What is claimed is:

1. An anti-LILRB2 antibody or an antigen-binding fragment thereof, comprising a clone-paired heavy chain variable region and light chain variable region as set forth in **Figure 1**.

2. The antibody or antigen-binding fragment thereof of claim 1, wherein
   (a) the heavy chain variable region has an amino acid sequence of SEQ ID NO: 25 and the light chain variable region has an amino acid sequence of SEQ ID NO: 26; or
   (b) the heavy chain variable region has an amino acid sequence of SEQ ID NO: 31 and the light chain variable region has an amino acid sequence of SEQ ID NO: 32.

3. The antibody or antigen-binding fragment thereof of any one of the preceding claims, further comprising an immunoglobulin constant region, optionally a constant region of IgG, or optionally a constant region of human IgG, or optionally a constant region of IgG4, or optionally a constant region of hinge-stabilized IgG4.

4. The antibody or antigen-binding fragment thereof of any one of the preceding claims, which is a humanized or fully human antibody.

5. The antibody or antigen-binding fragment thereof of any one of the preceding claims, which is a camelized single domain antibody, a diabody, a scFv, a scFv dimer, a BsFv, a dsFv, a $(dsFv)_2$, a dsFv-dsFv', an Fv fragment, a Fab, a Fab', a $F(ab')_2$, a bispecific antibody, a ds-diabody, a nanobody, a domain antibody, or a bivalent antibody.

6. The antibody or antigen-binding fragment of any one of the preceding claims, which blocks the binding of LILRB2 to one or more ligand, optionally wherein the ligand is selected from the group consisting of HLA-G, classical MHC-I, ANGPTLs, CD1c/d, CSPs and SEMA4A.

~~7. The antibody or antigen-binding fragment of claim 6, wherein the ligand is selected from the group consisting of HLA-G, classical MHC-I, ANGPTLs, CD1c/d, CSPs and SEMA4A.~~

~~8.~~7. The antibody or antigen-binding fragment thereof of any one of the preceding claims, which modulates or suppresses the activation of LILRB2; optionally which antagonizes

LILRB2 signaling.

~~9. The antibody or antigen-binding fragment thereof of claim 8, which suppresses the activation of LILRB2.~~

~~10. The antibody or antigen-binding fragment thereof of claim 8, which antagonizes LILRB2 signaling.~~

~~11.~~8. The antibody or antigen-binding fragment thereof of claim 1, which is multi-specific, optionally which binds specifically to a second antigen selected from PD-1, PD-L1, PD-L2, CTLA-4, LAG3, TIM-3, Fc receptors, FCRL(1-6), A2AR, CD160, 2B4, TGF-β, TGF-βR, VISTA, BTLA, TIGIT, LAIR1, LILRB1, LILRB3, LILRB4, LILRB5, LILRA(1-6), OX40, CD2, CD27, CD28, CD30, CD40, CD47, SIRPA, CLEC-1, clever-1/stabilin-1, ADGRE, TREM1, TREM2, CD122, ICAM-1, IDO, NKG2D/C, SLAMF7, MS4A4A, SIGLEC(7-15), NKp80, NKG2A, CD160, CD161, CD300, CD163, B7-H3, B7-H4, LFA-1, ICOS, 4-1BB, GITR, BAFFR, HVEM, CD7, LIGHT, TNFR2, TLR(1-9), IL-2, IL-7, IL-15, IL-21, CD16 and/or CD83.

~~12. The antibody or antigen-binding fragment thereof of claim 11, which binds specifically to a second antigen selected from PD-1, PD-L1, PD-L2, CTLA-4, LAG3, TIM-3, Fc receptors, FCRL(1-6), A2AR, CD160, 2B4, TGF-β, TGF-βR, VISTA, BTLA, TIGIT, LAIR1, LILRB1, LILRB3, LILRB4, LILRB5, LILRA(1-6), OX40, CD2, CD27, CD28, CD30, CD40, CD47, SIRPA, CLEC-1, clever-1/stabilin-1, ADGRE, TREM1, TREM2, CD122, ICAM-1, IDO, NKG2D/C, SLAMF7, MS4A4A, SIGLEC(7-15), NKp80, NKG2A, CD160, CD161, CD300, CD163, B7-H3, B7-H4, LFA-1, ICOS, 4-1BB, GITR, BAFFR, HVEM, CD7, LIGHT, TNFR2, TLR(1-9), IL-2, IL-7, IL-15, IL-21, CD16 and CD83.~~

~~13.~~9. The antibody or antigen-binding fragment thereof of any one of the preceding claims, which is linked to one or more conjugate moieties, optionally wherein the conjugate moiety comprises an immune modulatory agent, an anti-tumor drug, a clearance-modifying agent, a toxin, a detectable label, a DNA, an RNA, a cytokine, or purification moiety.

