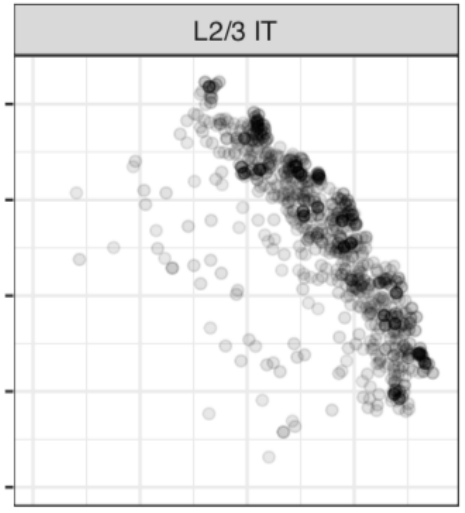
Jeremy



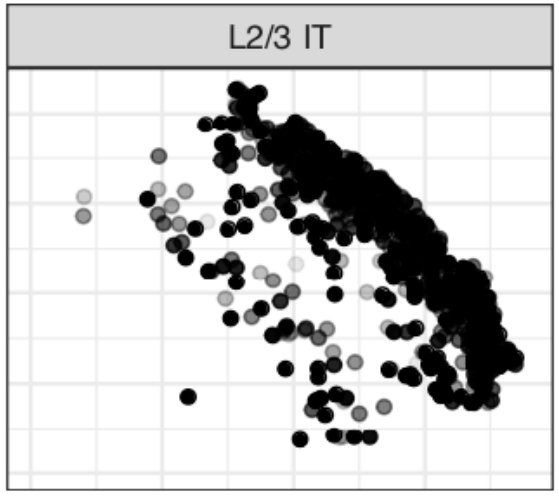
pciseq



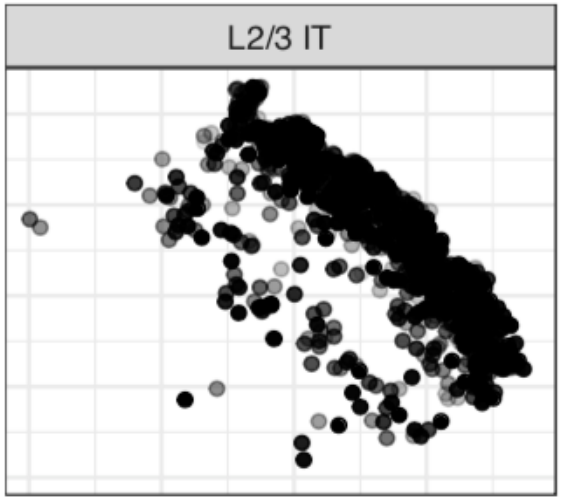
Renee



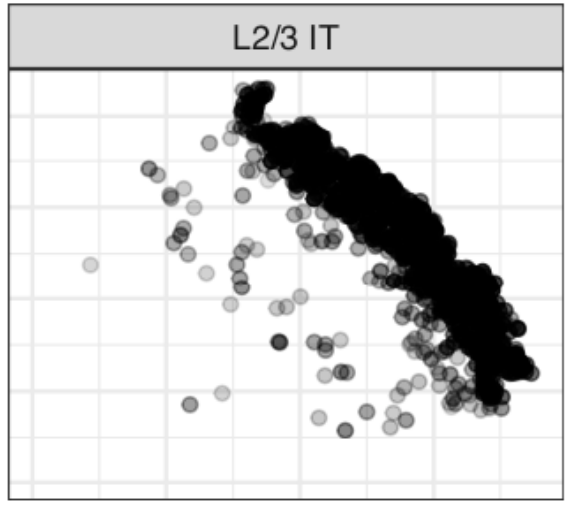
Viktor



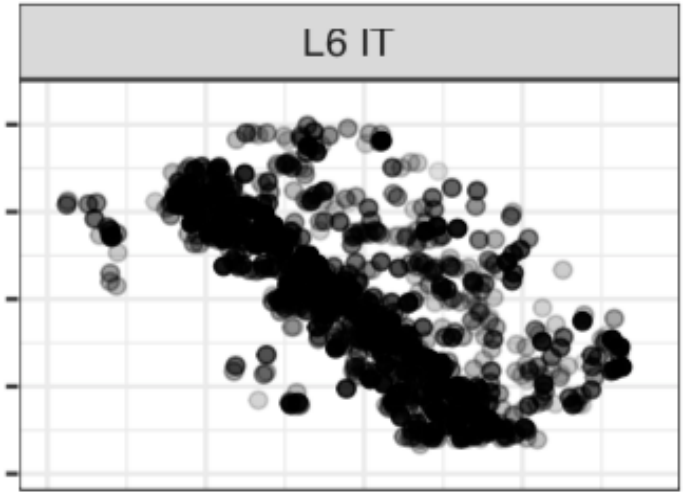
Yilin



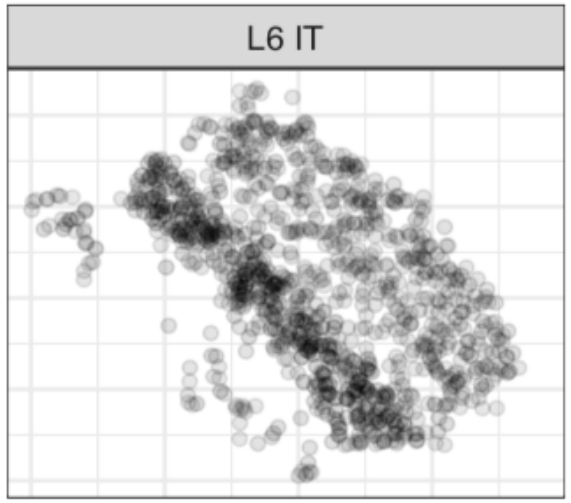
“Consensus”



