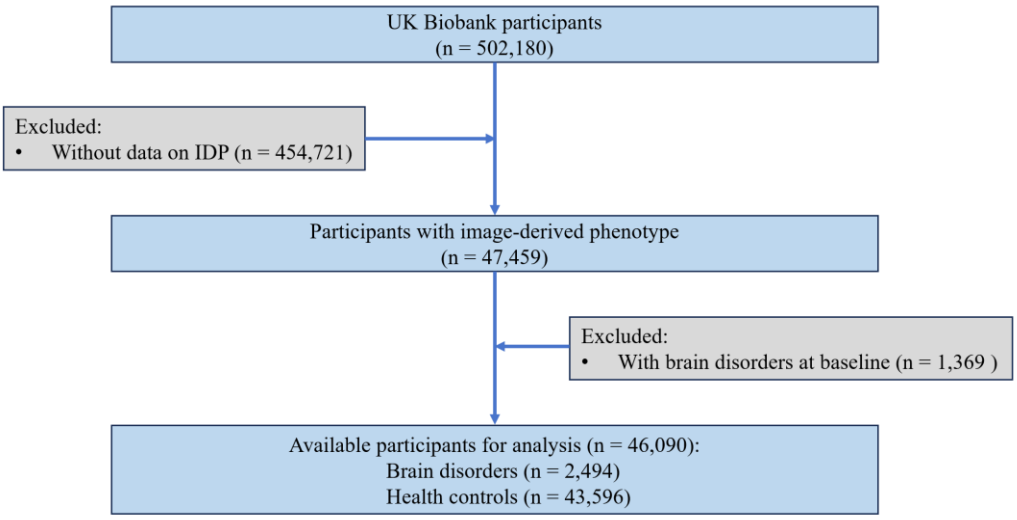
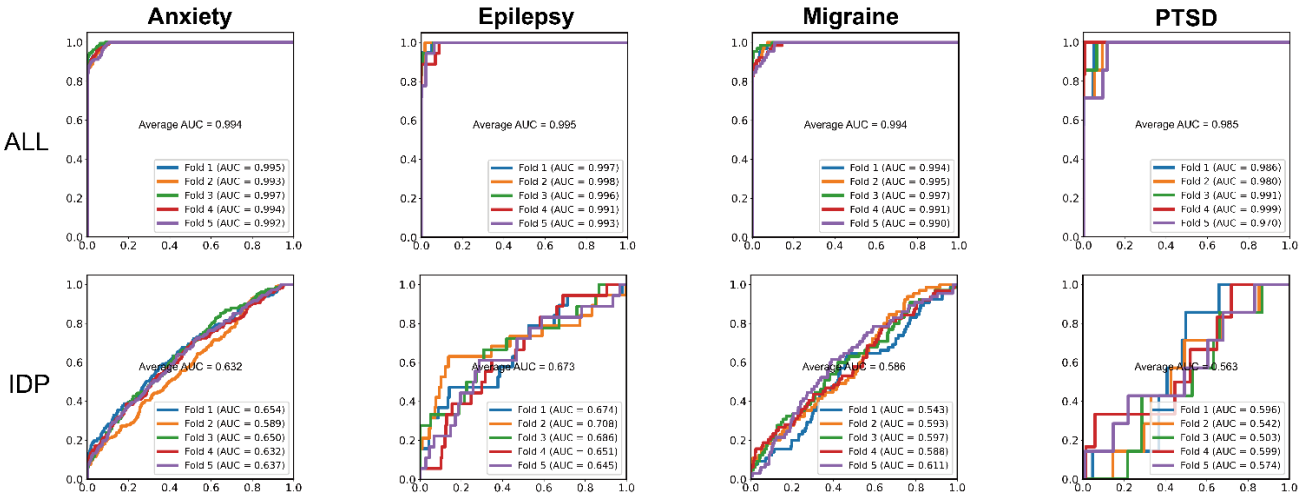
Contents

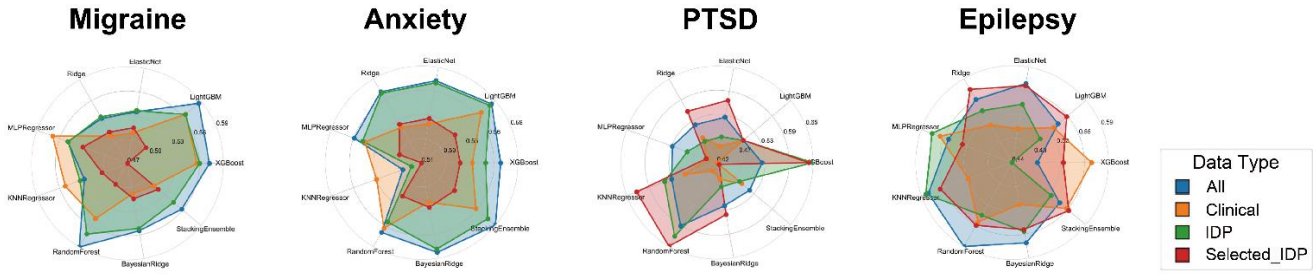
Supplementary Figure 1. Flowchart of the UK biobank participants included and excluded in study



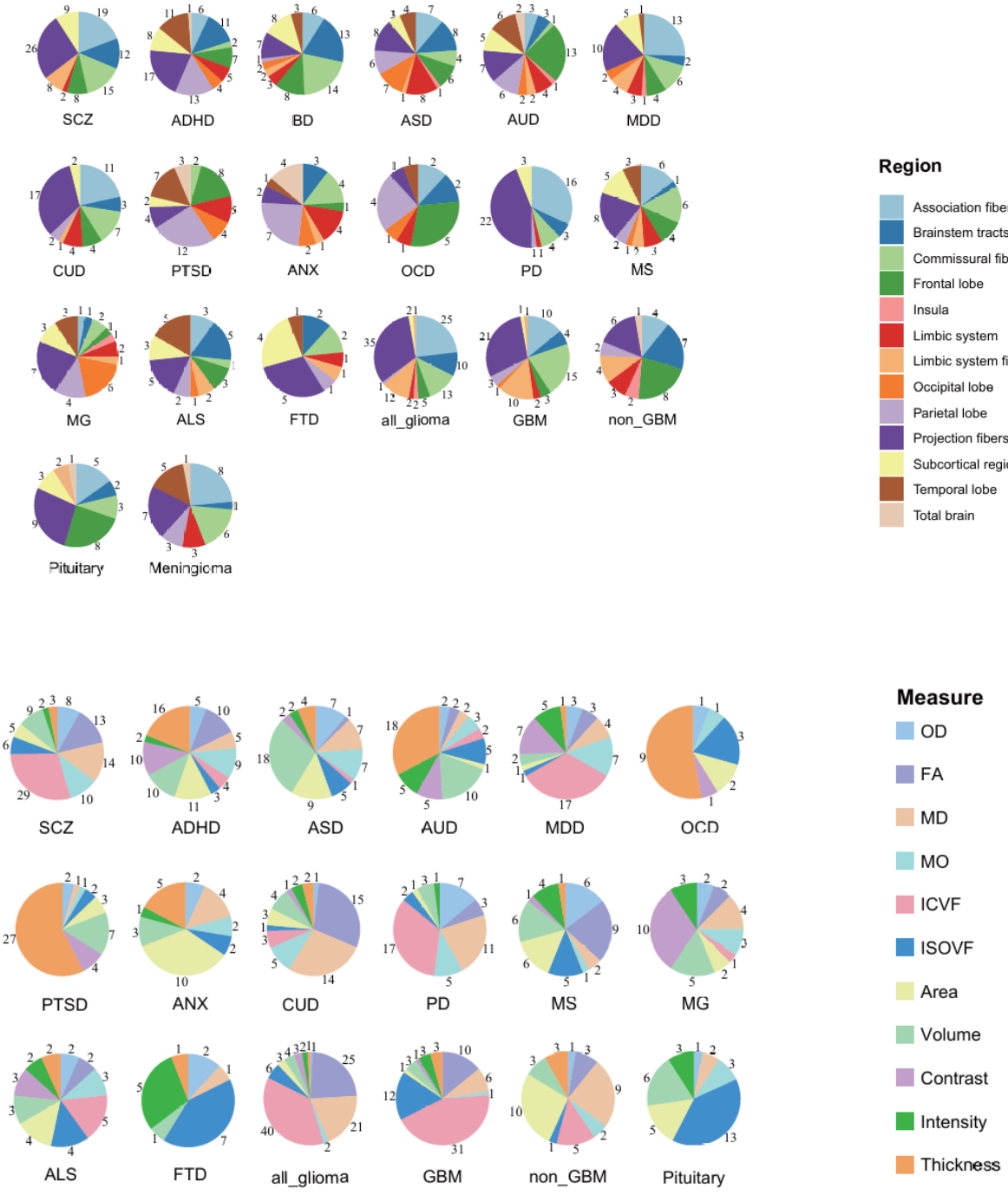
Supplementary Figure 2. ROC curves of different variable models for predicting another four diseases onset



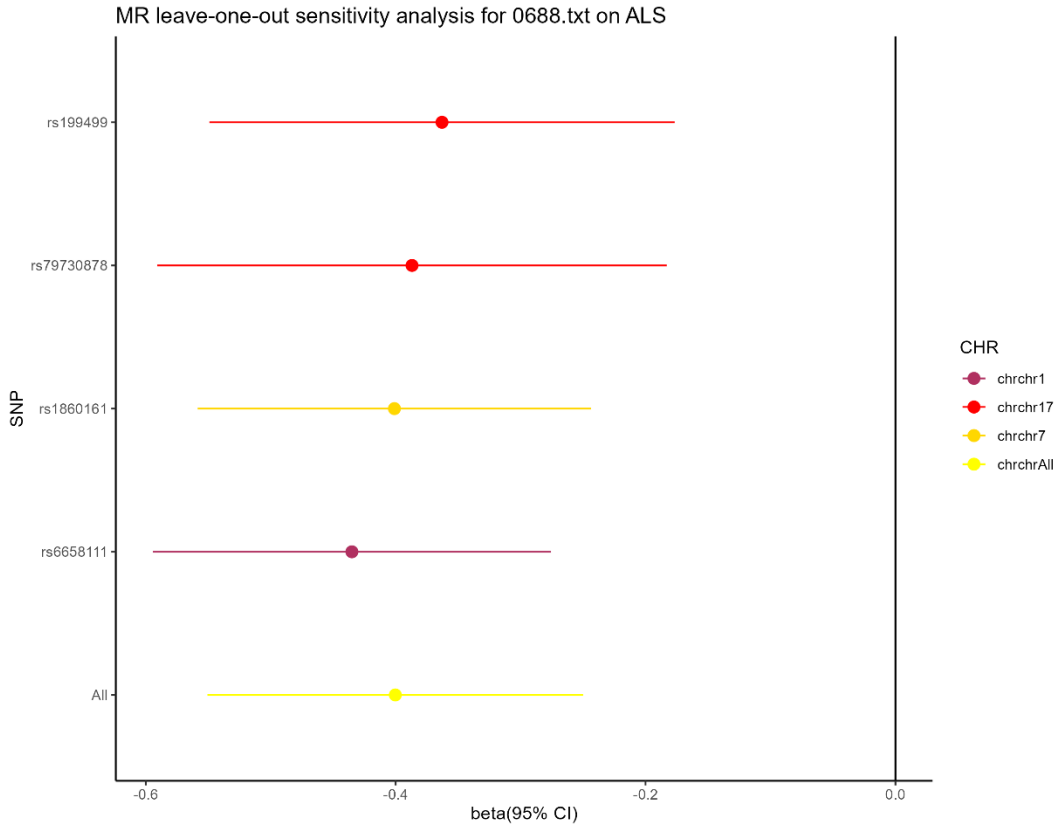
Supplementary Figure 3. Radar map of the AUC of different variable models for predicting another four diseases onset

