CLAIMS

1. A manufacturing system, comprising:

one or more stations, each station configured to perform at least one step in a multi-step manufacturing process for a component;

a monitoring platform configured to monitor progression of the component throughout the multi-step manufacturing process; and

a control module configured to dynamically adjust processing parameters of a step of the multi-step manufacturing process to achieve a desired final quality metric for the component, the control module configured to perform operations, comprising:

receiving image data of tooling at a first station of the one or more stations;

determining, by a first machine learning model, a final quality metric for the component, based on the image data;

determining that the final quality metric is outside an acceptable range of the desired final quality metric;

based on the determining, generating, by the first machine learning model, an updated instruction set to be performed by at least one of the first station or a downstream station to achieve the desired final quality metric;

predicting, by a second machine learning model, an updated final quality metric for the component based on the updated instruction set; and

based on the updated final quality metric, providing the updated instruction set to the first station and the downstream station.

2. The manufacturing system of claim 1, wherein the second machine learning model is trained with a training set comprising a synthetic set of data.

3. The manufacturing system of claim 1, wherein the final quality metric cannot be measured until processing of the component is complete.

4. The manufacturing system of claim 1, further comprising:

determining, based on positional information of the component, that an irreversible error is not present.

5. The manufacturing system of claim 1, further comprising:

identifying a set of keypoints from the image data, the set of keypoints corresponding to position information of the tooling during processing at the first station.

6. The manufacturing system of claim 5, wherein the set of keypoints are used by the first machine learning model to determine the final quality metric.

7. The manufacturing system of claim 5, further comprising:

comparing the set of keypoints corresponding to coordinates of the component to a canonical set of keypoints corresponding to a canonical component.

8. A method for dynamically adjusting processing parameters of a step of a multi-step manufacturing process to achieve a desired final quality metric for a component undergoing the multi-step manufacturing process, comprising:

receiving, by a computing system, image data of tooling at a first station of one or more stations involved in the multi-step manufacturing process;

determining, by a first machine learning model of the computing system, a final quality metric for the component, based on the image data;

determining, by a computing system, that the final quality metric is outside an acceptable range of the desired final quality metric;

based on the determining, generating, by the first machine learning model, an updated instruction set to be performed by at least one of the first station or a downstream station to achieve the desired final quality metric;

predicting, by a second machine learning model of the computing system, an updated final quality metric for the component based on the updated instruction set; and

based on the updated final quality metric, providing, by a computing system, the updated instruction set to the first station and the downstream station.

9. The method of claim 8, wherein the second machine learning model is trained with a training set comprising a synthetic set of data.

10. The method of claim 8, wherein the final quality metric cannot be measured until processing of the component is complete.

11. The method of claim 8, further comprising:

determining, based on positional information of the component, that an irreversible error is not present.

12. The method of claim 8, further comprising:

identifying a set of keypoints from the image data, the set of keypoints corresponding to position information of the tooling during processing at the first station.

13. The method of claim 12, wherein the set of keypoints are used by the first machine learning model to determine the final quality metric.

14. The method of claim 12, further comprising:

comparing the set of keypoints corresponding to coordinates of the component to a canonical set of keypoints corresponding to a canonical component.

15. A non-transitory computer readable medium comprising one or more sequences of instructions, which, when executed by a computing system, causes a processor to perform operations for dynamically adjusting processing parameters of a step of a multi-step manufacturing process to achieve a desired final quality metric for a component undergoing the multi-step manufacturing process, comprising:

receiving, by a computing system, image data of tooling at a first station of one or more stations involved in the multi-step manufacturing process;

determining, by a first machine learning model of the computing system, a final quality metric for the component, based on the image data;

determining, by a computing system, that the final quality metric is outside an acceptable range of the desired final quality metric;

based on the determining, generating, by the first machine learning model, an updated instruction set to be performed by at least one of the first station or a downstream station to achieve the desired final quality metric;

predicting, by a second machine learning model of the computing system, an updated final quality metric for the component based on the updated instruction set; and

based on the updated final quality metric, providing, by a computing system, the updated instruction set to the first station and the downstream station.

16. The non-transitory computer readable medium of claim 15, wherein the second machine learning model is trained with a training set comprising a synthetic set of data.

17. The non-transitory computer readable medium of claim 15, wherein the final quality metric cannot be measured until processing of the component is complete.

18. The non-transitory computer readable medium of claim 15, further comprising:

determining, based on positional information of the component, that an irreversible error is not present.

19. The non-transitory computer readable medium of claim 15, further comprising:

identifying a set of keypoints from the image data, the set of keypoints corresponding to position information of the tooling during processing at the first station.

20. The non-transitory computer readable medium of claim 19, wherein the set of keypoints are used by the first machine learning model to determine the final quality metric.