WHAT IS CLAIMED IS:

1. A method of providing iron scrap classification information through image analysis, the method comprising:

receiving, by a receiving circuit, a loaded state image from a camera in a state where a plurality of iron scraps are loaded onto a loading device;

generating, by a processor, segmented images by individually extracting each of the plurality of iron scraps as a separate scrap region at the pixel level from the loaded state image using a segmentation model, wherein the segmentation model performs segmentation on the target iron scrap, which is one of the plurality of iron scraps;

generating, by the processor, item information and grade information that correspond to the target iron scrap using a classification model, wherein the classification model performs classification on the segmented images and analyzes the classified images on an image-by-image basis, and wherein the item information corresponds to characteristic information on the iron scrap and includes at least one of heavy weight iron scrap information and light weight iron scrap information; and

providing, by the processor, iron scrap classification information that includes the item information and the grade information.

2. The method of claim 1, wherein the generating of the item information and the grade information includes:

generating, by the processor, a target iron scrap image representing the target iron scrap by excluding a background region from the segmented images; and

performing, by the processor, the classification on the target iron scrap image to generate the item information and the grade information.

3. The method of claim 2, further comprising:

receiving, by the receiving circuit, a correct image representing the target iron scrap;

determining, by the processor, a percentage of an overlapping region between the correct image and the target iron scrap image;

obtaining, by the processor, an iron scrap determination accuracy indicating whether the target iron scrap image corresponds to an actual image of iron scrap, when the percentage of the overlapping region exceeds a threshold overlap percentage; and

providing, by the processor, the iron scrap determination accuracy as a performance indicator.

4. The method of claim 2, further comprising:

determining, by the processor, a target weight based on a region size of the target iron scrap image;

determining, by the processor, a target accuracy for the target iron scrap image; and

applying, by the processor, the target weight to the target accuracy to determine an accuracy for the classification model.

5. The method of claim 1, further comprising:

receiving, by the receiving circuit, a single segmented image captured for a single iron scrap;

generating, by the processor, a synthesized image based on the loaded state image and the single segmented image; and

applying, by the processor, the segmentation model and the classification model to the synthesized image to provide additional iron scrap classification information.

6. The method of claim 5, wherein the generating of the synthesized image includes:

generating, by the processor, a single iron scrap image by excluding a background region from the single segmented image; and

generating, by the processor, the synthesized image by combining the loaded state image with the single iron scrap image.

7. The method of claim 6, wherein the generating of the synthesized image by combining the loaded state image with the single iron scrap image includes:

determining, by the processor, a number of possible combinations of the single iron scrap image and the loaded state image based on a region size of the single iron scrap image; and

generating, by the processor, the synthesized image based on the number of possible combinations.

8. The method of claim 1, wherein:

the receiving of the loaded state image includes receiving, by the receiving circuit, a loaded state image that is updated by being captured in a state in which positions of the plurality of iron scraps are updated in the loading device; and

the generating of the segmented images includes generating, by the processor, the segmented images including the target iron scrap from the updated loaded state image using the segmentation model.

9. The method of claim 4, wherein:

when a number of pixels included in the target iron scrap image is less than a first number, the target weight increases in proportion to a linear function corresponding to a first slope;

when the number of pixels is greater than or equal to the first number and less than a second number, the target weight increases in proportion to an exponential function having a base greater than the first slope; and

when the number of pixels is greater than or equal to the second number, the target weight increases in proportion to a linear function corresponding to a second slope smaller than the first slope,

wherein the first slope and the second slope have positive numbers, and the second number is greater than the first number.

10. The method of claim 1, wherein the providing of the iron scrap classification information includes:

obtaining, by the processor, average weight information indicating a cumulative area and/or cumulative number for each item and grade for the item information and grade information that correspond to the target iron scrap among the plurality of iron scraps; and

providing, by the processor, a circular graph showing a cumulative area ratio and/or cumulative number ratio for each item and grade for the target iron scrap in the loaded state image based on the average weight information.