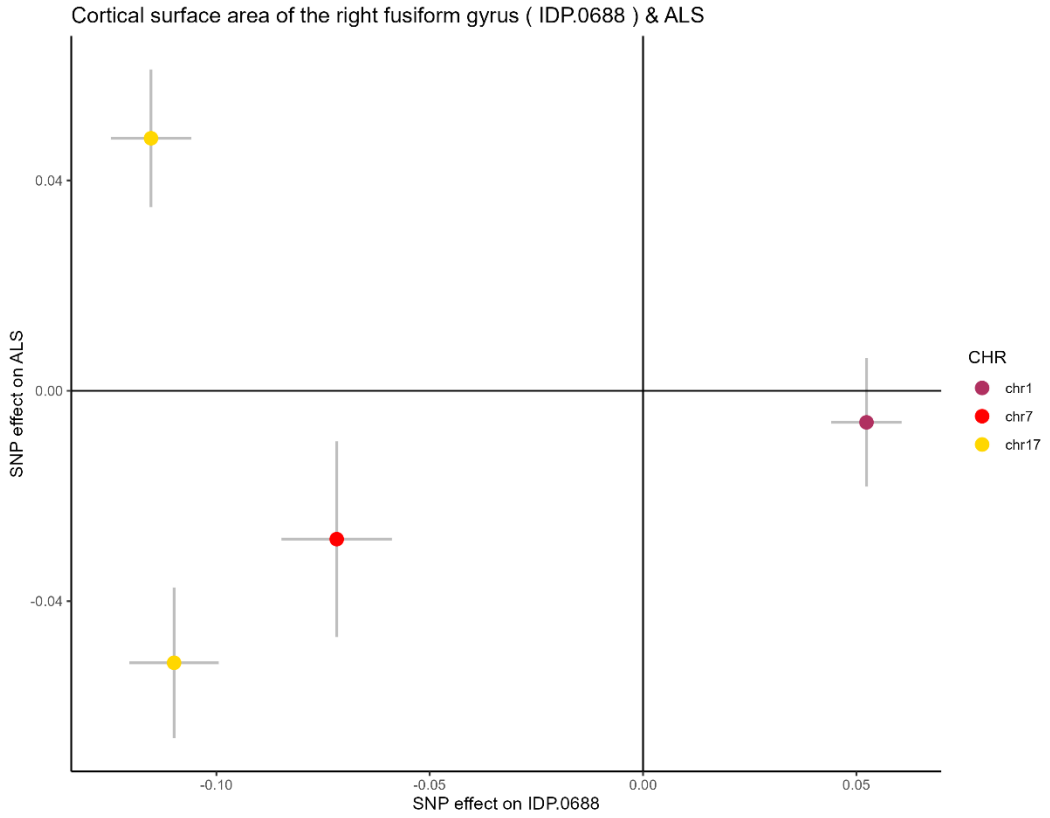


Supplementary Figure 4. LDSC histogram and pie chart

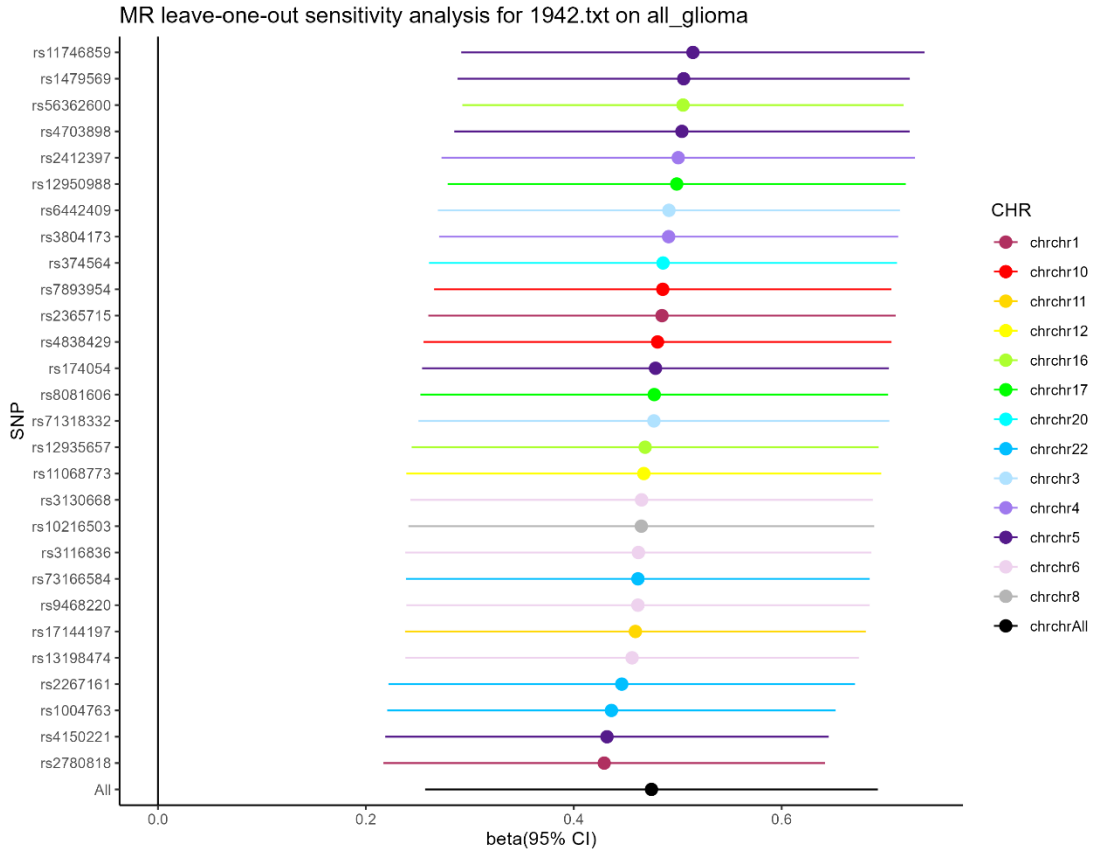


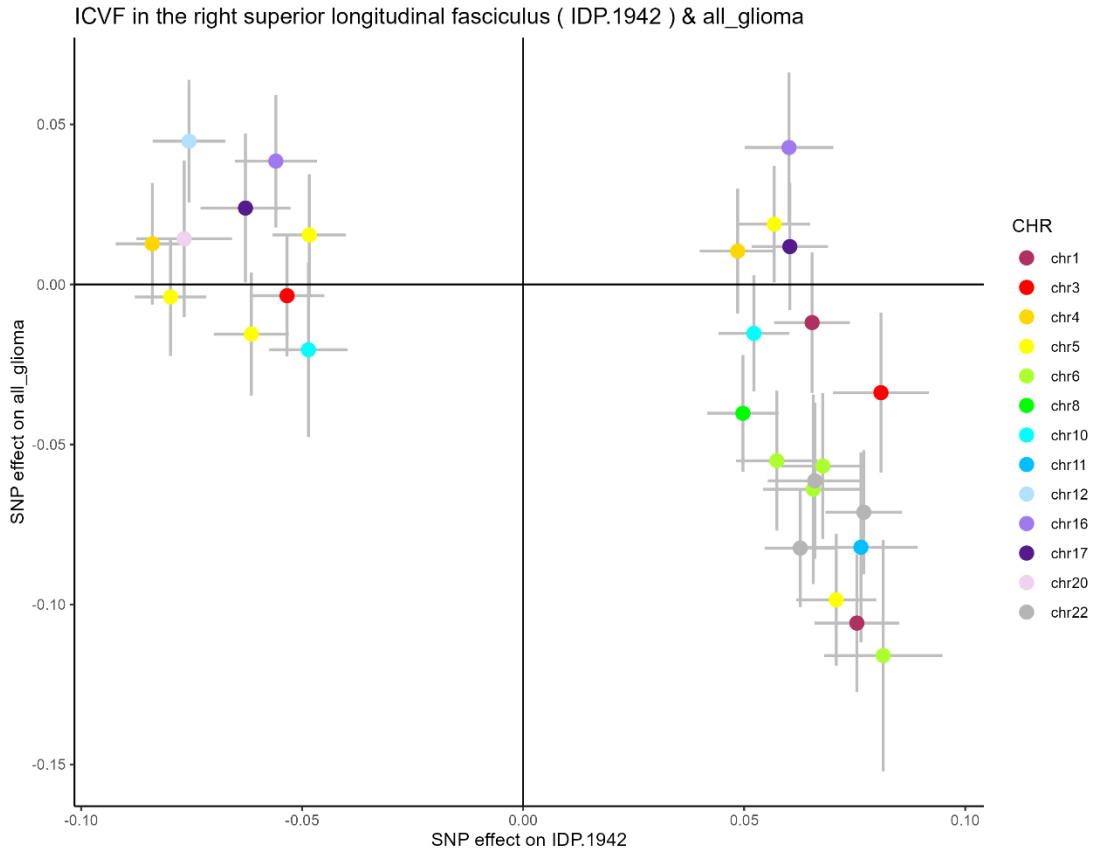
Supplementary Figure 5. The leave-one-out plot, and scatter plot for the association of Cortical surface area of the right fusiform gyrus (IDP.0688) and ALS in primary analysis.



