**Supplemental Materials**

Supplemental Table 1 Sample Information

Supplemental Table 2 Ligand-Receptor Pair List and Ligand Receptor Genes

Supplemental Table 3 Different Cell-Cell Interactions Between Pretreatment Responders and Nonresponders

Supplemental Table 4 Relative Differences in Changes from Pretreatment to Posttreatment Status Between Responders and Nonresponders

Supplemental Table 5 Differentially Expressed Genes Between CAFs and Myofibroblasts

Supplemental Table 6: GSVA between CAFs and Myofibroblasts

Supplemental Table 7 Differentially Expressed Ligands/Receptors Across the 4 Branches of Exhausted CD8 T cells in Responders

Supplemental Table 8 GSVA of the 4 Branches of Exhausted CD8 T cells in Responders

Supplemental Table 9 Differentially Expressed Genes Between Pretreatment- and Posttreatment Status in Cluster 1 Exhausted CD8 T cells in responders

Fig. S1 Specific Comparison of Each Ligand-receptor Interaction in Pretreatment responders with Each Ligand-receptor Interaction in Pretreatment Nonresponders. *Notes, a Ratio (pretreatment responders/nonresponders) >1 indicates that a higher interaction intensity existed in responders than in nonresponders (shown in red). A Ratio (pretreatment responders/nonresponders) <1 indicates that a lower interaction intensity exists in responders than in nonresponders (shown in blue).*

Fig. S2 Overlapping Genes Between Our Ligand or Receptor Genes and the 693 Differentially Expressed Genes (DEGs) Identified in the Hugo et al. Study Between Pretreatment Responders and Pretreatment Nonresponders. *Notes, a Ratio (pretreatment responders/nonresponders) >1 indicates that a higher interaction intensity existed in responders than in nonresponders (shown in red). A Ratio (pretreatment responders/nonresponders) <1 indicates that a lower interaction intensity exists in responders than in nonresponders (shown in blue).*

Fig. S3 Relative Differences (Responders vs. Nonresponders) in Changes from Pretreatment to Posttreatment Status. *Notes,* *a “Relative Ratio” between responders and nonresponders >1 means that the interaction intensity was relatively increased in responders or relatively decreased in nonresponders during treatment (shown in red). A “relative ratio” between responders and nonresponders <1 means that the interaction intensity was relatively decreased in responders or relatively increased in nonresponders during treatment (shown in blue).*

Fig.S4 Overlapping Genes Between Our Ligand or Receptor Genes and with 2,670 DEGs that changed differentially from pretreatment to posttreatment status between responders and nonresponders in the Riaz et al. study. *Notes,* *a “Relative Ratio” between responders and nonresponders >1 means that the interaction intensity was relatively increased in responders or relatively decreased in nonresponders during treatment (shown in red). A “relative ratio” between responders and nonresponders <1 means that the interaction intensity was relatively decreased in responders or relatively increased in nonresponders during treatment (shown in blue).*

Fig. S5 DEGs and GSVA between CAFs and Myofibroblasts.

Fig. S6 Validation of the Ligand/receptor Expression Patterns Identified in Our Study with Other Immunotherapy Datasets using the TIDE Platform. *Notes, genes that showed all red or all blue indicated a high correlation with immunotherapy response.*