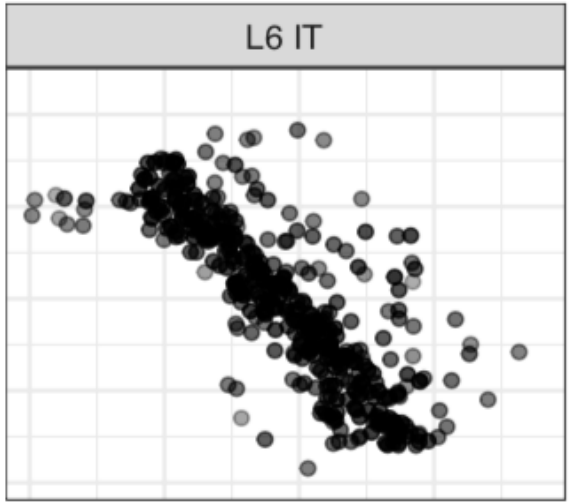
Eesh



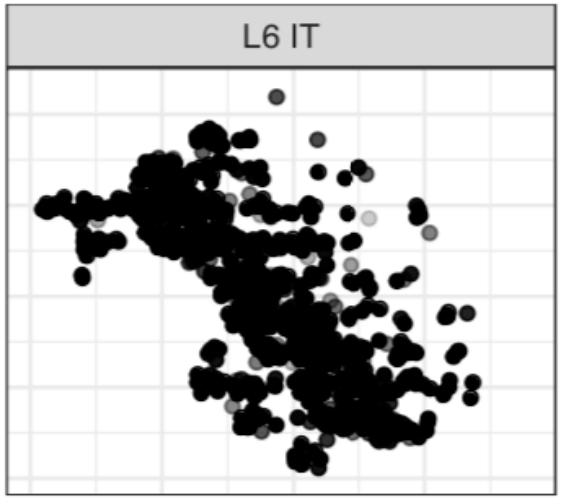
Gabriele



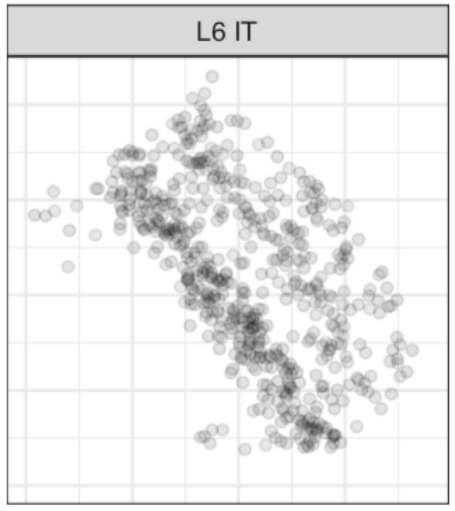
Jeremy



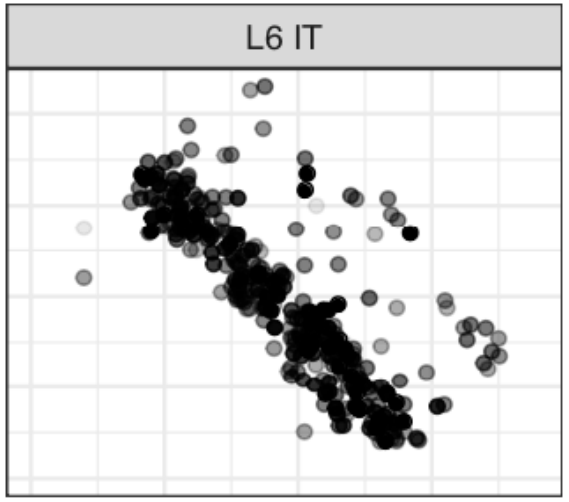
pciseq