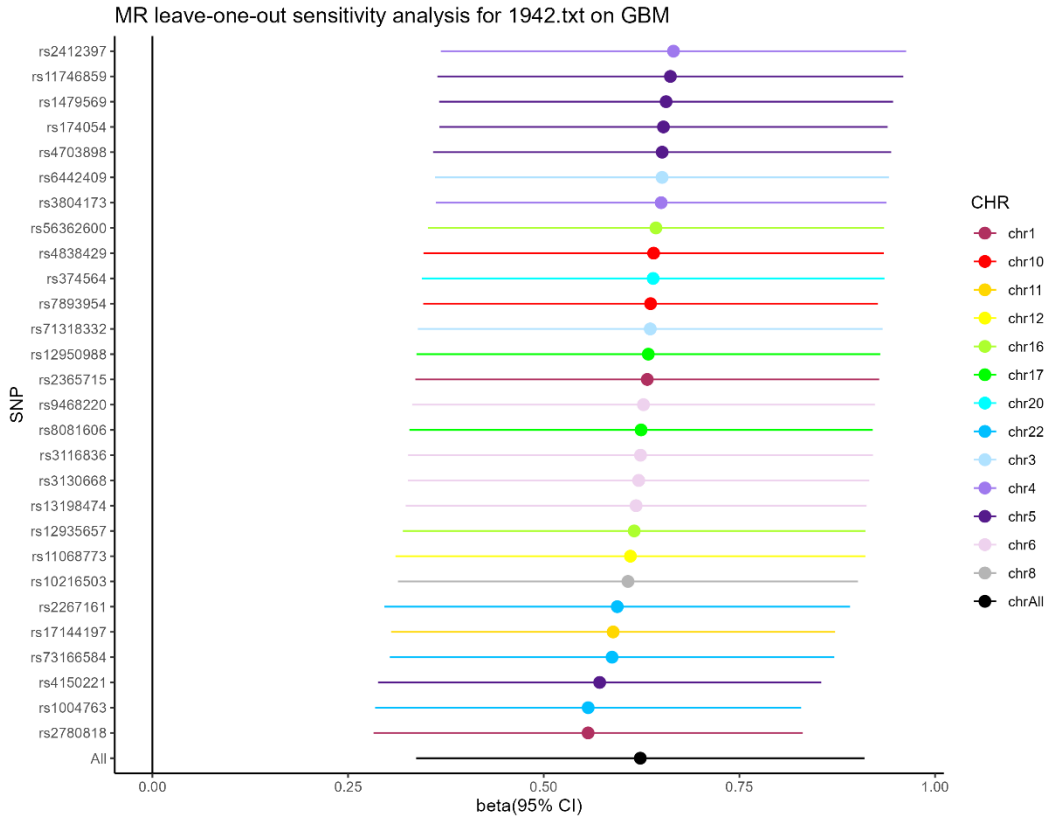


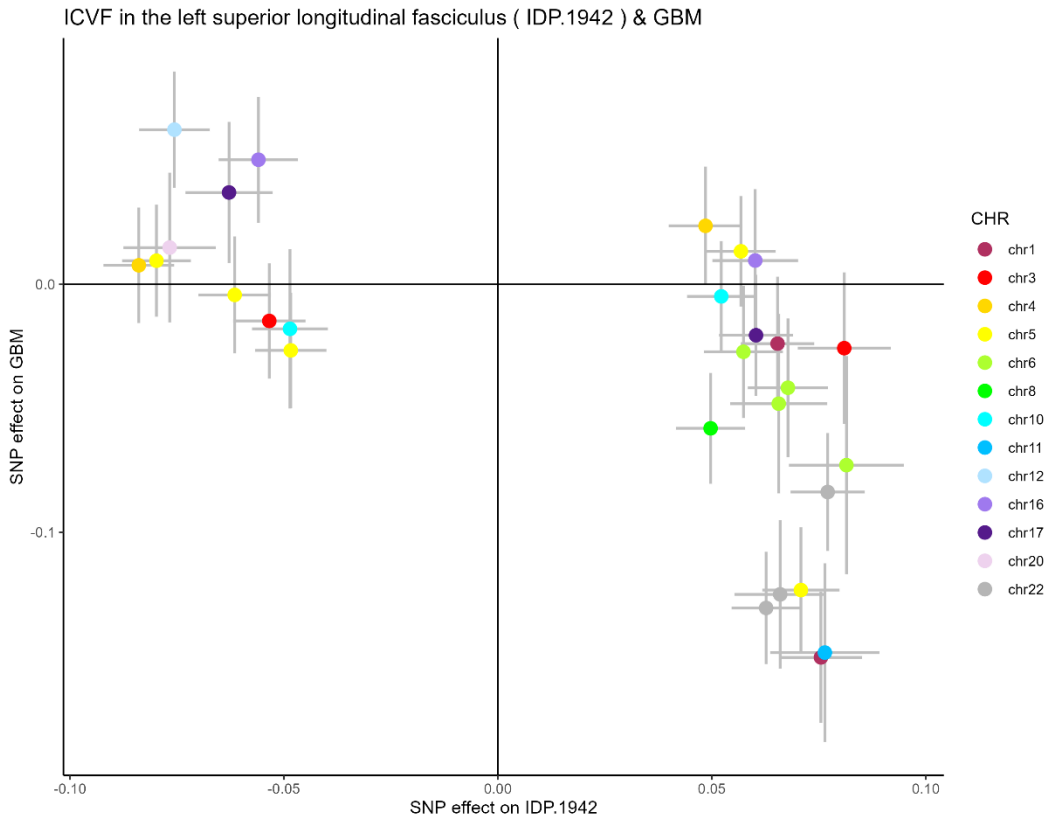
Supplementary Figure 6. The leave-one-out plot, and scatter plot for the association of ICVF in the right superior longitudinal fasciculus (IDP.1942) and all glioma in primary analysis.





Supplementary Figure 7. The leave-one-out plot, and scatter plot for the association of ICVF in the right superior longitudinal fasciculus (IDP.1942) and GBM in primary analysis.





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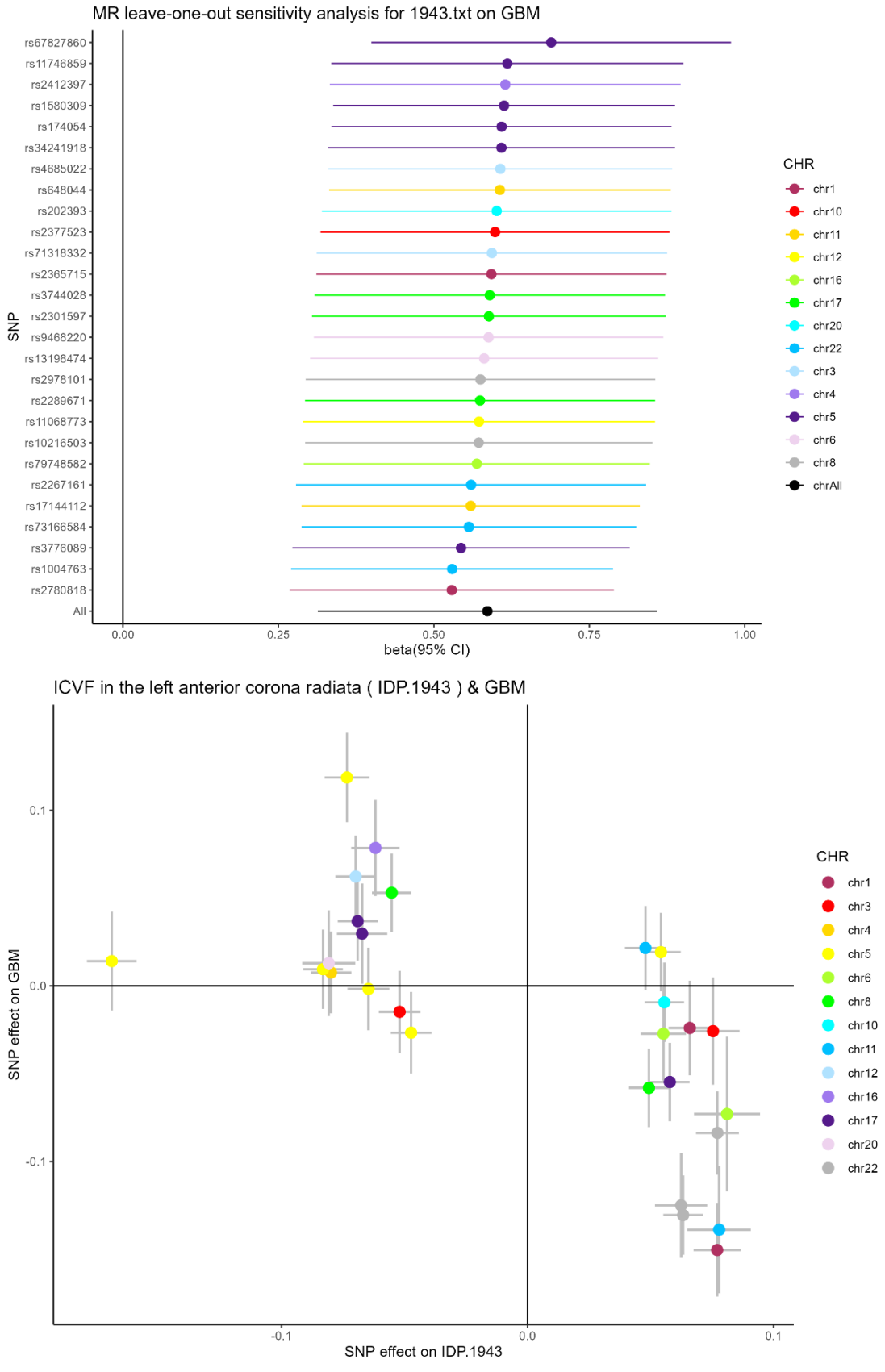
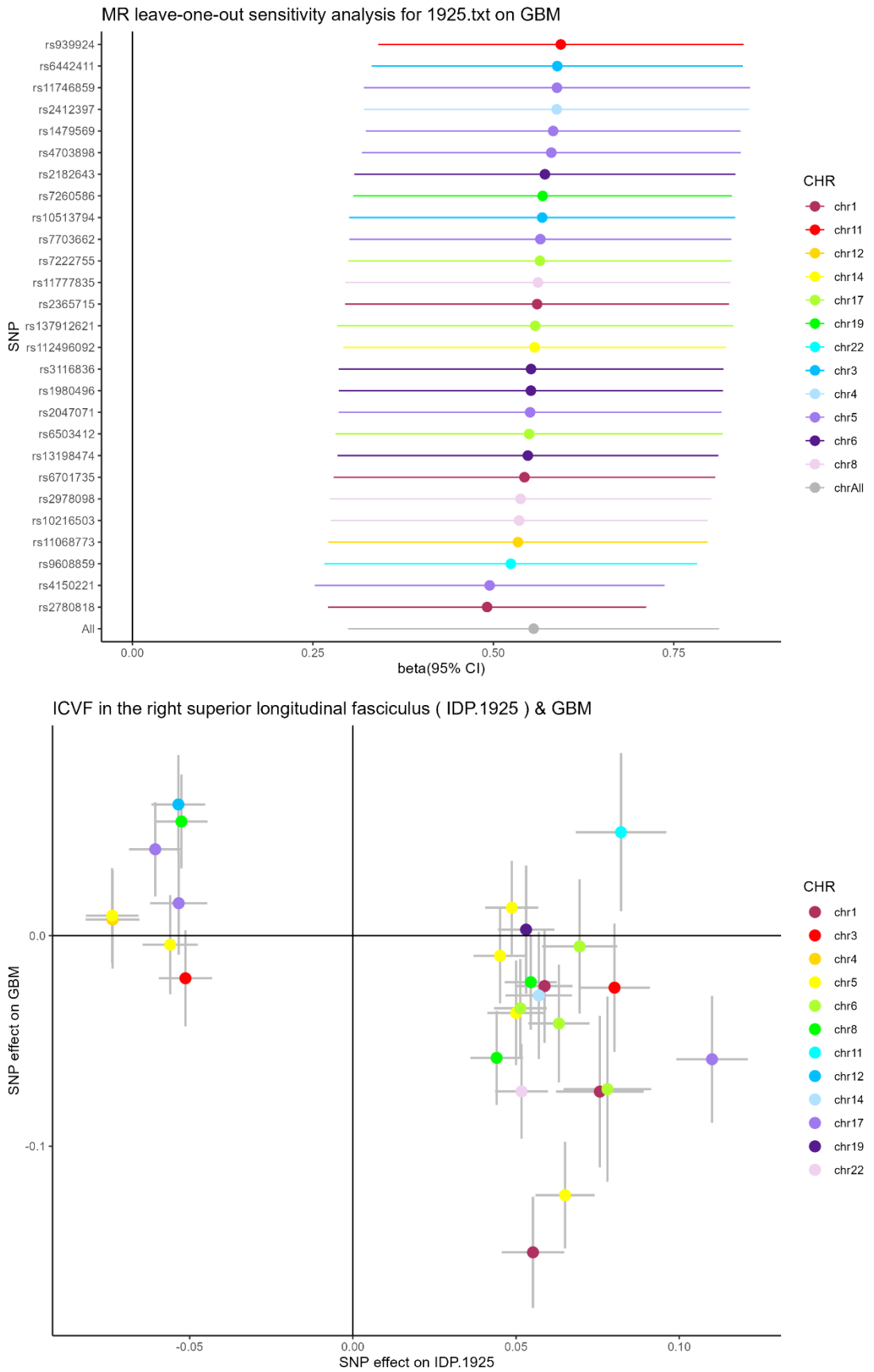
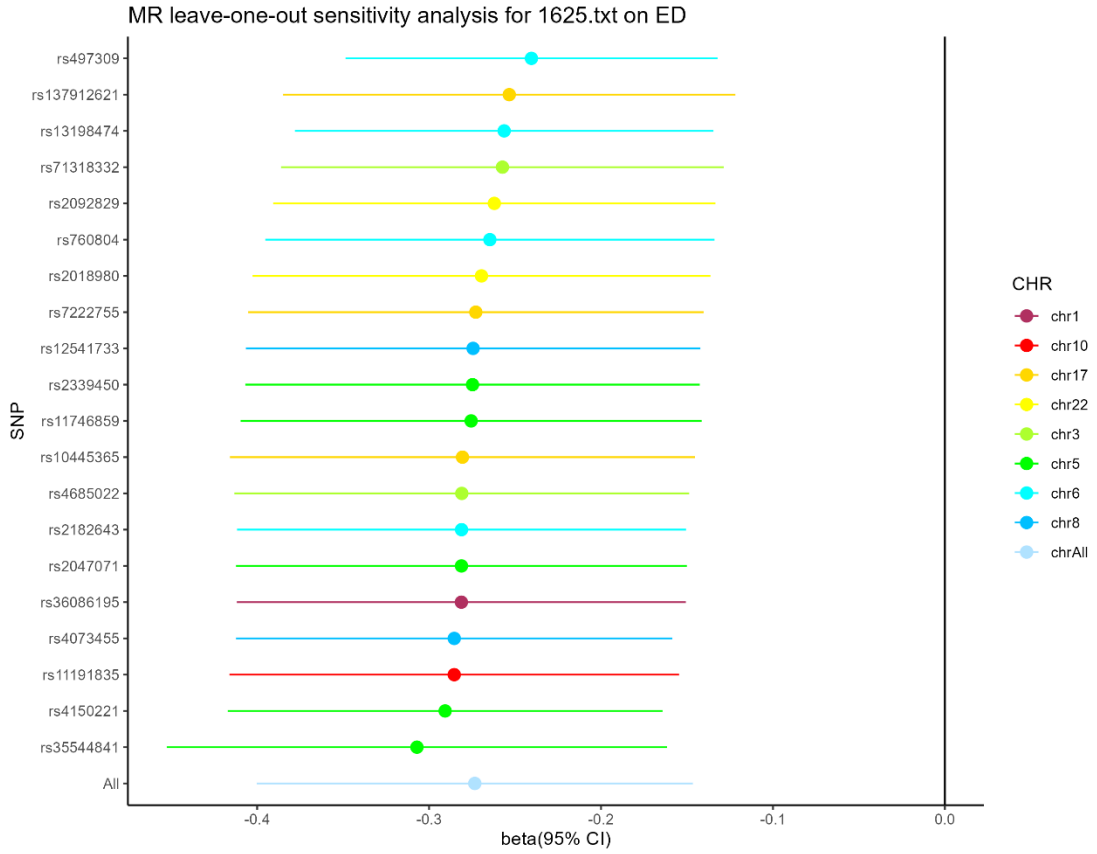
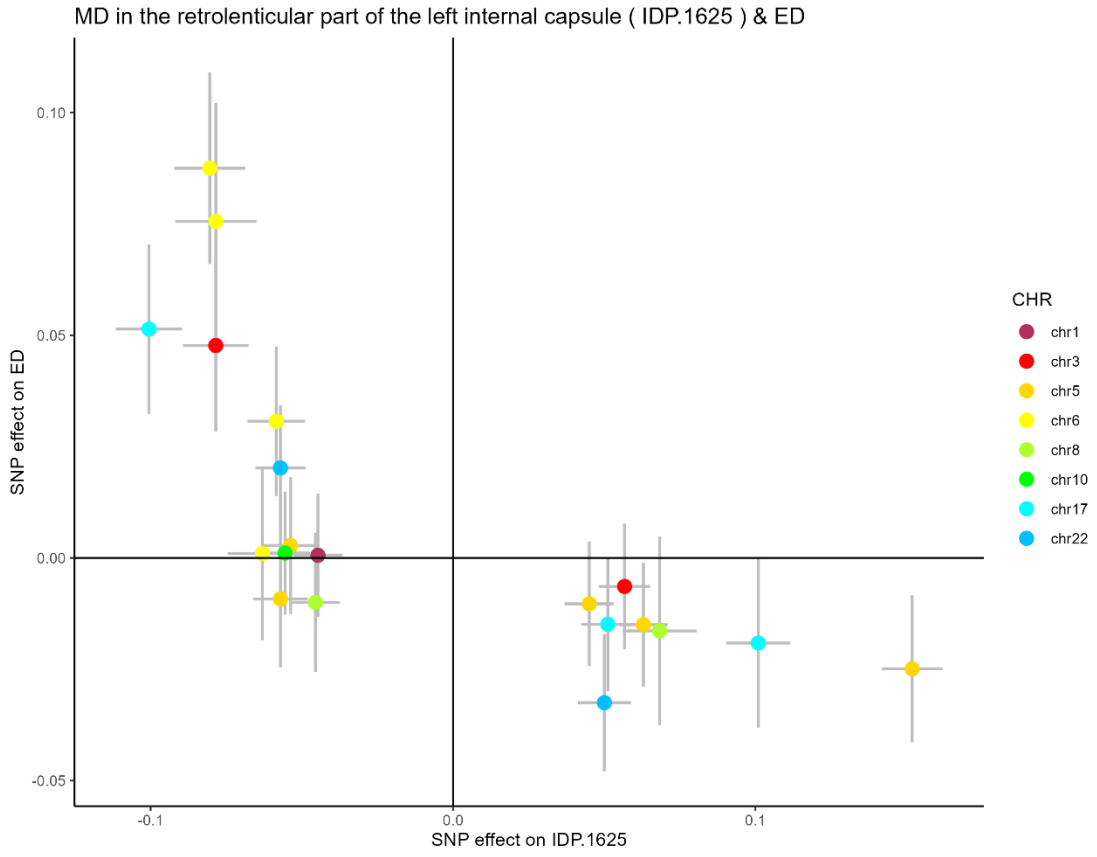