~~14. The antibody or antigen-binding fragment thereof of claim 13, wherein the conjugate moiety comprises an immune modulatory agent, an anti-tumor drug, a clearance-~~

~~modifying agent, a toxin, a detectable label, a DNA, an RNA, a cytokine, or purification moiety.~~

~~15.~~10. A pharmaceutical composition comprising an~~the~~ antibody or antigen-binding fragment thereof of any one of the preceding claims, and a pharmaceutically acceptable carrier.

~~16.~~11. An isolated polynucleotide encoding an~~the~~ antibody or antigen-binding fragment thereof of claims 1-9~~14~~.

~~17.~~12. A vector comprising the isolated polynucleotide of claim 11~~16~~.

~~18.~~13. A host cell comprising the vector of claim 12~~17~~.

~~19.~~14. A method of expressing an antibody or antigen-binding fragment thereof, comprising culturing the host cell of claim 13~~18~~ under a~~the~~ condition at which the antibody or antigen-binding fragment thereof is expressed.

~~20.~~15. A chimeric antigen receptor (CAR) protein comprising an antigen-binding fragment according to any one of claims 1-7~~10~~.

~~21.~~16. An isolated nucleic acid that encodes a CAR protein of claim 15~~20~~.

~~22.~~17. A vector comprising the isolated nucleic acid of claim 16~~21~~.

~~23.~~18. An engineered cell comprising the isolated nucleic acid of claim 16~~22~~, optionally wherein the engineered cell is a T cell, NK cell, or macrophage.

~~24. The engineered cell of claim 23, wherein the cell is a T cell, NK cell, or macrophage.~~

~~25.~~19. ~~A method of treating or ameliorating the effect of a cancer in a subject, comprising administering to the subject~~ Use of a therapeutically effective amount of an~~the~~ antibody or antigen-binding fragment thereof of any one of claims 1-9~~14~~, or a~~the~~ pharmaceutical composition of claim 10~~15~~, or an~~the~~ engineered cell of claim 18~~23 or 24~~ in the manufacture of a medicament for treating or ameliorating the effect of a cancer in a subject.

~~26. The method of claim 25, wherein the method reduces or eradicates the tumor burden in the subject.~~

~~27. The method of claim 25, wherein the method reduces the number of tumor cells.~~

~~28. The method of claim 25, wherein the method reduces tumor size.~~

~~29. The method of claim 25, wherein the method reduces or prevents tumor metastasis.~~

~~30.~~20. The use~~method~~ of claim 19~~25~~, wherein the cancer is a solid cancer, optionally wherein the solid cancer is selected from the group consisting of adrenal cancer, bone cancer, brain cancer, breast cancer, colorectal cancer, esophageal cancer, gastroesophageal junction adenocarcinoma (GEA), eye cancer, gastric cancer, head and neck cancer, kidney cancer, liver cancer, lung cancer, non-small cell lung cancer, bronchioloalveolar cell lung cancer, mesothelioma, head and neck cancer, squamous cell carcinoma, melanoma, oral cancer, ovarian cancer, cervical cancer, penile cancer, prostate cancer, pancreatic cancer, skin cancer, sarcoma, testicular cancer, thyroid cancer, uterine cancer, or vaginal cancer.

~~31. The method of claim 30, wherein the solid cancer is selected from the group consisting of adrenal cancer, bone cancer, brain cancer, breast cancer, colorectal cancer, esophageal cancer, gastroesophageal junction adenocarcinoma (GEA), eye cancer, gastric cancer, head and neck cancer, kidney cancer, liver cancer, lung cancer, non-small cell lung cancer, bronchioloalveolar cell lung cancer, mesothelioma, head and neck cancer, squamous cell carcinoma, melanoma, oral cancer, ovarian cancer, cervical cancer, penile cancer, prostate cancer, pancreatic cancer, skin cancer, sarcoma, testicular cancer, thyroid cancer, uterine cancer, vaginal cancer.~~

~~32. The method of claim 25, wherein the monocytes, macrophages, dendritic cells, neutrophils, myeloid-derived suppressor cells, tumor-associated macrophages and other LILRB2^{+} cells are targeted.~~