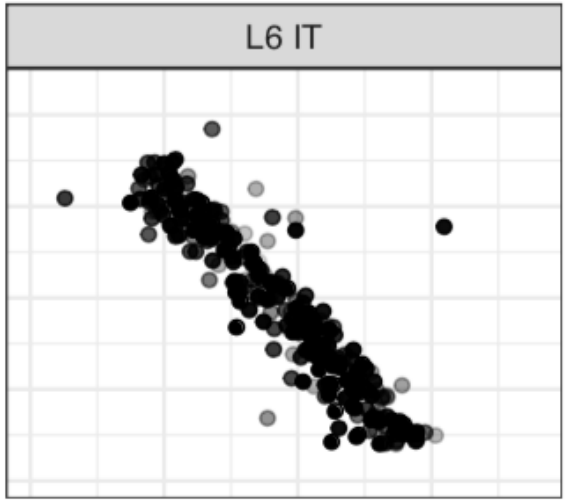
Renee



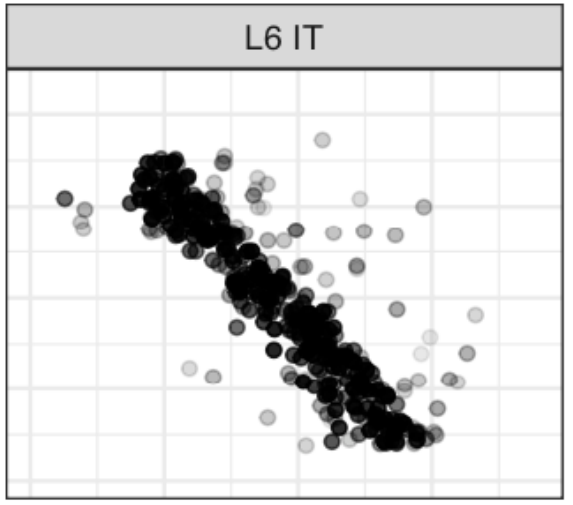
Viktor



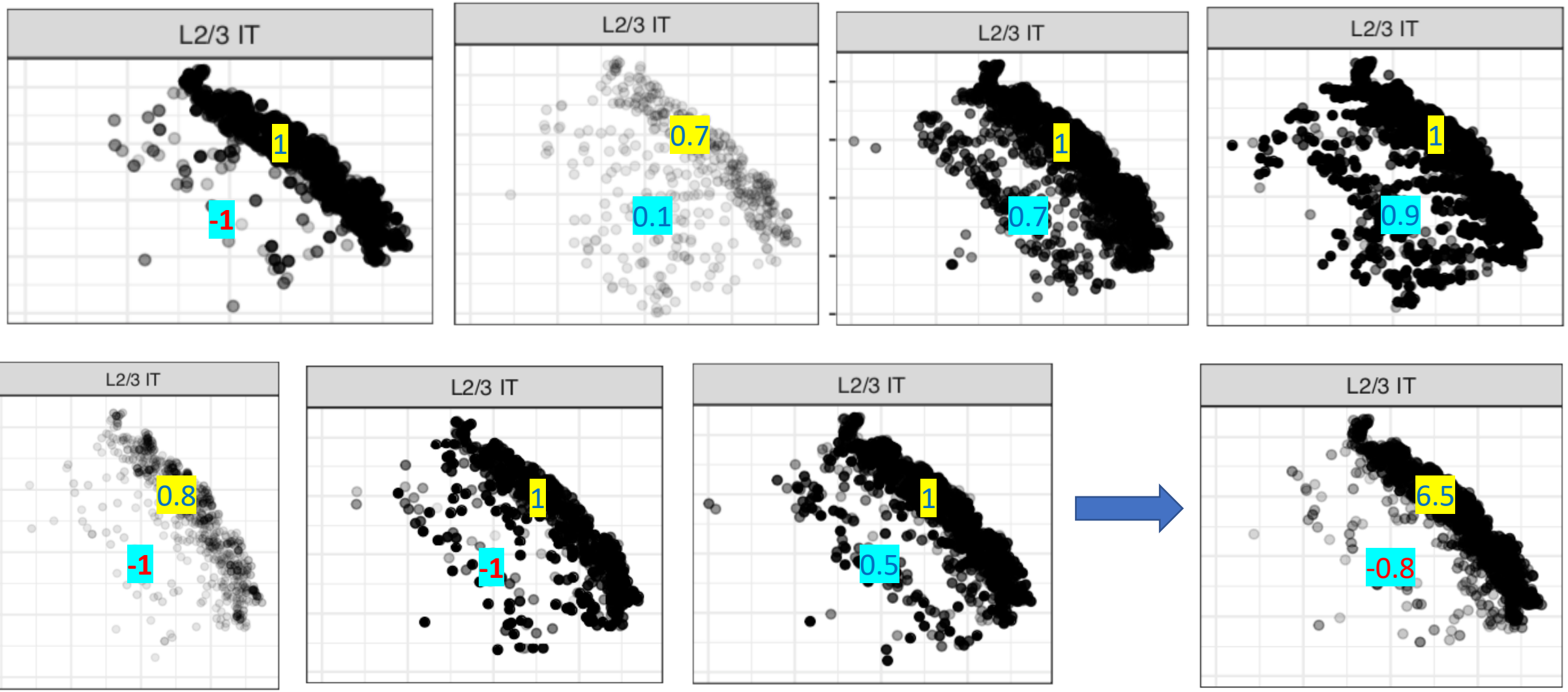
Yilin



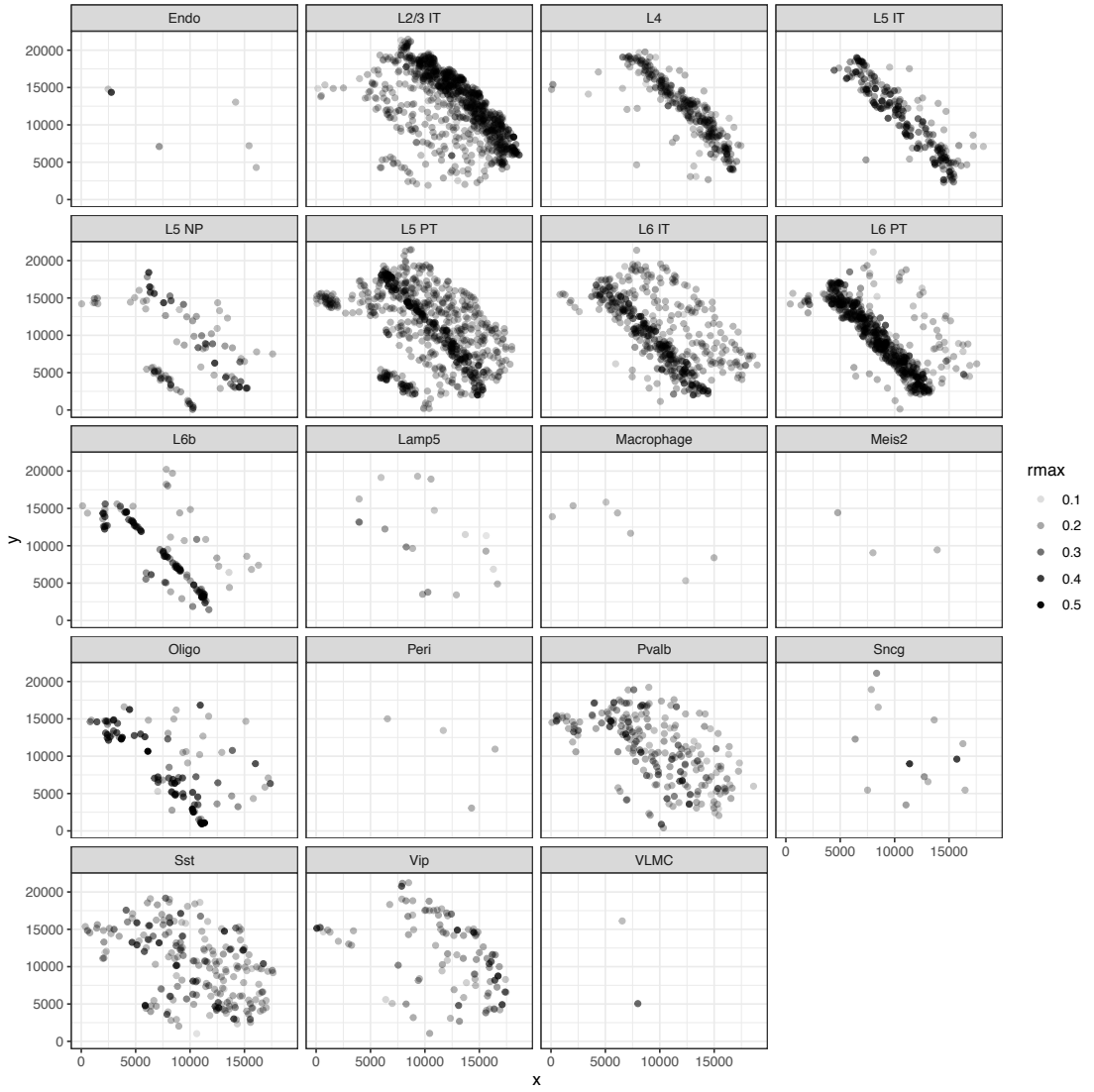
“Consensus”



