WHAT IS CLAIMED IS:

1. A computer-implemented system for processing real-time video, the system comprising:

an input port for receiving real-time video obtained from a medical image device;

a first bus for transferring the received real-time video;

at least one processor configured to receive the real-time video from the first bus, perform object detection by applying a trained neural network on frames of the received real-time video, and overlay a border indicating a location of at least one detected object in the frames;

a second bus for receiving the video with the overlaid border;

an output port for outputting the video with the overlaid border from the second bus to an external display; and

a third bus for directly transmitting the received real-time video to the output port.

2. The system of claim 1, wherein the third bus is activated upon receipt of an error signal from the at least one processor.

3. The system of any preceding claim, wherein at least one the first plurality of images and the second plurality of images comprise images from imaging device used during at least one of a gastroscopy, a colonoscopy, an enteroscopy, or an upper endoscopy, optionally including an endoscopy device.

4. The system of any preceding claim, wherein the at least one detected object is an abnormality, and wherein the abnormality optionally comprises a formation on or of human tissue, a change in human tissue from one type of cell to another type of cell, and/or an absence of human tissue from a location where the human tissue is expected.

5. The system of claim 4, wherein the abnormality comprises a lesion, optionally including a polypoid lesion or a non-polypoid lesion.

6. The system of any preceding claim, wherein the overlaid border comprises a graphical pattern around a region of the image including the at least one detected object, the pattern being displayed in a first color.

7. The system of claim 6, wherein the at least one processor is further configured to, after an elapsed period of time, modify the pattern to be displayed in a second color when the at least one detected object is a true positive and further modify the pattern to be displayed in a third color if the at least one detected object is a false positive.

8. The system of claim 7, wherein the at least one processor is further configured to transmit a command to one or more speakers to produce a sound when the pattern of the border is modified and/or to transmit a command to at least one wearable apparatus to vibrate when the pattern of the border is modified.

9. The system of claim 8, wherein at least one of duration, tone, frequency, and amplitude of the sound depends on whether the at least one detected object is a true positive or a false positive and/or at least one of duration, frequency, and amplitude of the vibration depends on whether the at least one detected object is a true positive or a false positive.

10. A computer-implemented system for processing real-time video, the system comprising:

an input port for receiving real-time video obtained from a medical image device;

at least one processor configured to receive the real-time video from the input port, perform object detection by applying a trained neural network on frames of the received real-time video, and overlay a border indicating a location of at least one detected object in the frames;

an output port for outputting the video with the overlaid border from the at least one processor to an external display; and

an input device for receiving a sensitivity setting from a user,

wherein the processor is further configured to adjust at least one parameter of the trained neural network in response to the sensitivity setting.

11. The system of claim 10, wherein at least one the first plurality of images and the second plurality of images comprise images from imaging device used during at least one of a gastroscopy, a colonoscopy, an enteroscopy, or an upper endoscopy, optionally including an endoscopy device.

12. The system of any preceding claim, wherein the at least one detected object is an abnormality, and wherein the abnormality optionally comprises a formation on or of human tissue, a change in human tissue from one type of cell to another type of cell, and/or an absence of human tissue from a location where the human tissue is expected.

13. The system of claim 12, wherein the abnormality comprises a lesion, optionally including a polypoid lesion or a non-polypoid lesion.

CLAIMS

1. A computer-implemented system for processing real-time video, the system comprising:

an input port for receiving real-time video obtained from a medical image device, the real-time video comprising a plurality of frames;

a first bus for transferring the received real-time video;

at least one processor configured to perform operations consisting of the following for object detection and border overlay: receive the real-time video from the first bus, feed the plurality of frames of the received real-time video directly to a trained neural network, perform object detection by applying the trained neural network to the plurality of frames of the received real-time video, and overlay a border indicating a location of at least one detected object in the plurality of frames determined by applying the trained neural network to the plurality of frames of the received real-time video, the overlaid border comprising a graphical indicator with a first pattern and/or color displayed around a region of the plurality of frames including the at least one detected object;

a second bus for receiving the plurality of frames with the overlaid border;

an output port for outputting the plurality of frames with the overlaid border from the second bus to an external display; and

a third bus for directly transmitting the received real-time video to the output port,

wherein the at least one processor is further configured to modify the graphical indicator to be displayed in a second pattern and/or color when the at least one

detected object is a true positive and further modify the graphical indicator to be displayed in a third pattern and/or color if the at least one detected object is a false positive.

2. The system of claim 1, wherein the at least one processor is further configured to receive an error signal, and the third bus is activated upon receipt of the error signal from the at least one processor.

3. The system of claim 1, wherein the at least one detected object is an abnormality.

4. The system of claim 3, wherein the abnormality comprises a change in human tissue from one type of cell to another type of cell.

5. The system of claim 3, wherein the abnormality comprises an absence of human tissue from a location where the human tissue is expected.