~~33.~~21. The use~~method~~ of claim 19~~25~~, wherein the cancer is a hematologic malignancy, optionally wherein the hematologic malignancy is selected from the group consisting of

acute lymphocytic leukemia (ALL), acute myeloid leukemia (AML), B-cell leukemia, chronic lymphoblastic leukemia (CLL), blastic plasmacytoid dendritic cell neoplasm (BPDCN), chronic myelomonocytic leukemia (CMML), chronic myelocytic leukemia (CML), pre-B acute lymphocytic leukemia (Pre-B ALL), diffuse large B-cell lymphoma (DLBCL), extranodal NK/T-cell lymphoma, hairy cell leukemia, heavy chain disease, HHV8-associated primary effusion lymphoma, plasmablastic lymphoma, primary CNS lymphoma, primary mediastinal large B-cell lymphoma, T-cell/histiocyte-rich B-cell lymphoma, Hodgkin's lymphoma, non-Hodgkin's lymphoma, Waldenstrom's macroglobulinemia, multiple myeloma (MM), myelodysplastic syndromes (MDS), myeloproliferative neoplasms, and/or polycythemia vera.

~~34. The method of claim 33, wherein the hematologic malignancy is selected from the group consisting of acute lymphocytic leukemia (ALL), acute myeloid leukemia (AML), B-cell leukemia, chronic lymphoblastic leukemia (CLL), blastic plasmacytoid dendritic cell neoplasm (BPDCN), chronic myelomonocytic leukemia (CMML), chronic myelocytic leukemia (CML), pre-B acute lymphocytic leukemia (Pre-B ALL), diffuse large B-cell lymphoma (DLBCL), extranodal NK/T-cell lymphoma, hairy cell leukemia, heavy chain disease, HHV8-associated primary effusion lymphoma, plasmablastic lymphoma, primary CNS lymphoma, primary mediastinal large B-cell lymphoma, T-cell/histiocyte-rich B-cell lymphoma, Hodgkin's lymphoma, non-Hodgkin's lymphoma, Waldenstrom's macroglobulinemia, multiple myeloma (MM), myelodysplastic syndromes (MDS), myeloproliferative neoplasms, and polycythemia vera.~~

~~35. The method of any of claims 25-34, wherein the antibody or an antigen-binding fragment thereof is administered intravenously, intra-arterially, intra-tumorally, intra-muscularly, or subcutaneously.~~

~~36. The method of any of claims 25-35, further comprising administering to the subject one or more drugs selected from the group consisting of a chemotherapeutic agent, a growth inhibitory agent, a cytotoxic agent, an agent used in radiation therapy, an anti-angiogenesis agent, a cancer immunotherapeutic agent, a apoptotic agent, an anti-tubulin agent, an anti-HER-2 antibody, an anti-CD20 antibody, an epidermal growth factor receptor (EGFR) antagonist, HER1/EGFR inhibitor, a platelet derived growth factor inhibitor, a COX-2 inhibitor, an interferon, a CTLA4 inhibitor (e.g., anti-CTLA antibody ipilimumab (YERVOY®), or tremelimumab), a PD-l or PD-L1 inhibitor (e.g., OPDIVO® or~~

~~nivolumab, KEYTRUDA® or pembrolizumab, TECENTRIQ® or atezolizumab, BAVENCIO® or avelumab, IMFINZI® or durvalumab, LIBTAYO® or cemiplimab-rwlc, TYVYT® or sintilimab, tislelizumab (BGB-A317), penpulimab (AK105), camrelizumab, toripalimab, zimberelimab (GLS-010), retifanlimab, sugemalimab, or CS1003), a dual-targeting antibody against CTLA-4 and PD-1 or PD-L1 (e.g., an anti-PD-1/CTLA-4 bi-specific antibody or AK104), a TIM3 inhibitor (e.g., anti-TIM3 antibodies), a LAG-3 inhibitor (e.g., anti-LAG3 antibodies), a cytokine, an antagonist (e.g., neutralizing antibodies) that bind to one or more of the following targets ErbB2, ErbB3, ErbB4, FGFR2b, PDGFR-beta, BlyS, APRIL, BCMA, or VEGF receptor(s), TRAIL/Apo2, an IDH1 inhibitor, an ivosidenib, Tibsovo®, an IDH2 inhibitor, an enasidenib, Idhifa®, a smoothened (SMO) inhibitor, a glasdegib, an arginase inhibitor, an IDO inhibitor, an epacadostat, a BCL-2 inihbitor, a venetoclax, Venclexta®, a platinum complex derivative, oxaliplatin, a kinase inhibitor, a tyrosine kinase inhibitor, a PI3 kinase inhibitor, a BTK inhibitor, an ibrutinib, IMBRUVICA®, an acalabrutinib, CALQUENCE®, a zanubrutinib, a TLR agonist, a STING agonist, an ICOS antibody, a TIGIT antibody, a CD40 antibody, a 4-1BB antibody, a CD47 antibody, an OX40 antibody, a TNFR2 antibody, an antibody to another LILR family member, a Siglec antibody, a SIRP1α antibody or fusions protein, an antagonist of E-selectin, an antibody binding to a tumor antigen, an antibody binding to a T cell surface marker, an antibody binding to a myeloid cell or NK cell surface marker, an alkylating agent, a nitrosourea agent, an antimetabolite, an antitumor antibiotic, an alkaloid derived from a plant, a hormone therapy medicine, a hormone antagonist, an aromatase inhibitor, and a P-glycoprotein inhibitor, an engineered T cell, NK cell or macrophage.~~