A “qualitative” consensus by assigning negative weight

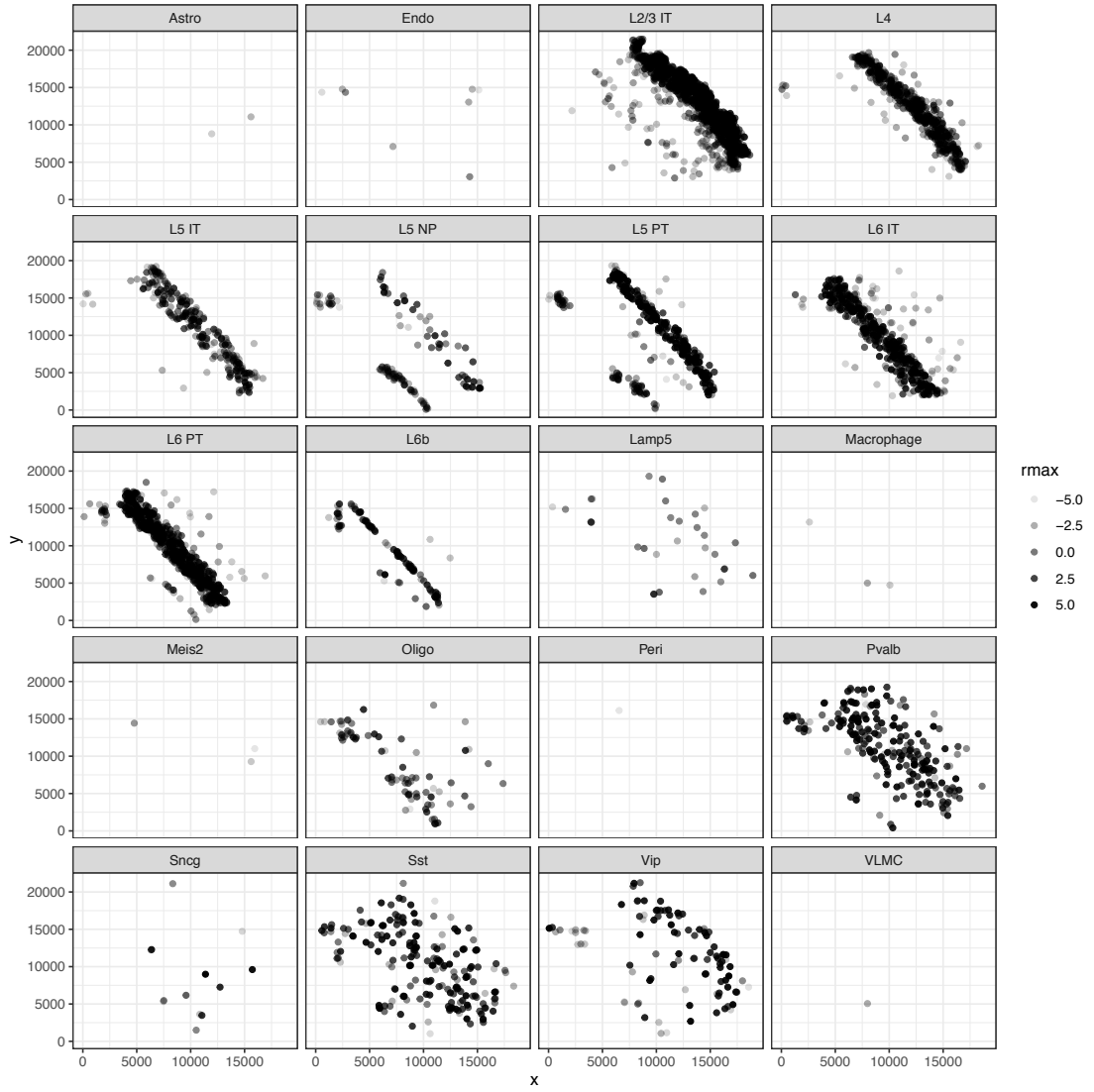


Arithmetic mean



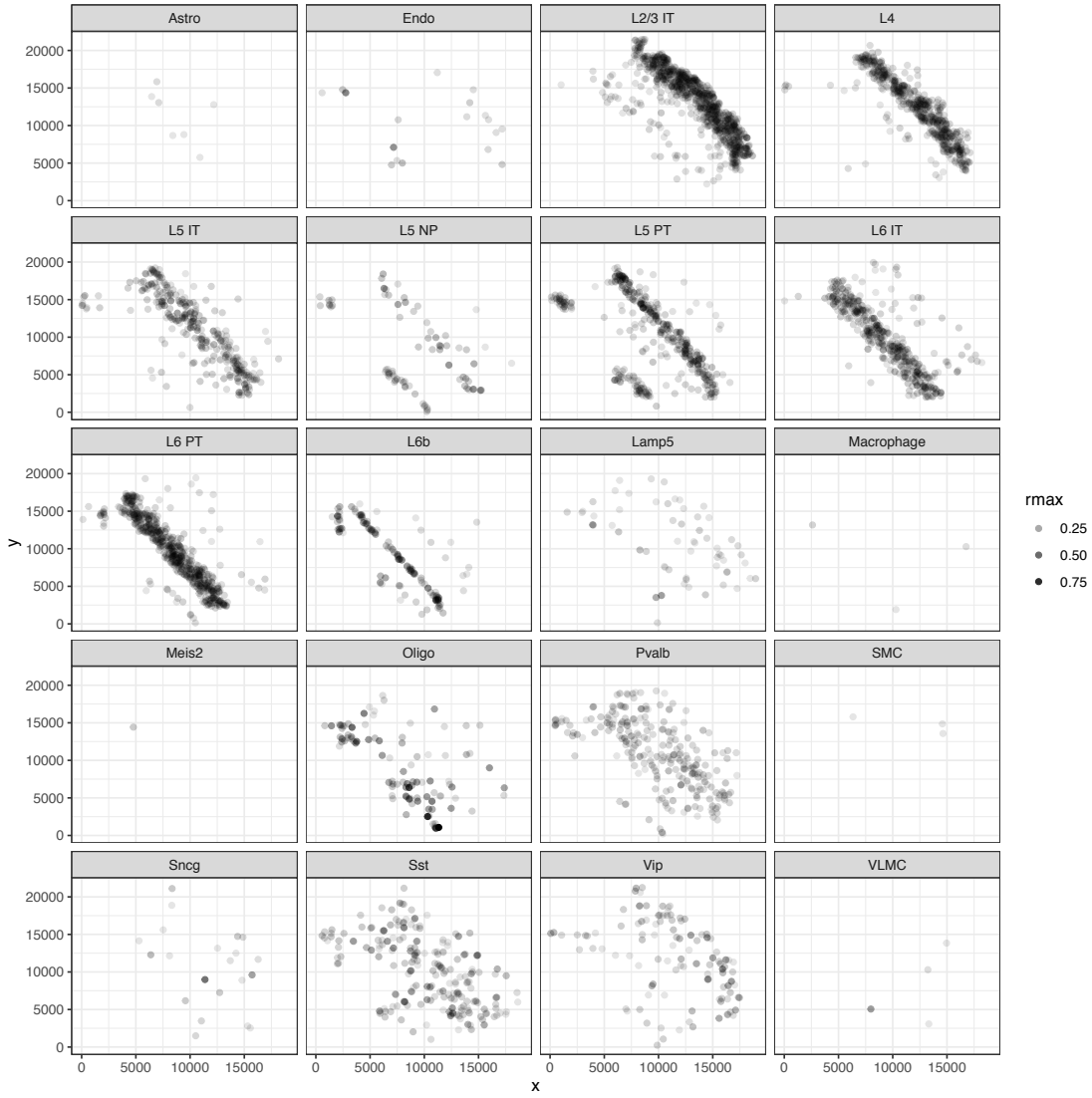
(Eesh)

