CLAIMS

What is claimed is:

1. A computer-implemented method for processing digital images to predict at least one continuous value, the method comprising:

receiving one or more digital medical images;

determining whether the one or more digital medical images includes at least one salient region;

upon determining that the one or more digital medical images includes the at least one salient region, predicting, by a trained machine learning system, at least one continuous value corresponding to the at least one salient region, the predicting comprising incorporating spatial characteristics corresponding to the at least one salient region, wherein the spatial characteristics are from disparate regions in the one or more digital medical images, the spatial characteristics being incorporated by:

concatenating coordinates to pixels or voxels of the one or more digital medical images,

appending the coordinates to the pixels or voxels during processing by the machine learning system, and/or

self-selecting salient regions in input to processing by the machine learning system; and

outputting the at least one continuous value to an electronic storage device and/or display.

2. The computer-implemented method of claim 1, wherein determining whether the one or more digital medical images includes the at least one salient region further comprises:

breaking each of the one or more digital medical images into at least one region;

determining that the at least one region is a salient region;

identifying a location of the salient region; and

flagging the salient region.

3. The computer-implemented method of claim 2, wherein determining that the at least one region is the salient region further comprises:

generating, by a salient trained machine learning system, a saliency heatmap corresponding to the at least one region; and

extracting, by the salient trained machine learning system, at least one relevant saliency region from the saliency heatmap.

4. The computer-implemented method of claim 2, wherein determining that the at least one region is the salient region further comprises:

generating, by a salient trained machine learning system, a saliency prediction for t at least one region.

5. The computer-implemented method of claim 1, wherein determining whether the one or more digital medical images includes the at least one salient region is performed by a salient trained machine learning system.

6. The computer-implemented method of claim 1, wherein the one or more digital medical images comprise at least one of: a whole slide image (WSI), a magnetic resonance imaging (MRI) scan, a computed tomography (CT) scan, a positron emission topography (PET) scan, and/or a mammogram.

7. The computer-implemented method of claim 1, wherein receiving the one or more digital medical images further comprises:

receiving patient information, wherein the patient information comprises at least one of: an age, an ethnicity, and/or an ancillary test result.

8. The computer-implemented method of claim 1, further comprising:

outputting a recommended treatment corresponding to the at least one continuous value.

9. The computer-implemented method of claim 1, further comprising:

indicating a predicted severity corresponding to the at least one continuous value.

10. The computer-implemented method of claim 1, wherein the at least one continuous value corresponds to a continuous biomarker value.

11. The computer-implemented method of claim 1, wherein the at least one salient region comprises a tissue or blood region associated with a pathological condition, a cancerous region, one or more biomarkers, specific cell types, particular protein presence, and/or at least one drug response indicator.

12. A computer system for processing digital images to predict at least one continuous value for one or more digital medical images, the computer system comprising:

at least one memory storing instructions; and

at least one processor configured to execute the instructions to perform operations comprising:

access the at least one memory and execute processor-readable instructions, which when executed by the at least one processor configures the at least one processor to perform a plurality of functions, including functions for:

receiving one or more digital medical images;

determining whether the one or more digital medical images includes at least one salient region;

upon determining that the one or more digital medical images includes the at least one salient region, predicting, by a trained machine learning system, at least one continuous value corresponding to the at least one salient region, the predicting comprising incorporating spatial characteristics corresponding to the at least one salient region, wherein the spatial characteristics are from disparate regions in the one or more digital medical images, the spatial characteristics being incorporated by:

concatenating coordinates to pixels or voxels of the one or more digital medical images,

appending the coordinates to the pixels or voxels during processing by the machine learning system, and/or

self-selecting salient regions in input to processing by the machine learning system; and

outputting the at least one continuous value to an electronic storage device and/or display.

13. The computer system of claim 12, wherein determining whether the one or more digital medical images includes the at least one salient region further comprises:

breaking each of the one or more digital medical images into at least one region;

determining that the at least one region is a salient region;

identifying a location of the salient region; and

flagging the salient region.

14. The computer system of claim 13, wherein determining that the at least one region is the salient region further comprises:

generating, by a salient trained machine learning system, a saliency heatmap corresponding to the at least one region; and

extracting, by the salient trained machine learning system, at least one relevant saliency region from the saliency heatmap.

15. The computer system of claim 13, wherein determining that the at least one region is the salient region further comprises:

generating, by a salient trained machine learning system, a saliency prediction for the at least one region.

16. A non-transitory computer-readable medium storing instructions that, when executed by a processor, cause the processor to perform operations for processing digital images to predict at least one continuous value for one or more digital medical images, the operations comprising:

receiving one or more digital medical images;

determining whether the one or more digital medical images includes at least one salient region;

upon determining that the one or more digital medical images includes the at least one salient region, predicting, by a trained machine learning system, at least one continuous value corresponding to the at least one salient region, the predicting comprising incorporating spatial characteristics corresponding to the at least one salient region, wherein the spatial characteristics are from disparate regions in the one or more digital medical images, the spatial characteristics being incorporated by:

concatenating coordinates to pixels or voxels of the one or more digital medical images,

appending the coordinates to the pixels or voxels during processing by the machine learning system, and/or

self-selecting salient regions in input to processing by the machine learning system; and

outputting the at least one continuous value to an electronic storage device and/or display.

17. The non-transitory computer-readable medium of claim 16, wherein determining whether the one or more digital medical images includes the at least one salient region further comprises:

breaking each of the one or more digital medical images into at least one region;

determining that the at least one region is a salient region;

identifying a location of the salient region; and

flagging the salient region.

18. The non-transitory computer-readable medium of claim 17, wherein determining that the at least one region is the salient region further comprises:

generating, by a salient trained machine learning system, a saliency heatmap corresponding to the at least one region; and

extracting, by the salient trained machine learning system, at least one relevant saliency region from the saliency heatmap.