Supplementary Figure 9. The leave-one-out plot, and scatter plot for the association of ICVF in the left anterior corona radiata (IDP.1925) and GBM in primary analysis.

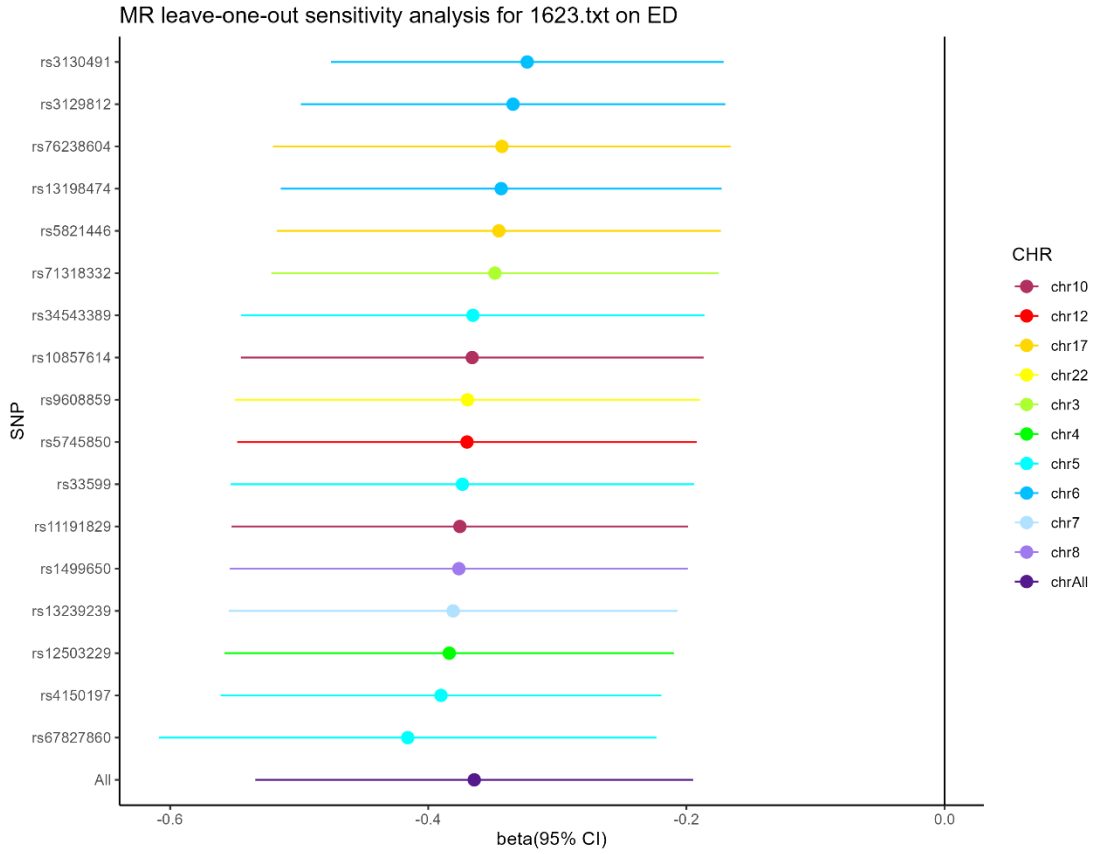


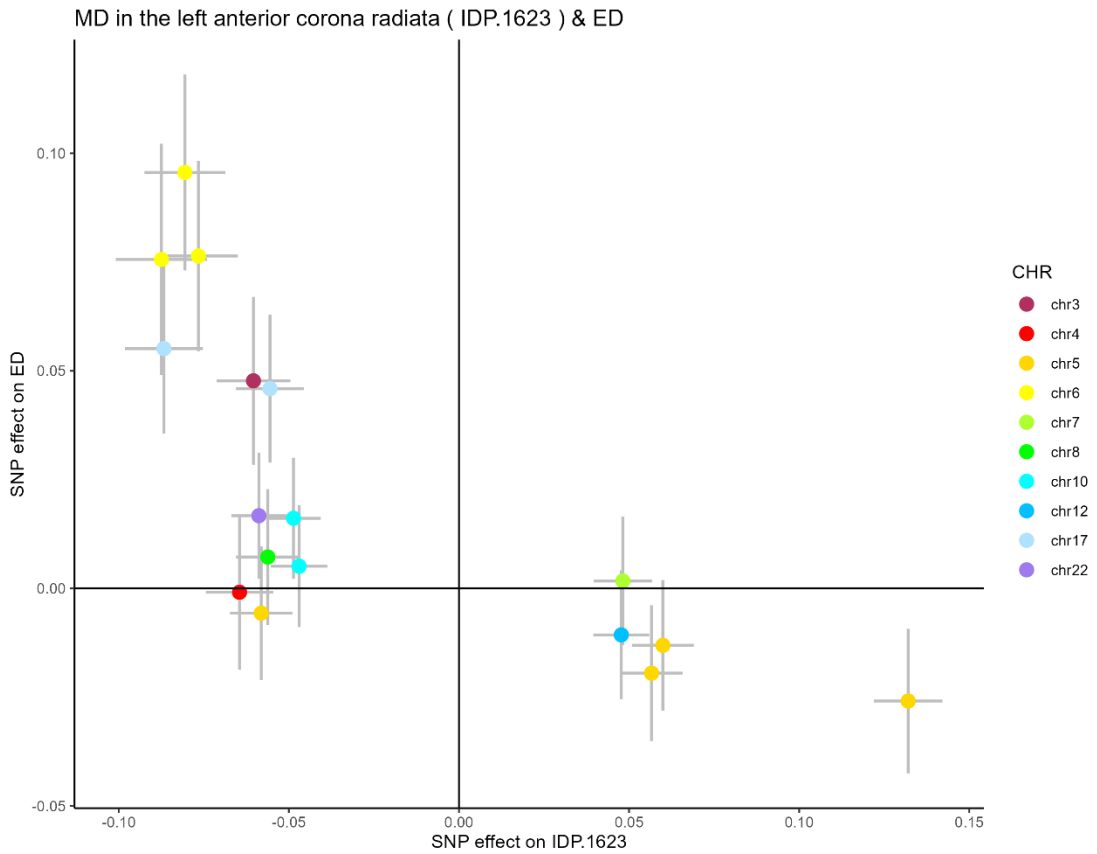
Supplementary Figure 10. The leave-one-out plot, and scatter plot for the association of MD in the left anterior corona radiata (IDP.1625) and ED in primary analysis.