6. The system of claim 3, wherein the abnormality comprises a formation on or of human tissue.

7. The system of claim 6, wherein the abnormality comprises a lesion.

8. The system of claim 7, wherein the lesion comprises a polypoid lesion.

9. The system of claim 7, wherein the lesion comprises a non-polypoid lesion.

10. The system of claim 1, wherein the at least one processor is further configured to transmit a command to one or more speakers to produce a sound when the graphical indicator of the overlaid border is modified.

11. The system of claim 10, wherein at least one of duration, tone, frequency, or amplitude of the sound depends on whether the at least one detected object is a true positive or a false positive.

12. The system of claim 1, wherein the at least one processor is further configured to transmit a command to at least one wearable apparatus to vibrate when the graphical indicator of the overlaid border is modified.

13. The system of claim 12, wherein at least one of duration, frequency, or amplitude of the vibration depends on whether the at least one detected object is a true positive or a false positive.

14. The system of claim 1, wherein the plurality of frames comprise images from the medical image device used during at least one of a gastroscopy, a colonoscopy, or an enteroscopy.

15. The system of claim 1, wherein the trained neural network is trained using a plurality of frames of video containing indicators of a location of a feature-of-interest.

16. The system of claim 1, wherein the trained neural network comprises a generator network and a discriminator network, wherein the generator network is trained to generate a plurality of artificial representations of a feature-of-interest, and the discriminator network is trained to differentiate between the plurality of artificial representations of the feature-of-interest and true representations of the feature-of-interest.

17. The system of claim 16, wherein the discriminator network comprises an adversarial branch and a perception branch, wherein the adversarial branch is trained to produce difference indicators between the plurality of artificial representations of the feature-of-interest and true representations of the feature-of-interest, and the perception branch is trained to produce a second plurality of detections of the feature-of-interest.

18. The system of claim 1, wherein the at least one processor is further configured to perform classification of the detected object by applying the trained neural network.

19. The system of claim 18, wherein the classification is based on at least one of a histological classification, a morphological classification, or a structural classification.

20. A computer-implemented system for processing real-time video, the system comprising:

an input port for receiving real-time video obtained from a medical image device, the real-time video comprising a plurality of frames;

at least one processor configured to perform operations consisting of the following for object detection and border overlay: receive the real-time video from the input port, feed the plurality of frames of the received real-time video directly to a trained neural network, perform object detection by applying the trained neural network to the plurality of frames of the received real-time video, and overlay a border indicating a location of at least one detected object in the plurality of frames determined by applying the trained neural network to the plurality of frames of the received real-time video, the overlaid border comprising a graphical indicator with a first pattern and/or color displayed around a region of the plurality of frames including the at least one detected object;

an output port for outputting the plurality of frames with the overlaid border from the at least one processor to an external display; and

an input device for receiving a sensitivity setting from a user,

wherein the at least one processor is further configured to adjust at least one parameter of the trained neural network in response to the sensitivity setting, and

wherein the at least one processor is further configured to modify the graphical indicator to be displayed in a second pattern and/or color when the at least one detected object is a true positive and further modify the graphical indicator to be

displayed in a third pattern and/or color if the at least one detected object is a false positive.

21. The system of claim 20, wherein the at least one detected object is an abnormality.

22. The system of claim 21, wherein the abnormality comprises a formation on or of human tissue.

23. The system of claim 21, wherein the abnormality comprises a change in human tissue from one type of cell to another type of cell.

24. The system of claim 21, wherein the abnormality comprises an absence of human tissue from a location where the human tissue is expected.

25. The system of claim 21, wherein the abnormality comprises a lesion.

26. The system of claim 25, wherein the lesion comprises a polypoid lesion.

27. The system of claim 25, wherein the lesion comprises a non-polypoid lesion.

28. The system of claim 20, wherein the plurality of frames comprise images from the medical image device used during at least one of a gastroscopy, a colonoscopy, or an enteroscopy.

29. The system of claim 20, wherein the trained neural network is trained using a plurality of frames of video containing indicators of a location of a feature-of-interest.

30. The system of claim 20, wherein the at least one parameter comprises one or more weights of one or more nodes of the trained neural network.

31. The system of claim 20, wherein the at least one parameter comprises one or more thresholds of one or more output layers of the trained neural network.

32. The system of claim 20, wherein the trained neural network comprises a generator network and a discriminator network, wherein the generator network is trained to generate a plurality of artificial representations of a feature-of-interest, and the discriminator network is trained to differentiate between the plurality of artificial representations of the feature-of-interest and true representations of the feature-of-interest.

33. The system of claim 32, wherein the discriminator network comprises an adversarial branch and a perception branch, wherein the adversarial branch is trained to produce difference indicators between the plurality of artificial representations of the

feature-of-interest and true representations of the feature-of-interest, and the perception branch is trained to produce a second plurality of detections of the feature-of-interest.