WHAT IS CLAIMED IS:

1. A computer-implemented method for identifying a subject suitable for immunotherapy to treat a tumor of the subject, the method executing on data processing hardware that causes the data processing hardware to perform operations comprising:

receiving a histology image of a sample of the tumor of the subject;

performing image analysis on the histology image to obtain image analysis results indicating CD8+ T-cell abundance in tumor parenchyma and stroma in the histology image;

processing a polar coordinate transformation of the image analysis results indicating the CD8+ T-cell abundance in tumor parenchyma and stroma to determine:

a real inflammation score of the sample of the tumor; and

a tumor infiltration score of the sample of the tumor;

determining, from a plurality of possible classifications of CD8 localization, a classification of CD8 localization in the sample of the tumor by applying a patient response model to the polar coordinate transformation of the image analysis results that maps a value of the real inflammation score and a value of the tumor infiltration score in a feature space, the feature space comprising a plot having a first axis denoting real inflammation scores and a second axis denoting tumor infiltration scores and defining linear boundaries or linear cutoffs between the plurality of possible classifications of CD8 localization; and

generating a recommendation for a treatment option of the subject based on the classification of the CD8 localization in the sample of the tumor.

2. A system comprising:

data processing hardware; and

memory hardware in communication with the data processing hardware and storing instructions that when executed on the data processing hardware causes the data processing hardware to perform operations for identifying a subject suitable for immunotherapy to treat a tumor of the subject, the operations comprising:

receiving a histology image of a sample of the tumor of the subject;

performing image analysis on the histology image to obtain image analysis results indicating CD8+ T-cell abundance in tumor parenchyma and stroma in the histology image;

processing a polar coordinate transformation of the image analysis results indicating the CD8+ T-cell abundance in tumor parenchyma and stroma to determine:

a real inflammation score of the sample of the tumor; and

a tumor infiltration score of the sample of the tumor;

determining, from a plurality of possible classifications of CD8 localization, a classification of CD8 localization in the sample of the tumor by applying a patient response model to the polar coordinate transformation of the image analysis results that maps a value of the real inflammation score and a value of the tumor infiltration score in a feature space, the feature space comprising a plot having a first axis denoting real inflammation scores and a second axis denoting tumor infiltration scores and defining linear boundaries or linear cutoffs between the plurality of possible classifications of CD8 localization; and

generating a recommendation for a treatment option of the subject based on the classification of the CD8 localization in the sample of the tumor.

3. The method of claim 1 or system of claim 2, wherein the plurality of possible classifications of CD8 localization comprises inflamed, cold, and excluded.

4. The method or system of claim 3, wherein determining the classification of CD8 localization in the sample of the tumor comprises determining the classification of CD8 localization in the sample of the tumor comprises cold when the mapping of the value of the real inflammation score in the feature space applied by the patient response model is less than a predetermined value on the first axis of the plot of the feature space.

5. The method or system of claim 3, wherein determining the classification of CD8 localization in the sample of the tumor comprises determining the classification of CD8 localization in the sample of the tumor comprises excluded when the mapping of the value of the real inflammation score is greater than or equal to a predetermined value on the first axis of the plot of the feature space and when the mapping of the value of the tumor infiltration score is less than a predetermined value on the second axis of the plot of the feature space.

6. The method or system of claim 3, wherein determining the classification of CD8 localization in the sample of the tumor comprises determining the classification of CD8 localization in the sample of the tumor comprises inflamed when the mapping of the value of the real inflammation score is greater than or equal to a predetermined value on the first axis of the plot of the feature space and when the tumor infiltration score is greater than a predetermined value on the second axis of the plot of the feature space.

7. The method of any one of claims 1 or 3 to 6 or the system of any one of claims 2 to 6, wherein the operations further comprise displaying, on a screen in communication with the data processing hardware, the CD8+ T-cell abundance in the tumor parenchyma and stroma in the histology image as a graphical representation of a relationship between percentages of stromal CD8+ T-cells and percentage of parenchymal CD8+ T-cells with respect to a total number of T-cells present in the histology image.

8. The method or system of claim 7, wherein the operations further comprise:

determining the percentage of the stromal CD8+ T-cells by dividing a number of the CD8+ T-cells in the tumor stroma by a total number of T-cells in the tumor stroma; and

determining the percentage of the parenchymal CD8+ T-cells by dividing a number of the CD8+ T-cells in the tumor parenchyma by a total number of T-cells in the tumor parenchyma.

9. The method of any one of claims 1 or 3 to 8 or the system of any one of claims 2 to 8, wherein the patient response model applied to the polar coordinate transformation of the image analysis results is obtained by:

receiving a plurality of histology images of tumor samples in a plurality of patients;

obtaining patient response data for each of the plurality of patients;

for each corresponding histology image in the plurality of histology images:

performing image analysis on the corresponding histology image to obtain a CD8+ T-cell abundance in a tumor parenchyma and stroma in the corresponding histology image; and

processing a polar coordinate transformation of the CD8+ T-cell abundance in the tumor parenchyma and stroma to determine:

a real inflammation score for the corresponding histology image; and

a tumor infiltration score for the corresponding histology image;

generating the feature space based on the real inflammation scores and the tumor infiltration scores determined for the plurality of histology images; and

identifying the linear boundaries or linear cutoffs between the plurality of possible classifications of CD8 localization in the feature space based on the patient response data and the real inflammation scores and the tumor infiltration scores determined for the plurality of histology images.

10. The method or system of claim 9, wherein the CD8+ T-cell abundance comprises a graphical representation of a relationship between percentages of stromal CD8+ T-cells and percentage of parenchymal CD8+ T-cells with respect to a total number of T-cells present in the histology image.

11. The method or system of claim 10, wherein the operations further comprise:

applying the polar coordinate transformation on the graphical representation, resulting in a polar plot,

wherein generating the feature space comprises using the polar plot to generate the feature space.

12. The method or system of any one of claims 9 to 11, wherein the patient response data comprises retrospective clinical response data indicating whether or not each patient in the plurality of patients is responsive to a treatment or therapy.

13. The method or system of claim 12, wherein identifying the linear boundaries or the linear cutoff between the plurality of classifications of CD8 localization in the feature space comprises:

iteratively fitting boundary-defining values for the real inflammation scores and the tumor infiltration scores in the feature space; and

using the patient response data to identify the linear boundaries or the linear cutoff between the plurality of possible classifications of CD8 localization in the feature space.