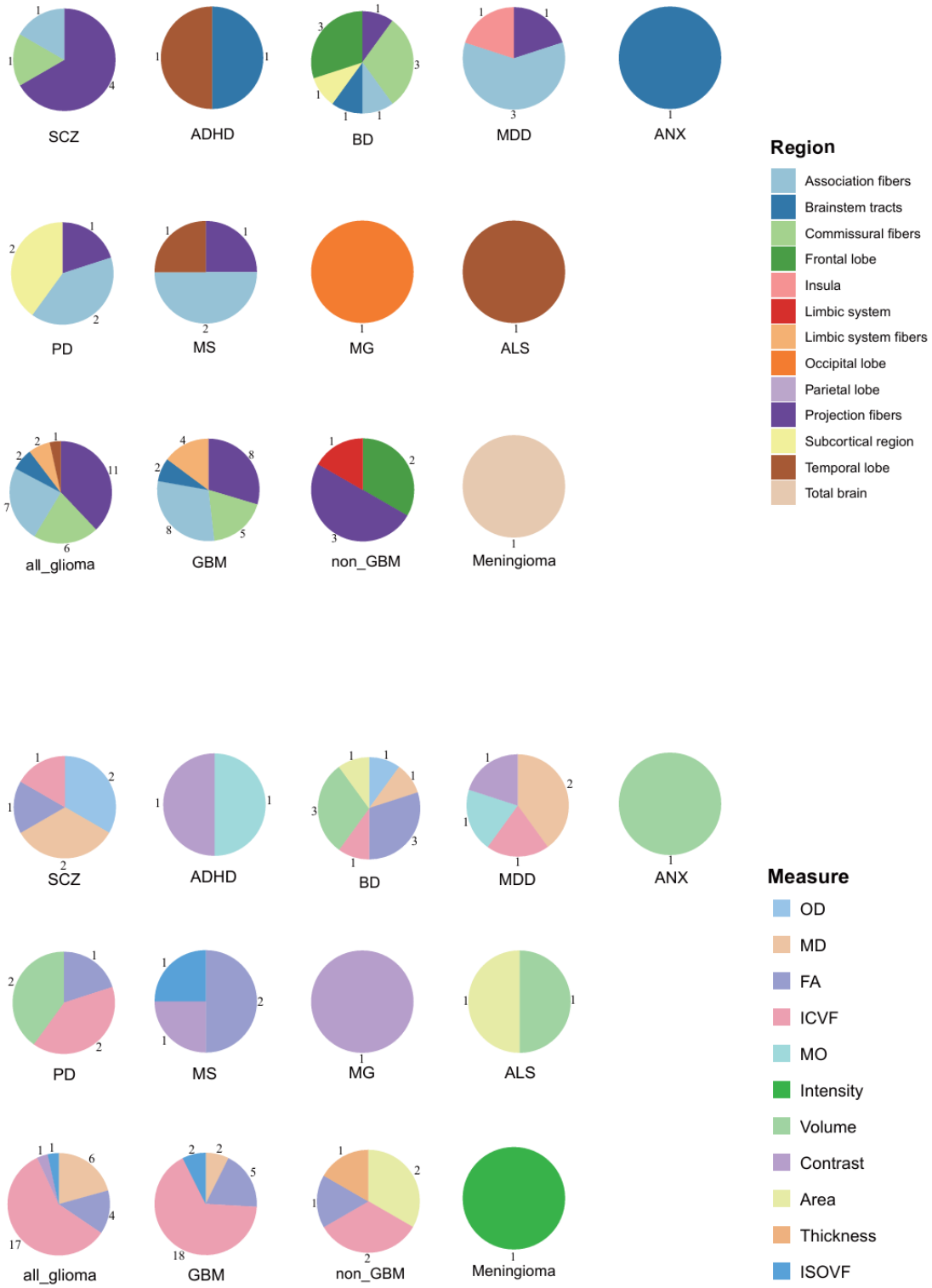


Supplementary Figure 11. The leave-one-out plot, and scatter plot for the association of MD in the retrolenticular (IDP.1623) and ED in primary analysis.





Supplementary Figure 12. Mendelian randomization analysis pie chart



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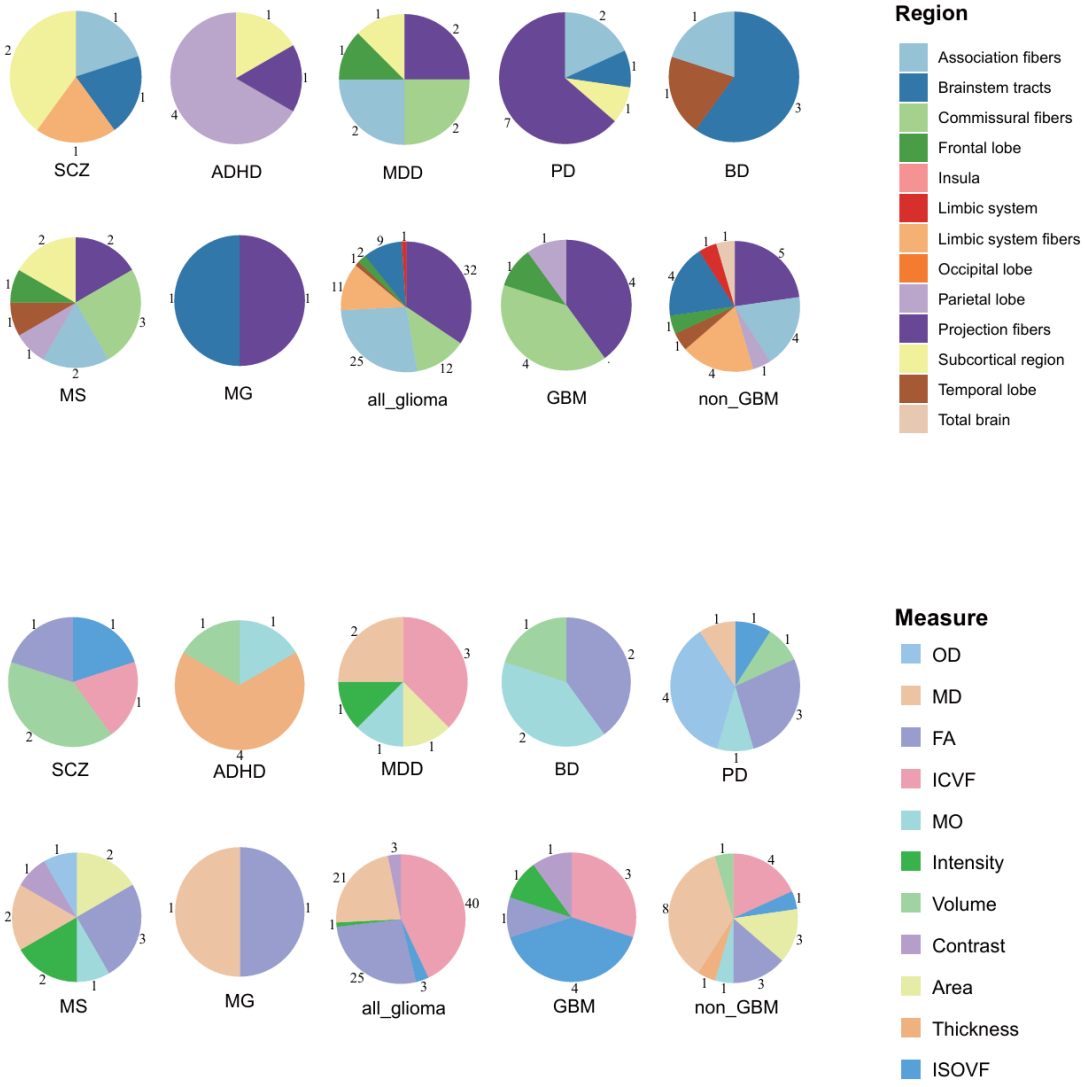
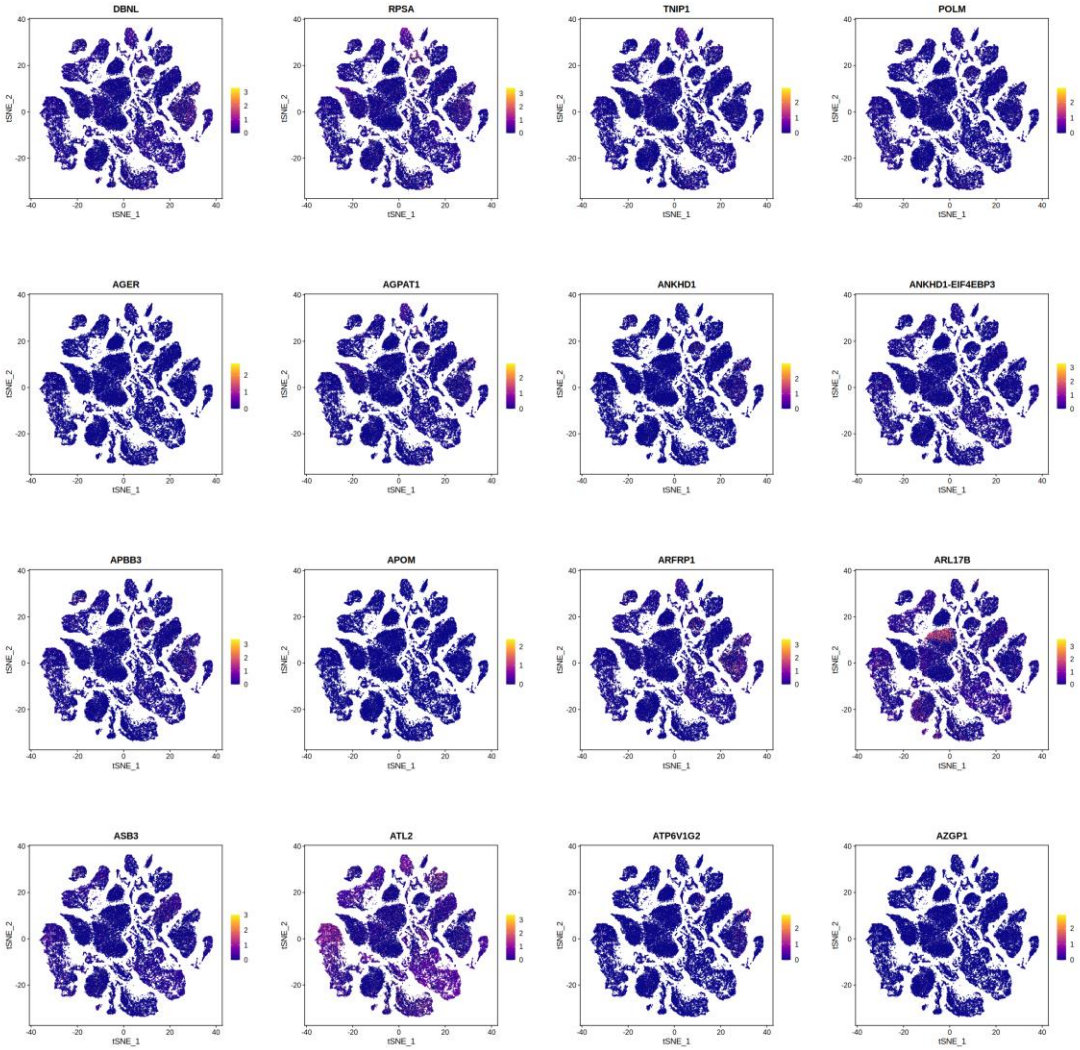
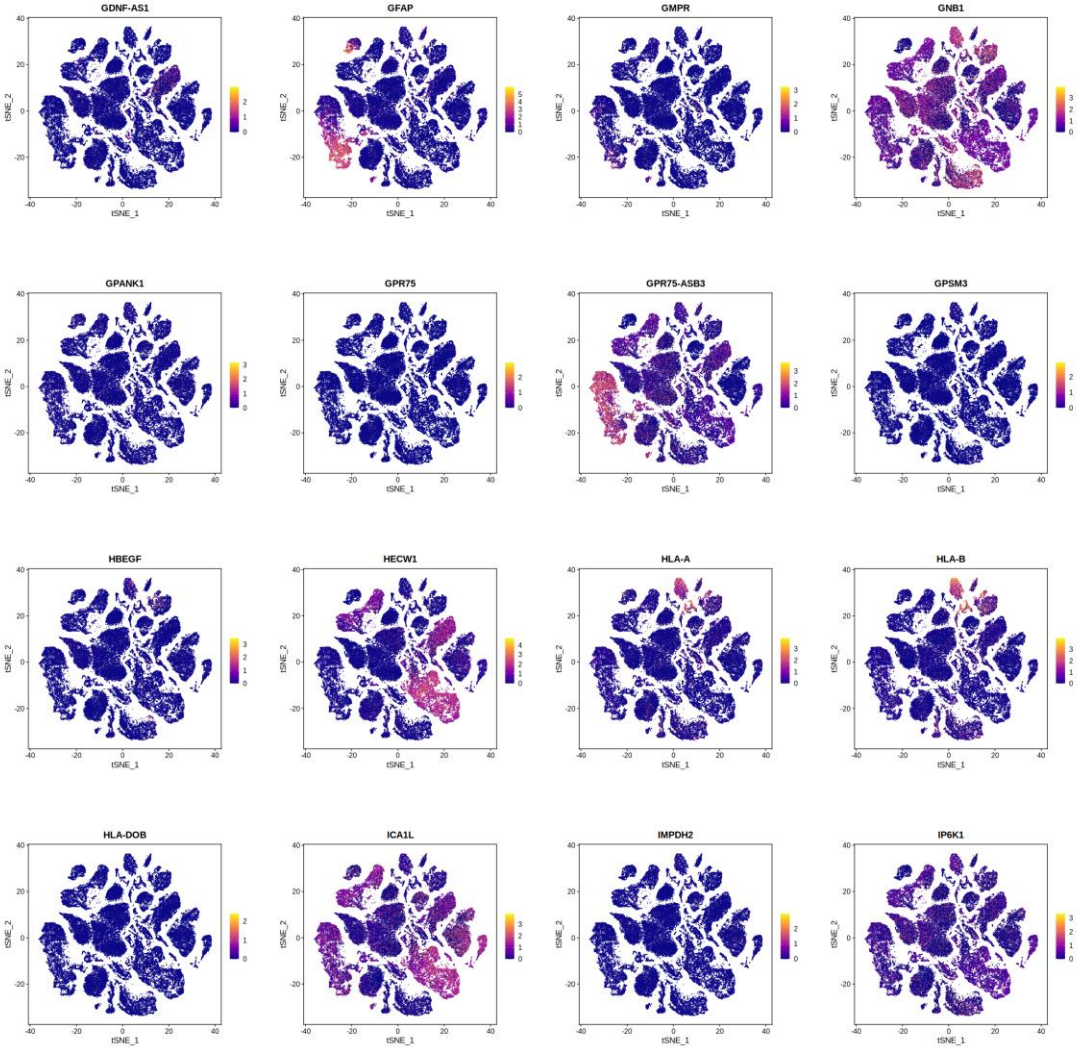