Negative weighting



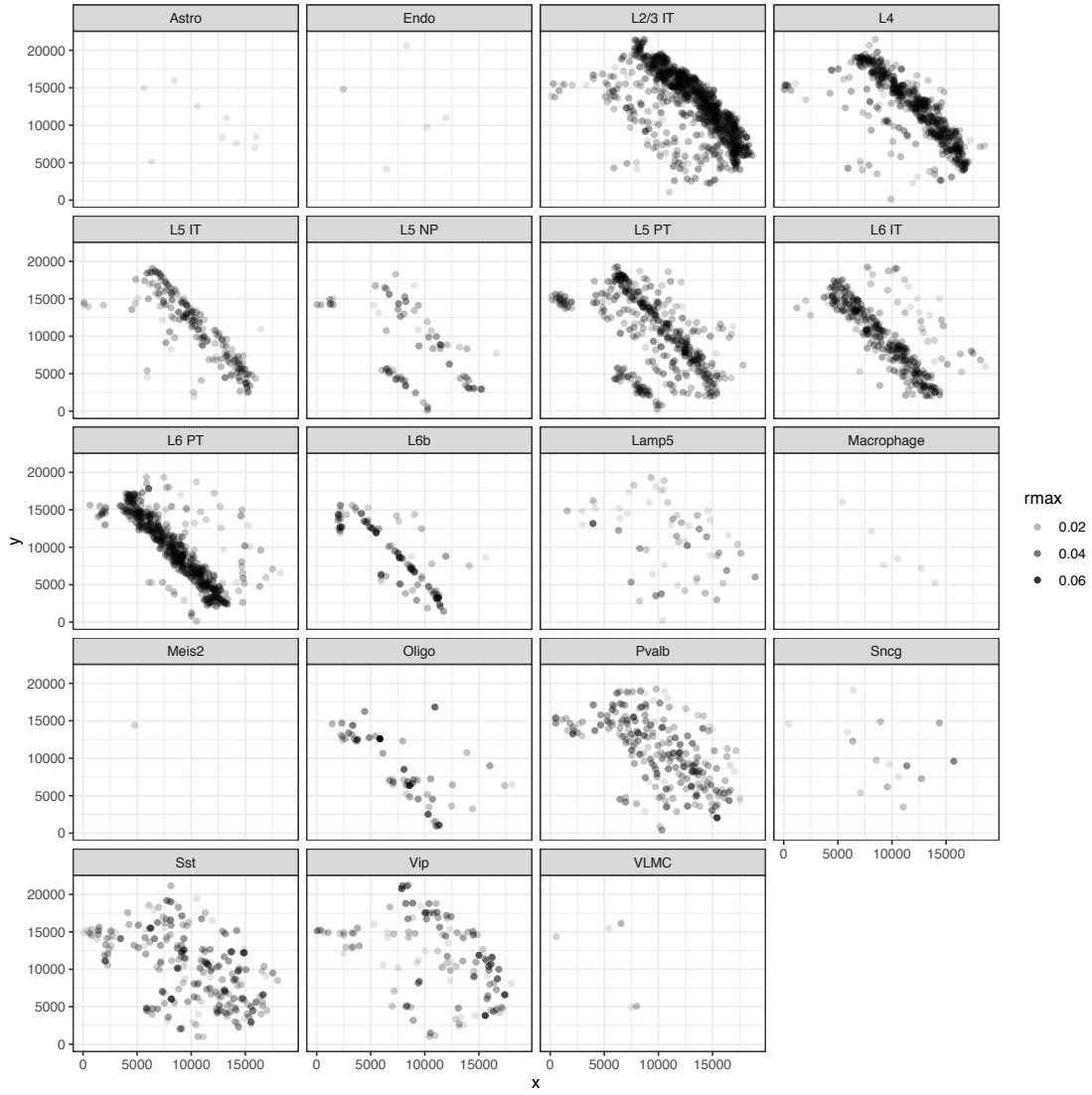
(Renee)

Geometric mean



(Eesh & Charles)

JS divergence

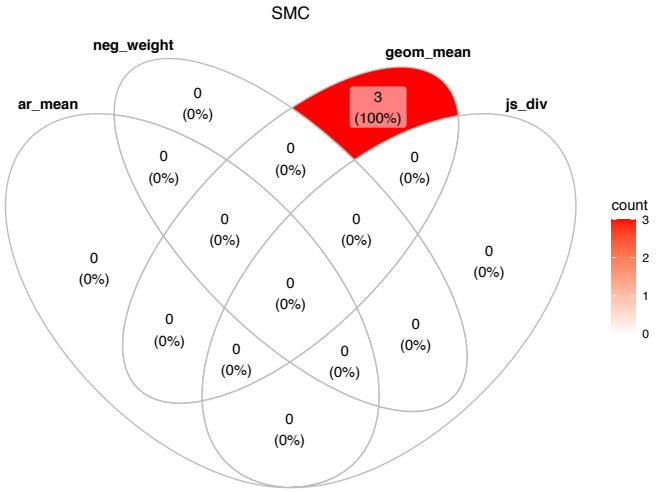


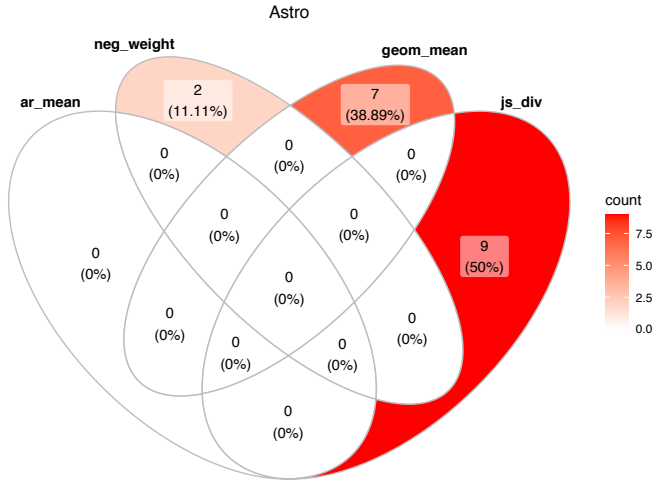
(Eesh & Charles)

