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 thereof of any one of the preceding claims, which modulates or suppresses the activation of LILRB2; optionally which antagonizes LILRB2 signaling.

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.

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.

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

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

12. A vector comprising the isolated polynucleotide of claim 11.

13. A host cell comprising the vector of claim 12.

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

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

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

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

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

19. Use of a therapeutically effective amount of an antibody or antigen-binding fragment thereof of any one of claims 1-9, or a pharmaceutical composition of claim 10, or an engineered cell of claim 18 in the manufacture of a medicament for treating or ameliorating the effect of a cancer in a subject.

20. The use of claim 19, 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.

21. The use of claim 19, 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.

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

    (a) contacting the subject or the sample from the subject with an antibody or an antigen-binding fragment thereof according to any one of claims 1-7; 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.

23. The method of claim 22, 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.

24. Use of an antibody or an antigen-binding fragment thereof according to any one of claims 1-9 or an engineered cell of claim 18 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 .