CLAIMS

What is claimed:

1. A method of diagnosing cancer of a subject, comprising:

   (a) receiving a plurality of somatic mutation and non-human nucleic acid molecule k-mer sequences of a sample obtained from a subject;

   (b) comparing the plurality of somatic mutation and non-human nucleic acid molecule k-mer sequences of the subject with a plurality of somatic mutation and non-human nucleic acid molecule k-mer sequences for a given cancer; and

   (c) diagnosing cancer of the subject by providing a probability of the cancer based at least in part on the comparison of the subject's plurality of somatic mutation and non-human nucleic acid molecule k-mer sequences and the plurality of somatic mutation and non-human nucleic acid molecule k-mer sequences for the given cancer.

2. The method of claim 1, further comprising comparing a count of the plurality of somatic mutation nucleic acid molecule k-mer sequence of the subject to a count of the plurality of somatic mutation nucleic acid molecule k-mer sequences of the given cancer.

3. The method of claim 1, further comprising comparing a count of the plurality non-human nucleic acid molecule k-mer sequences of the subject to a count of the plurality of non-human nucleic acid molecule k-mer sequences of the given cancer.

4. The method of claim 1, wherein diagnosing the cancer of the subject further comprises determining a category or location of the subject's cancer.

5. The method of claim 1, wherein diagnosing the cancer of the subject further comprises determining one or more types of the subject's cancer.

6. The method of claim 1, wherein diagnosing the cancer of the subject further comprises determining one or more subtypes of the subject's cancer.

7. The method of claim 1, wherein diagnosing the cancer of the subject further comprises determining the stage of the subject's cancer, cancer prognosis, or any combination thereof.

8. The method of claim 1, wherein diagnosing the cancer of the subject further comprises determining a type of cancer at a low-stage.

9. The method of claim 8, wherein the type of cancer at the low-stage comprises stage I or stage II cancers.

10. The method of claim 1, wherein diagnosing the cancer of the subject further comprises determining a mutation status of the subject's cancer.

11. The method of claim 1, further comprising determining the subject's response to therapy to treat the subject's cancer.

12. The method of claim 1, wherein the given cancer or the subject's cancer comprises: acute myeloid leukemia, adrenocortical carcinoma, bladder urothelial carcinoma, brain lower grade glioma, breast invasive carcinoma, cervical squamous cell carcinoma and endocervical adenocarcinoma, cholangiocarcinoma, colon adenocarcinoma, esophageal carcinoma, glioblastoma multiforme, head and neck squamous cell carcinoma, kidney chromophobe, kidney renal clear cell carcinoma, kidney renal papillary cell carcinoma, liver hepatocellular carcinoma, lung adenocarcinoma, lung squamous cell carcinoma, lymphoid neoplasm diffuse large B-cell lymphoma, mesothelioma, ovarian serous cystadenocarcinoma, pancreatic adenocarcinoma, pheochromocytoma and paraganglioma, prostate adenocarcinoma, rectum adenocarcinoma, sarcoma, skin cutaneous melanoma, stomach adenocarcinoma, testicular germ cell tumors, thymoma, thyroid carcinoma, uterine carcinosarcoma, uterine corpus endometrial carcinoma, uveal melanoma, or any combination thereof.

13. The method of claim 1, wherein the subject is a non-human mammal.

14. The method of claim 1, wherein the subject is a human.

15. The method of claim 1, where the subject is mammal.

16. The method of claim 1, wherein the plurality of non-human k-mer sequences originate from the following non-mammalian domains of life: viral, bacterial, archaeal, fungal, or any combination thereof.

17. The method of claim 1, wherein the comparing is conducted with a predictive model.

18. The method of claim 17, wherein the predictive model comprises an ensemble of predictive models.

19. The method of claim 1, wherein the sample of the subject comprises a tissue sample, a liquid biopsy sample, or combination thereof.

20. The method of claim 19, wherein the liquid biopsy comprises: plasma, serum, whole blood, urine, cerebral spinal fluid, saliva, sweat, tears, exhaled breath condensate, or any combination thereof.