~~37. The method of claim 36, wherein the one or more drugs are co-administered with the antibody or an antigen-binding fragment thereof.~~

~~38. The method of claim 37, wherein the one or more drugs are (a) co-formulated with the antibody or an antigen-binding fragment thereof or (b) pre-mixed with the antibody or an antigen-binding fragment thereof prior to administering to the subject.~~

~~39.~~22. A method of detecting a cancer cell or cancer stem cell in a sample or subject comprising:

(a) contacting thea subject or thea sample from the subject with anthe antibody or an antigen-binding fragment thereof according to any one of claims 1-710; and

(b) detecting binding of said antibody to a cancer cell or cancer stem cell in said subject or said sample; optionally wherein said sample is blood, bone marrow, sputum, tears, saliva, mucous, serum, ascites, urine, feces or biospy.

~~40. The method of claim 39, wherein the sample is a body fluid or biopsy.~~

~~41. The method of claim 39, wherein the sample is blood, bone marrow, sputum, tears, saliva, mucous, serum, ascites, urine or feces.~~

~~42.~~23. The method of claim 2239, wherein detection comprises immunohistochemistry (IHC), flow cytometry, an immunoassay (including ELISA, RIA etc.) or Western blot; optionally the method further comprises performing steps (a) and (b) a second time and determining a change in detection levels as compared to the first time; optionally wherein said antibody or said antigen binding fragment thereof further comprises a label, optionally wherein said label is a peptide tag, an enzyme, a magnetic particle, a chromophore, a fluorescent molecule, a chemo-luminescent molecule, or a dye; optionally wherein said monoclonal antibody or said antigen binding fragment thereof is conjugated to a liposome or nanoparticle.

~~43. The method of claim 39, further comprising performing steps (a) and (b) a second time and determining a change in detection levels as compared to the first time.~~

~~44. The method of claim 39, wherein said isolated antibody or an antigen binding fragment thereof further comprises a label.~~

~~45. The method of claim 44, wherein said label is a peptide tag, an enzyme, a magnetic particle, a chromophore, a fluorescent molecule, a chemo-luminescent molecule, or a dye.~~

~~46. The method according to any of claims 39-45, wherein said isolated monoclonal antibody or an antigen binding fragment thereof is conjugated to a liposome or nanoparticle.~~

~~47.~~24. ~~A method for enhancing T cell activation or enhancing dendritic cell maturation and activation in a subject, the method comprising administering to the subject the~~Use of an antibody or an antigen-binding fragment thereof according to any one of claims 1-~~9~~14 or an~~the~~ engineered cell of claim 18~~s 23 or 24~~ in the manufacture of a medicament for enhancing T cell activation or enhancing dendritic cell maturation and activation; modulating anti-inflammatory macrophage and tolerogenic DC phenotype; polarizing myeloid cells from solid tumor cancer patients towards a pro-inflammatory phenotype; or alleviating suppressive effect of patient-derived monocytic MDSC (M-MDSC) on autologous T cell proliferation and cytokine release in a subject .

~~48. A method for modulating anti-inflammatory macrophage and tolerogenic DC phenotype in a subject, the method comprising administering to the subject the antibody or an antigen-binding fragment thereof according to any one of claims 1-14 or the engineered cell of claims 23 or 24.~~

~~49. A method for polarizing myeloid cells from solid tumor cancer patients towards a pro-inflammatory phenotype comprising administering to the subject the antibody or an antigen-binding fragment thereof according to any one of claims 1-14 or the engineered cell of claims 23 or 24.~~

~~50. A method for alleviating suppressive effect of patient-derived monocytic MDSC (M-MDSC) on autologous T cell proliferation and cytokine release comprising administering to the subject the antibody or an antigen-binding fragment thereof according to any one of claims 1-14 or the engineered cell of claims 23 or 24.~~