

### **Description of Additional Supplementary Files**

File Name: Supplementary Data 1

Description: Patient sample information.

File Name: Supplementary Data 2

Description: Quality control for short- and long-read transcriptomes.

File Name: Supplementary Data 3

Description: Four integrated gene sets of spatial transcriptional modules.

File Name: Supplementary Data 4

Description: Gene Ontology enrichment analysis of Biological Process (BP) for all glioma modules.

File Name: Supplementary Data 5

Description: Niche-specific differentially expressed isoforms across all samples.

File Name: Supplementary Data 6

Description: Survival-related splice junctions from differentially expressed isoforms.

File Name: Supplementary Data 7

Description: A list of RG-Vs-AC-specific genes based on Bhaduri et al. GBM scRNA-seq.

File Name: Supplementary Data 8

Description: Predicted ligand-receptor pairs in each module.

File Name: Supplementary Data 9

Description: Gene expression dynamics along the spatial tumor invasion trajectory.

File Name: Supplementary Data 10

Description: Gene Ontology enrichment analysis of BP for genes in the GCL\_TI\_RG signature.