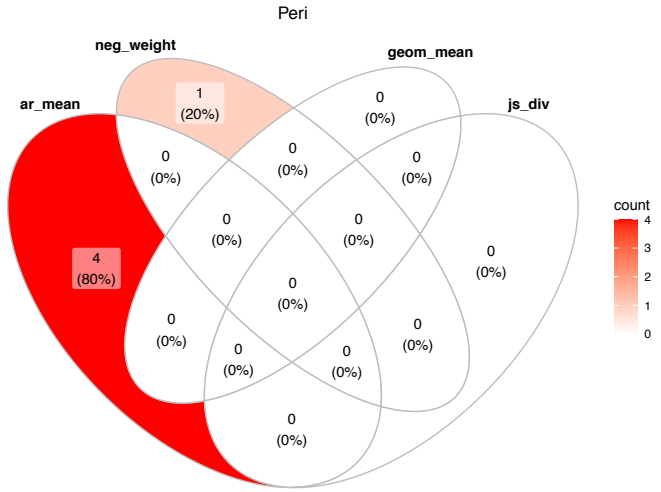
Number of cells mapped to each subclass

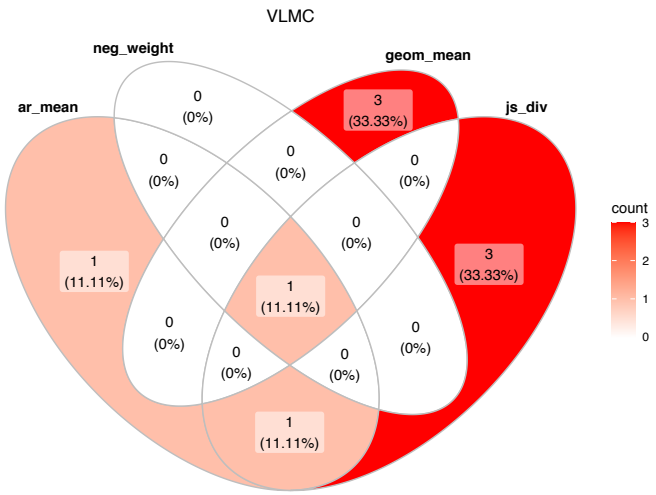
subclass	n_ar_mean	n_neg_weight	n_geom_mean	n_js_div
CR	0	0	0	0
SMC	0	0	3	0
Astro	0	2	7	9
VLMC	3	1	4	5
Meis2	3	3	1	1
Peri	4	1	0	0
Endo	6	8	19	5
Macrophage	7	3	3	6
Sncg	13	13	21	15
Lamp5	18	32	61	61
Oligo	91	78	101	53
Vip	98	99	112	122
L5 NP	98	117	79	76
L6b	106	97	121	98
L5 IT	194	220	277	176
Sst	212	196	216	233
Pvalb	224	224	245	237
L4	283	478	484	503
L6 IT	428	409	373	328
L6 PT	529	584	517	531
L5 PT	646	290	335	408
L2/3 IT	773	882	758	870

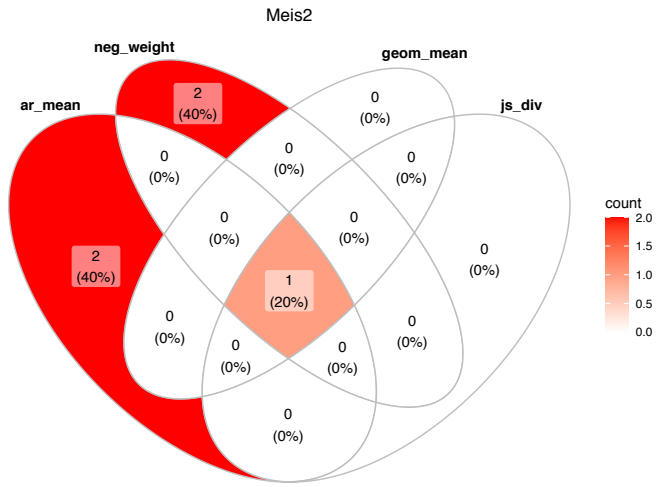
Nearly no agreement on rare cell type callings