Supplementary Figure 14. The expression levels of pleiotropic genes across various cell populations using scRNA-seq data, visualized through tSNE.

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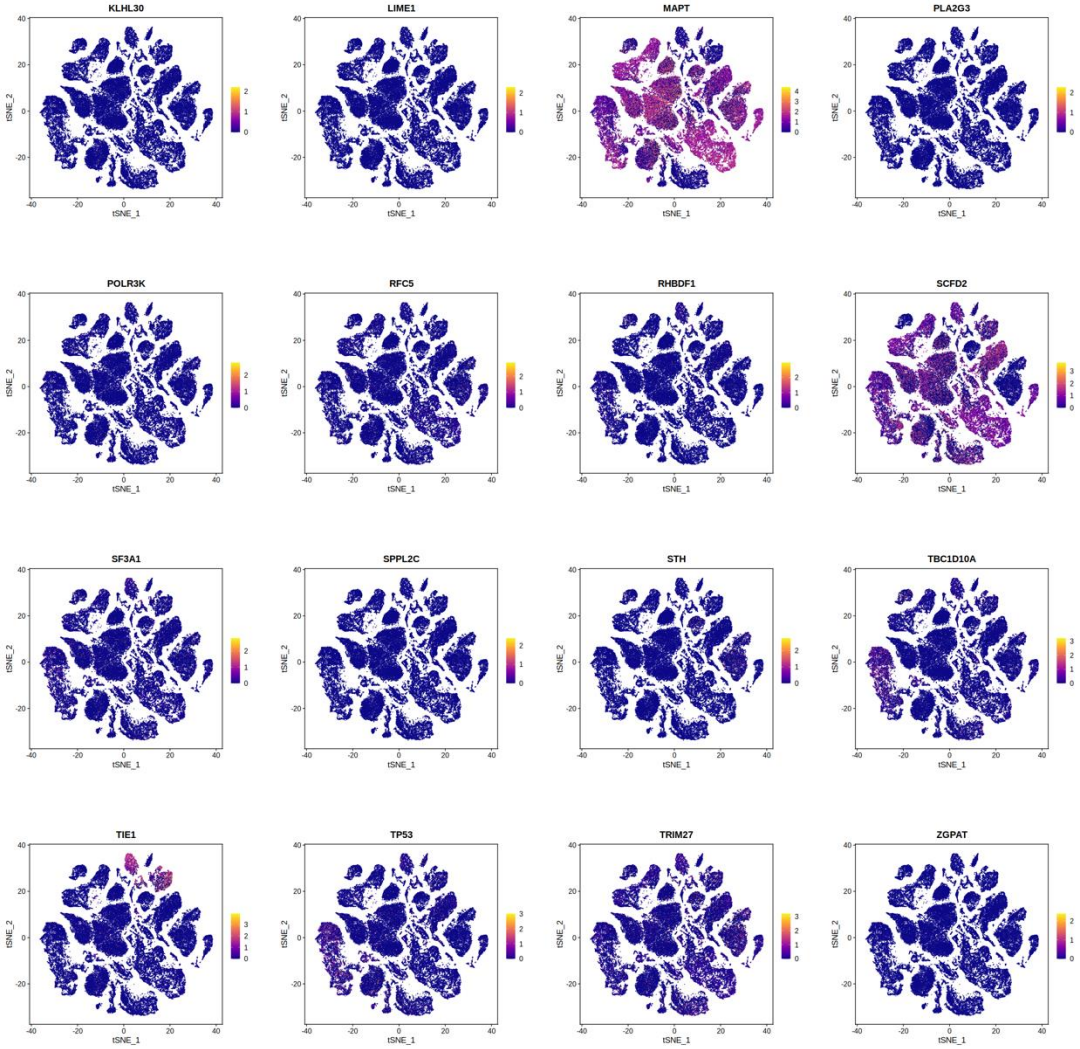
HLA-DOB
ICA1L
IMPDH2
IP6K1
tSNE_1
tSNE_2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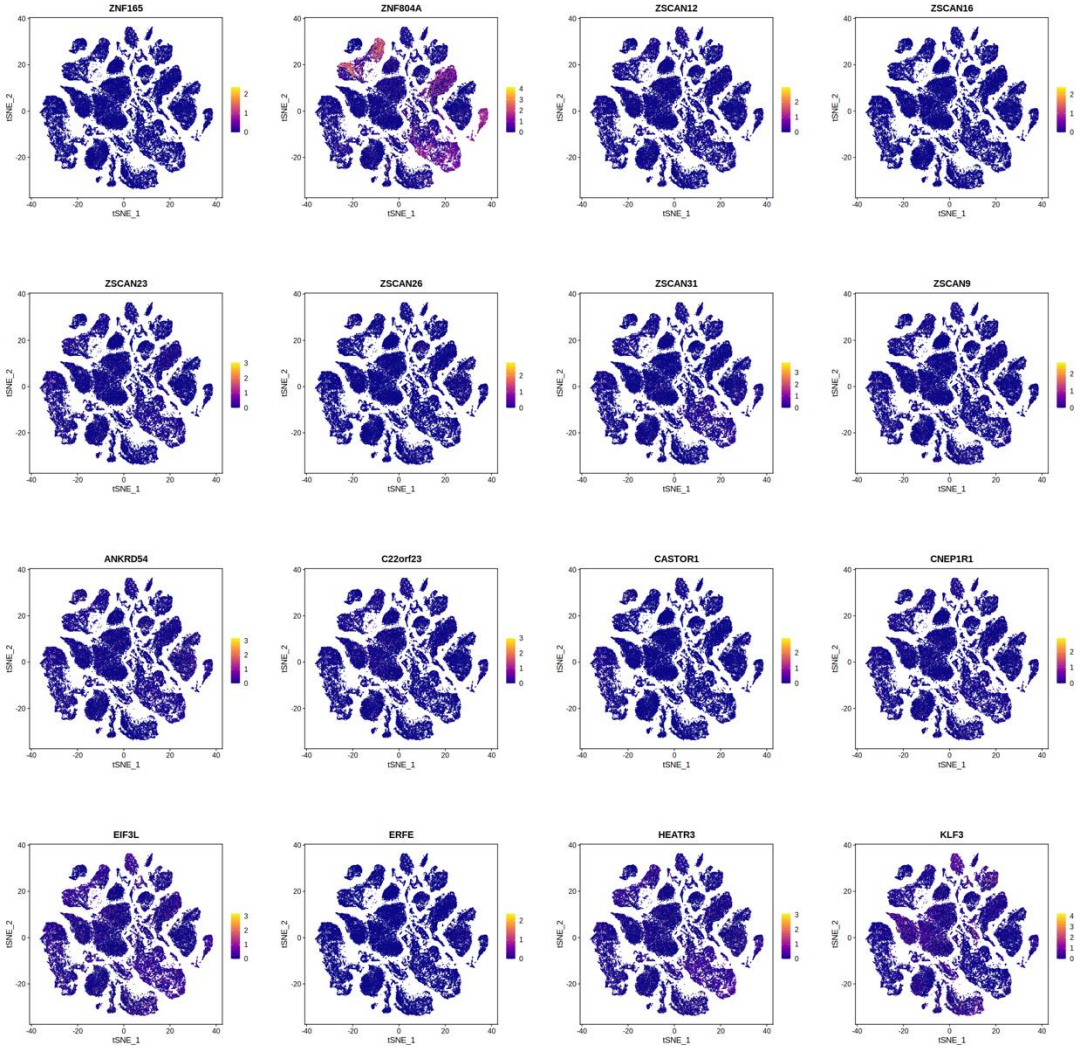
ZGPAT
tSNE_1
tSNE_2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tSNE_1
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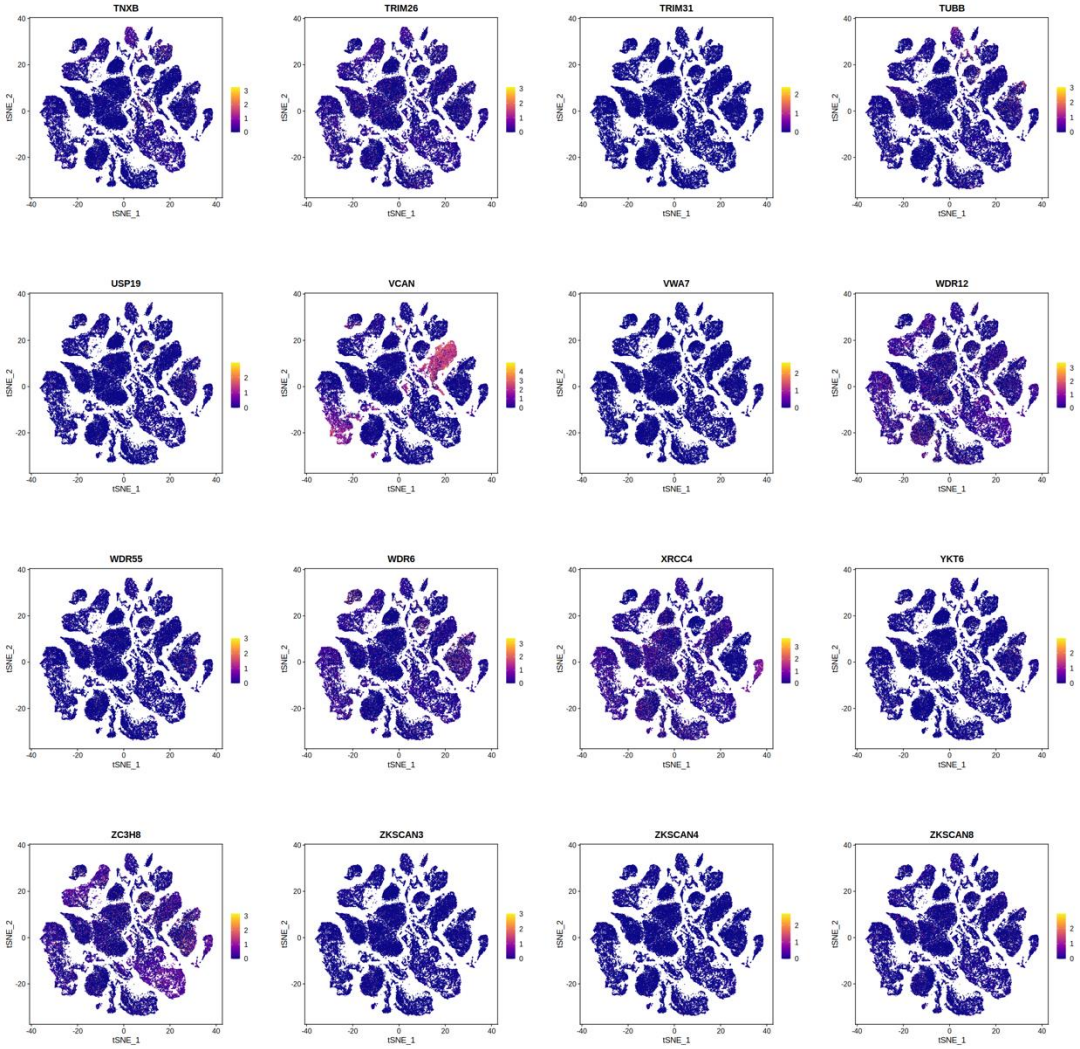
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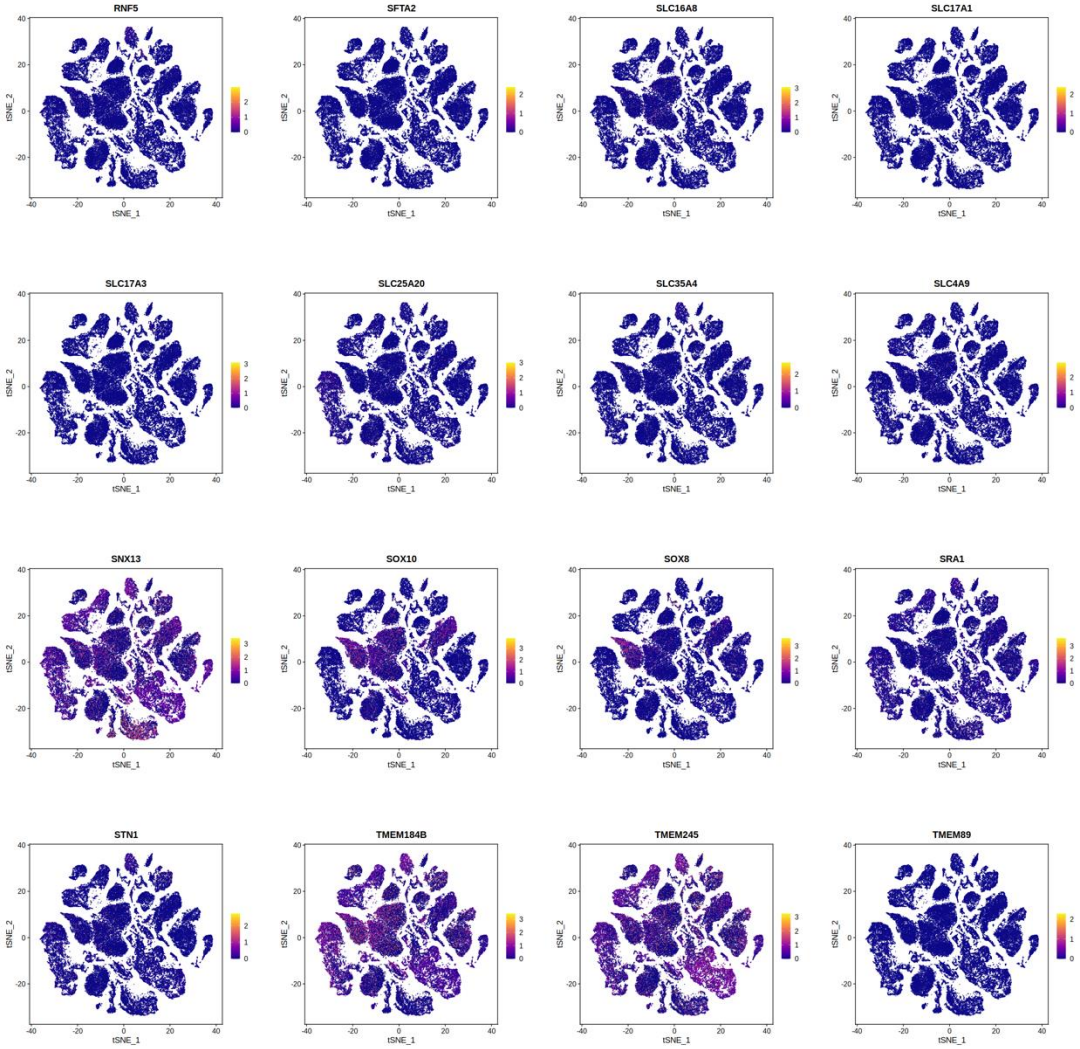