11. An apparatus for classifying iron scrap that provides iron scrap classification information through image analysis, the apparatus comprising:

a receiving circuit configured to receive a loaded state image from a camera in a state where a plurality of iron scraps are loaded onto a loading device; and

a processor that is configured to:

generate segmented images by individually extracting each of the plurality of iron scraps as a separate scrap region at the pixel level from the loaded state image using a segmentation model, wherein the segmentation model performs segmentation on the target iron scrap, which is one of the plurality of iron scraps;

generate item information and grade information corresponding to the target iron scrap using a classification model, wherein the classification model performs classification on the segmented images and analyzes the classified images on an image-by-image basis, and wherein the item information corresponds to characteristic information on the iron scrap and includes at least one of heavy weight iron scrap information and light weight iron scrap information; and

provide iron scrap classification information that includes the item information and the grade information.

12. The apparatus of claim 11, wherein the processor is configured to:

generate a target iron scrap image representing the target iron scrap by excluding a background region from the segmented image; and

perform the classification on the target iron scrap image to generate the item information and the grade information.

13. The apparatus of claim 12, wherein the receiving circuit receives a correct image representing the target iron scrap, and

the processor is configured to:

determine a percentage of an overlapping region between the correct image and the target iron scrap image;

obtain an iron scrap determination accuracy indicating whether the target iron scrap image corresponds to an actual image of iron scrap, when the percentage of the overlapping region exceeds a threshold overlap percentage;

provide the iron scrap determination accuracy as a performance indicator;

determine a target weight based on a region size of the target iron scrap image;

determine a target accuracy for the target iron scrap image; and

apply the target weight to the target accuracy to determine an accuracy for the classification model.

14. The apparatus of claim 11, wherein the receiving circuit receives a single segmented image captured for a single iron scrap, and

the processor is configured to:

generate a synthesized image based on the loaded state image and the single segmented image; and

apply the segmentation model and the classification model to the synthesized image to provide additional iron scrap classification information.

15. A computer-readable recording medium on which a program is recorded, the program comprising instructions that, when executed by a processor, cause the processor to:

receiving a loaded state image from a camera in a state where a plurality of iron scraps are loaded onto a loading device;

generating segmented images by individually extracting each of the plurality of iron scraps as a separate scrap region at the pixel level from the loaded state image using a segmentation model, wherein the segmentation model performs segmentation on the target iron scrap, which is one of the plurality of iron scraps;

generating item information and grade information that correspond to the target iron scrap using a classification model, wherein the classification model performs classification on the segmented images and analyzes the classified images on an image-by-image basis, and wherein the item information corresponds to characteristic information on the iron scrap and includes at least one of heavy weight iron scrap information and light weight iron scrap information; and

providing iron scrap classification information that includes the item information and the grade information.

16. The computer-readable recording medium of claim 15, wherein when executed by a processor, the instructions causes the processor to:

generate a target iron scrap image representing the target iron scrap by excluding a background region from the segmented image; and

perform the classification on the target iron scrap image to generate the item information and the grade information.

17. The computer-readable recording medium of claim 16, the program further comprising instructions to receive a correct image representing the target iron scrap,

wherein the instructions causes the processor to:

determine a percentage of an overlapping region between the correct image and the target iron scrap image;

obtain an iron scrap determination accuracy indicating whether the target iron scrap image corresponds to an actual image of iron scrap, when the percentage of the overlapping region exceeds a threshold overlap percentage;

provide the iron scrap determination accuracy as a performance indicator;

determine a target weight based on a region size of the target iron scrap image;

determine a target accuracy for the target iron scrap image; and

apply the target weight to the target accuracy to determine an accuracy for the classification model.

18. The computer-readable recording medium of claim 15, the program further comprising instructions to receive a single segmented image captured for a single iron scrap, and

wherein the instructions causes the processor to:

generate a synthesized image based on the loaded state image and the single segmented image; and

apply the segmentation model and the classification model to the synthesized image to provide additional iron scrap classification information.