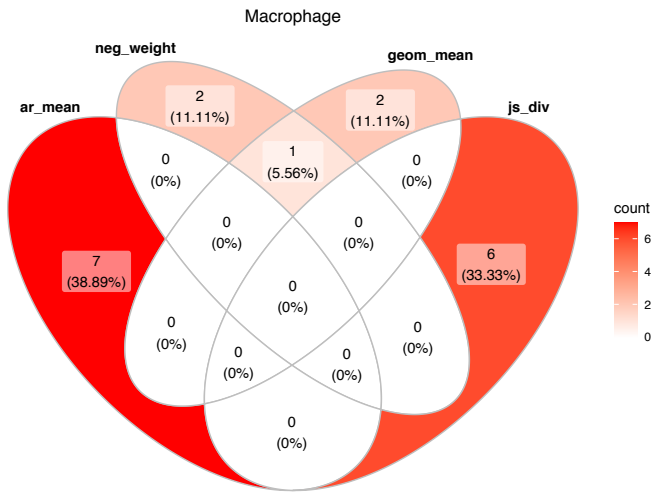




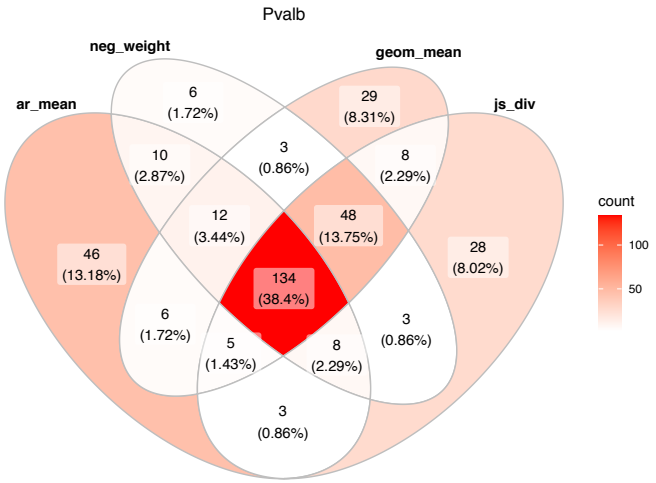


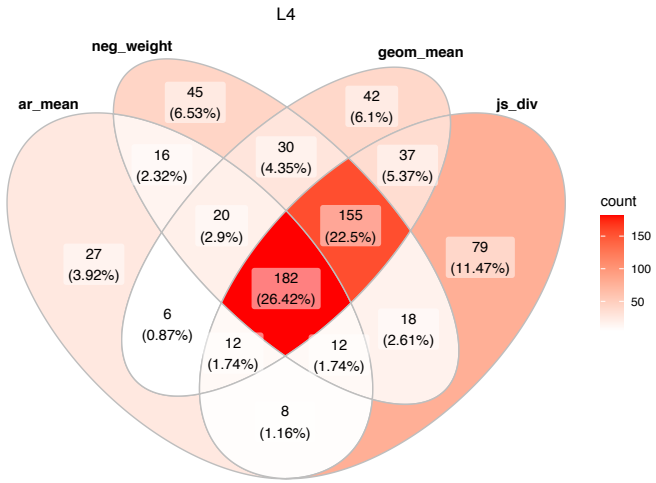


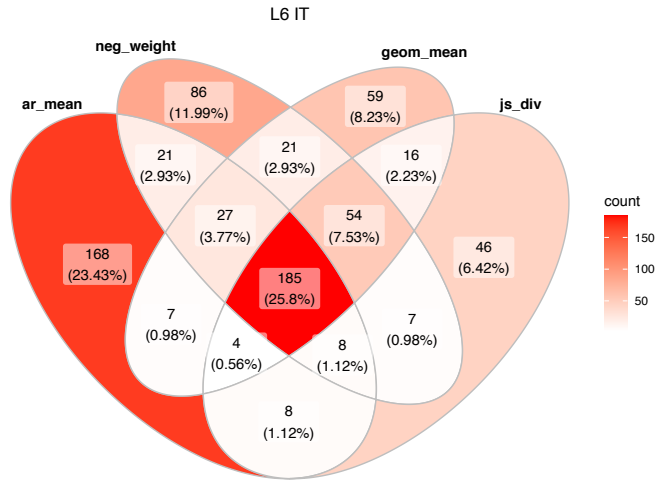


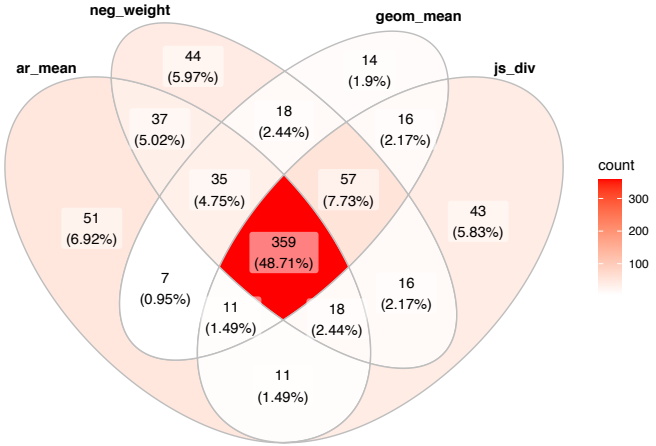


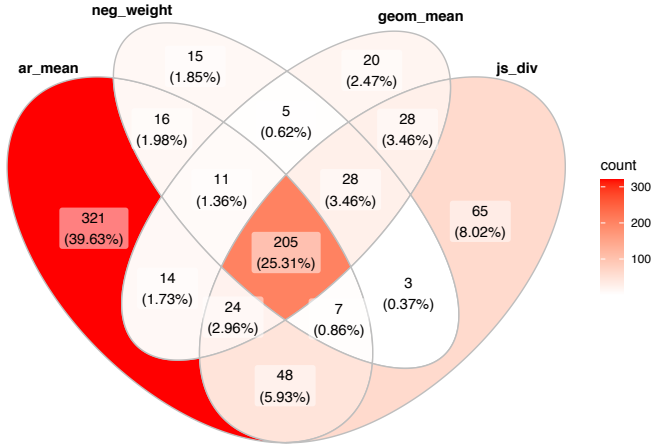
More agreement on abundant cell types

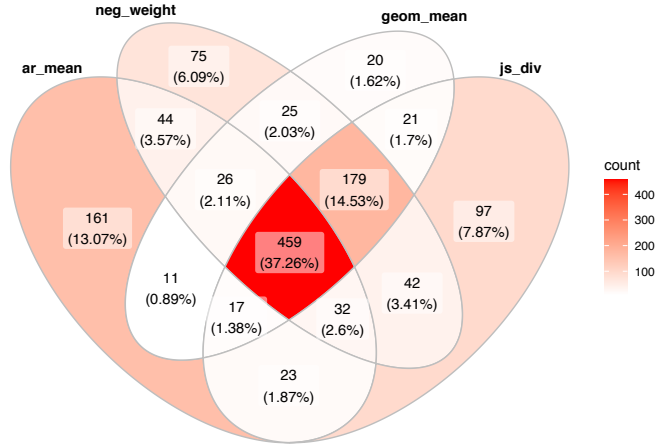












Qualitative agreement measure

- Cohen's/Fleiss's Kappa: inter-rater reliability measure for categorical data between two/multiple raters
- For subclass types, Fleiss's Kappa = 0.6686645

```
> pairwise_agreement(df_subclass, cols=cols)
             ar_mean neg_weight geom_mean    js_div
ar_mean    1.0000000  0.6244438 0.5922805 0.5678788
neg_weight 0.6244438  1.0000000 0.7683555 0.7219416
geom_mean  0.5922805  0.7683555 1.0000000 0.7395798
js_div     0.5678788  0.7219416 0.7395798 1.0000000
```

- For broad class types, Fleiss's Kappa = 0.7405832

```
> pairwise_agreement(df_class, cols=cols)
             ar_mean neg_weight geom_mean    js_div
ar_mean    1.0000000  0.7132448 0.6455139 0.6298084
neg_weight 0.7132448  1.0000000 0.8230567 0.8240154
geom_mean  0.6455139  0.8230567 1.0000000 0.8056270
js_div     0.6298084  0.8240154 0.8056270 1.0000000
```