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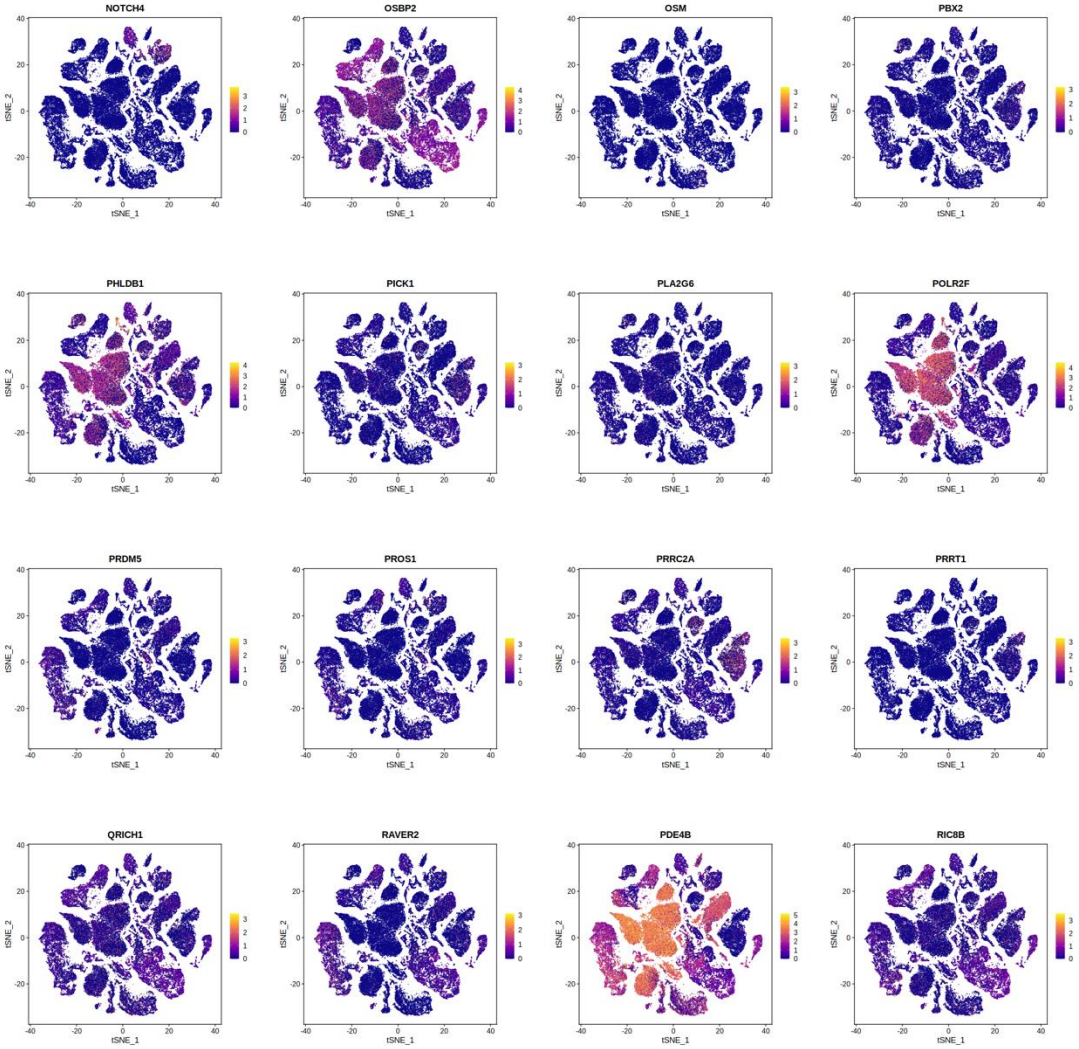
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PBX2
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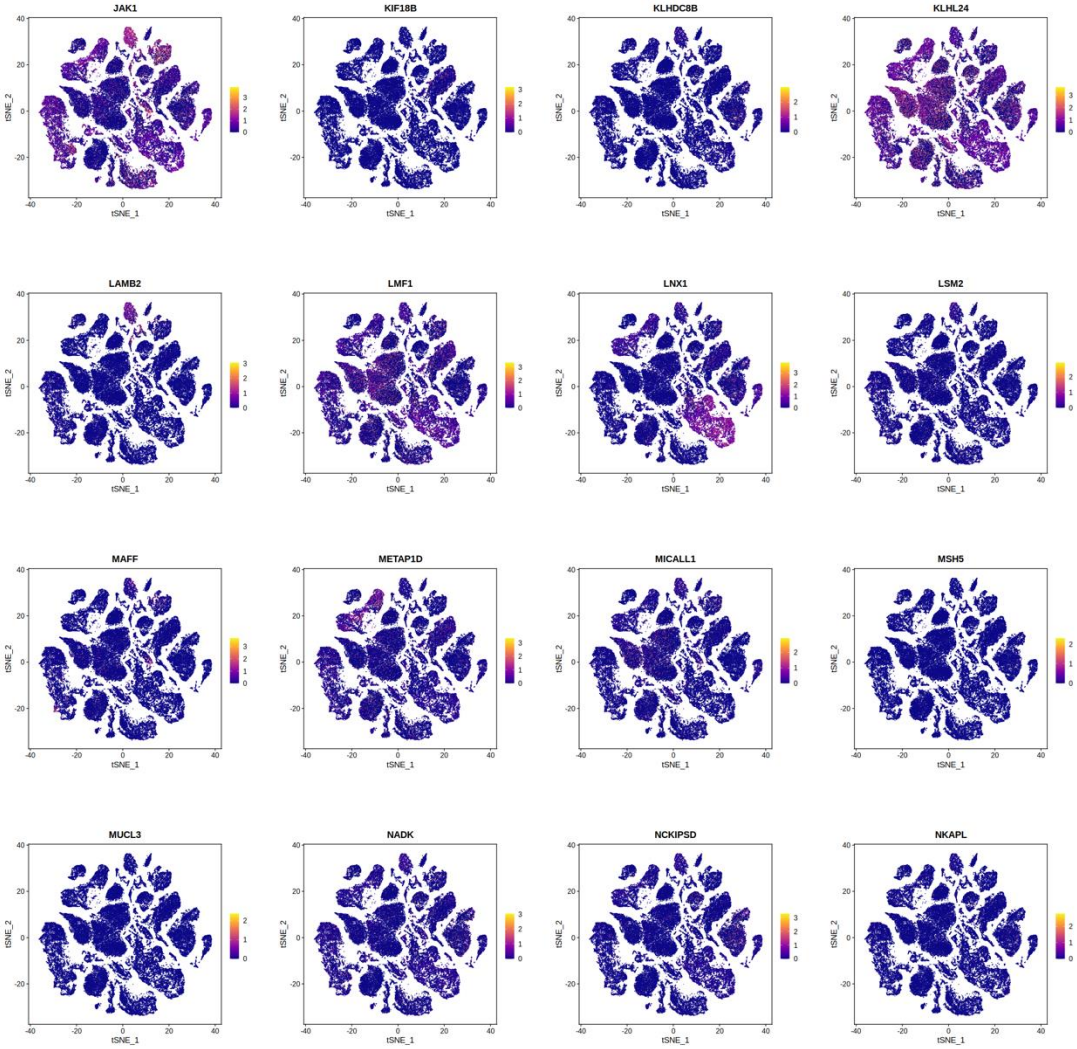
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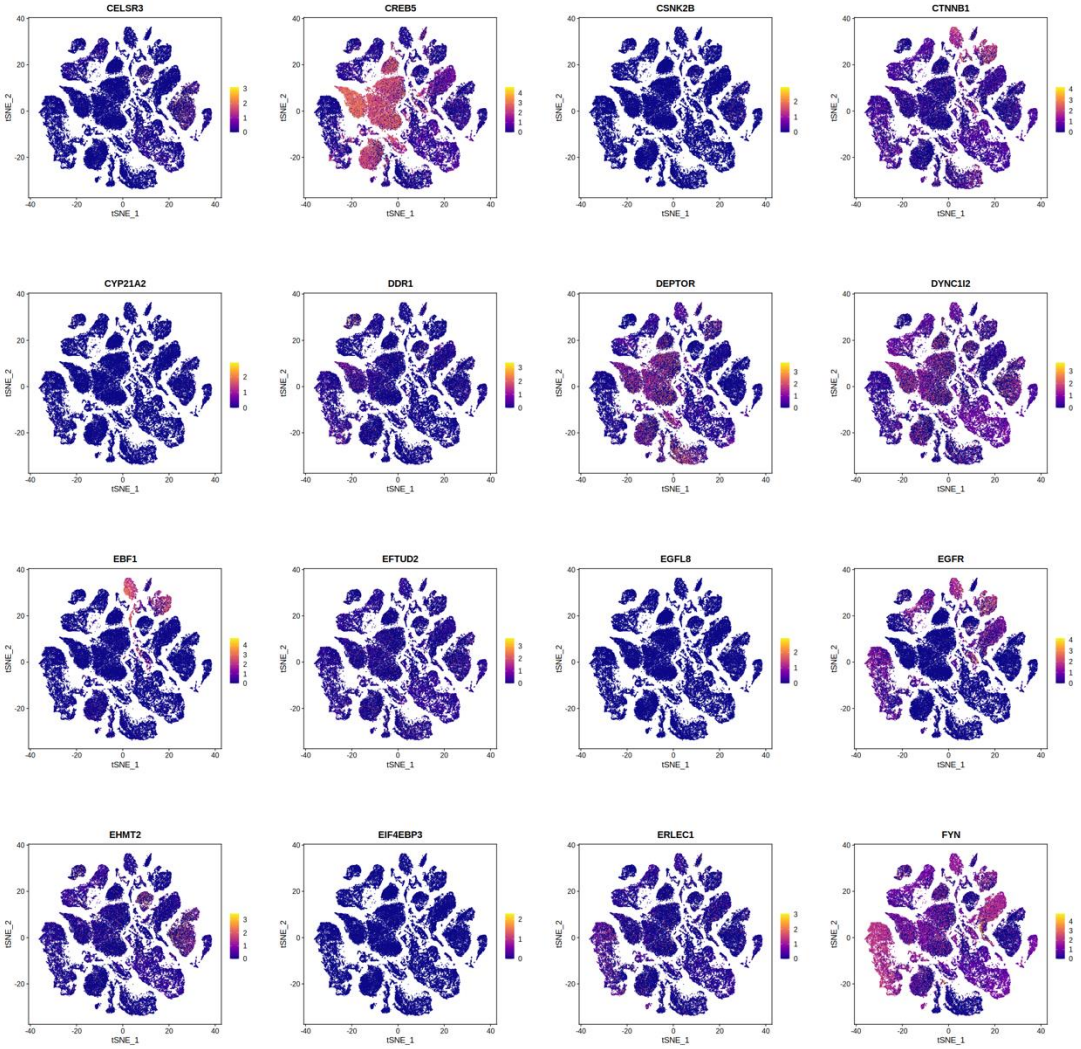
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EHMT2
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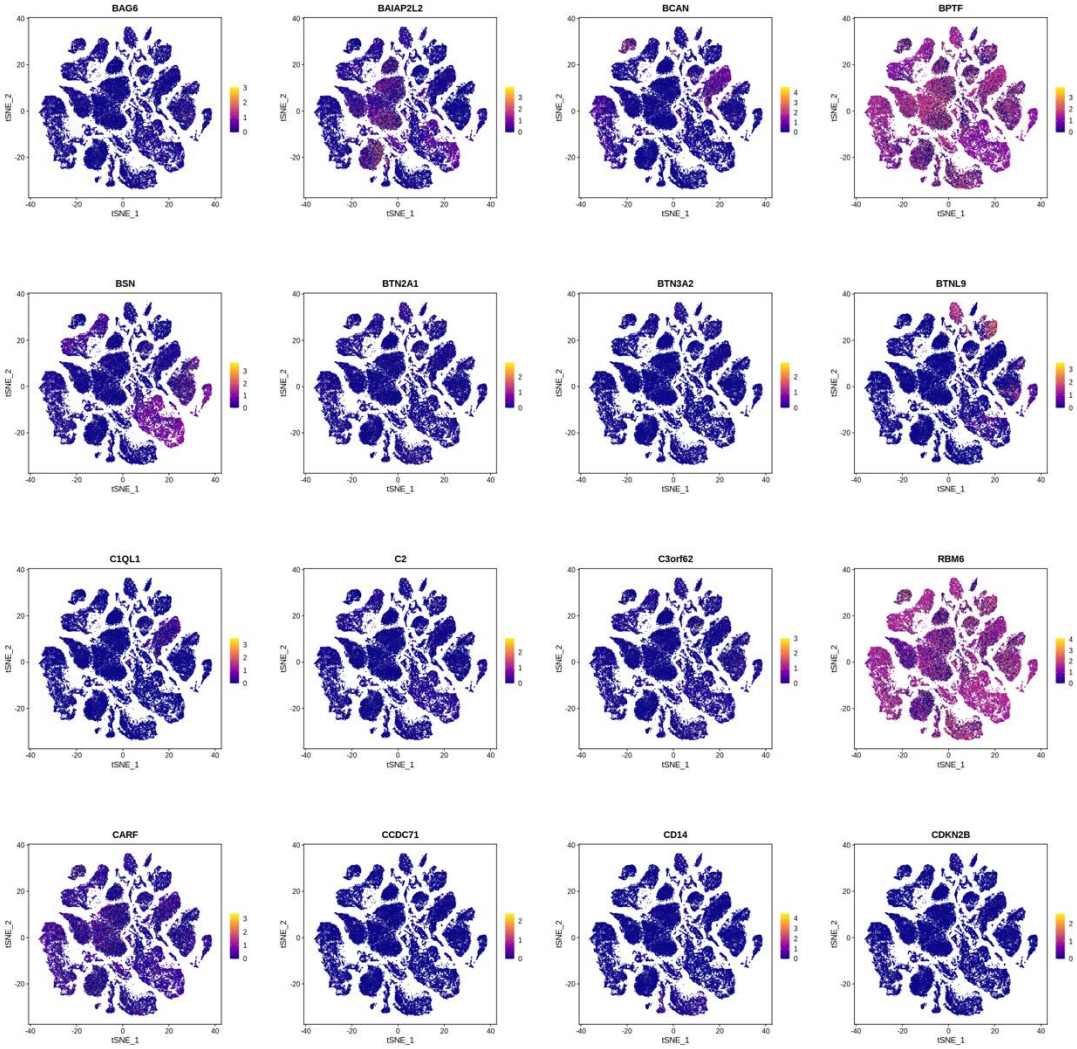
ERLEC1
FYN
tSNE_1
tSNE_2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BSN
BTN2A1
BTN3A2
BTNL9
C1QL1
C2
C3orf62
RBM6
CARF
CCDC71
CD14
CDKN2B
tSNE_1
tSNE_2

2 Supplementary Tables

2.1 ICD codes used to brain diseases.

The results are shown in the attached EXCEL sheet. **Supplementary Table 1.**

2.2 Information of the IDPs.

The results are shown in the attached EXCEL sheet. **Supplementary Table 2.**

2.3 Details of clinical predictors..

The results are shown in the attached EXCEL sheet. **Supplementary Table 3.**

2.4 Multivariate Cox regression analysis between IDPs and brain diseases adjusting for covariates.

The results are shown in the attached EXCEL sheet. **Supplementary Table 4.**

2.5 The results of corresponding C index by each machine-learning method.

The results are shown in the attached EXCEL sheet. **Supplementary Table 5.**

2.6 IDPs selected for each fold of the prediction model.

The results are shown in the attached EXCEL sheet. **Supplementary Table 6.**

2.7 The results of genetic correlation and forward MR analysis between IDPs and disorders.

The results are shown in the attached EXCEL sheet. **Supplementary Table 7.**

2.8 The forward MR analysis results.

The results are shown in the attached EXCEL sheet. **Supplementary Table 8.**

2.9 Sensitive results of forward MR analyses.

The results are shown in the attached EXCEL sheet. **Supplementary Table 9.**

2.10 The reverse MR analysis results.

The results are shown in the attached EXCEL sheet. **Supplementary Table 10.**

2.11 Sensitive results of reverse MR analyses.

The results are shown in the attached EXCEL sheet. **Supplementary Table 11.**

2.12 The result of colocalization analysis.

The results are shown in the attached EXCEL sheet. **Supplementary Table 12.**

2.13 The result of MAGMA.

The results are shown in the attached EXCEL sheet. **Supplementary Table 13.**

2.14 The result of PLACO.

The results are shown in the attached EXCEL sheet. **Supplementary Table 14.**

2.15 The GENE of enrichment analysis.

The results are shown in the attached EXCEL sheet. **Supplementary Table 15.**

3 Supplementary Note

The Supplementary Tables mentioned above can be downloaded via the provided link: http://s.n0i.cn/36QXaJ.