component is based at least in part on the one or more parameters indicative of the condition of the recontouring system.

[0089] In yet some implementations, the recontouring system includes a material removal tool having an abrasive belt. In such implementations, the condition of the recontouring system includes a tool state ~~δ~~ ρ indicative of a condition of the material removal tool 230.

[0090] In yet some implementations, the method (400) further includes adding a deposited material to the component prior to obtaining the data set. The method also includes machining the component utilizing the material removal tool path after adjusting the material removal tool path based at least in part on the machine offsets, and wherein after machining, the component defines a regenerated portion and a non-regenerated portion. Moreover, the method further includes performing a post-inspection process on the component. In such implementations, the one or more parameters indicative of the condition of the recontouring system includes a measured step ε, wherein the measured step ε is measured along the component for each of the sections of the component as a distance between an edge of the non-regenerated portion to an edge of the regenerated portion.

[0091] In yet some implementations, after inputting, the method (400) further includes processing, by the one or more computing devices, each subset in its respective machine-learned model in parallel.

[0092] FIG. 16 provides a flow diagram of another exemplary method (500) according to exemplary embodiments of the present disclosure. Some or all of the method (500) can be implemented by the recontouring system 200 described herein.

[0093] At (502), exemplary method (500) includes obtaining, by one or more computing devices, a data set comprised of a plurality of subsets, each subset comprised of one or more parameters indicative of a condition of one of the sections of the component and a condition of the recontouring system. For instance, one of the computing devices 251 of computing system 250 can obtain data set 300. Data set 300 can include any suitable number of subsets 302. Each subset 302 can include one or more parameters indicative of the condition of the component, such as engine component 190. In particular, exemplary parameters can include an angular deviation parameter φ, a step position parameter δ, a twist angle, a blade length, a batch or serial

number of the component, etc. In addition, exemplary parameters indicative of a condition of the recontouring system can include a tool state ~~δ~~ρ indicative of a condition of the material removal tool 230 and a measured step ε indicative of the condition or uncertainty of the regeneration system.

[0094] At (504), exemplary method (500) includes inputting, by the one or more computing devices, the data set into a machine-learned model comprised of a plurality of neural networks, each subset being input into a respective neural network. For instance, each subset 302 of the data set 300 can be input into a respective DNN of the machine-learned model. In some implementations, the neural networks are deep neural networks that include at least two hidden layers.

[0095] At (506), exemplary method (500) includes determining, by the one or more computing devices, a machine offset for each section of the component based at least in part on the one or more parameters indicative of the condition of the section and the condition of the recontouring system. In such implementations, as the inputs (i.e., parameters) are fed forward through their respective networks, the weights and activation functions are applied to the value of the parameters, as a result, a machine offset is output from each of the neural networks.

[0096] At (508), exemplary method (500) includes obtaining, by the one or more computing devices, the machine offset for each section of the component as outputs of their respective neural networks. For example, one or more of the computing devices 251 of the computing system 250 can obtain a machine offset from each of the neural networks 304. Each neural network is trained to output a particular machine offset based on the parameters obtained.

[0097] At (510), exemplary method (500) includes adjusting, by the one or more computing devices, a material removal tool path based at least in part on the machine offsets. For instance, one or more of the computing devices 251 of the computing system 250 can process the obtained machine offsets and can determine an optimized material removal tool path. In some implementations, the machine offsets can each be output as values, and based on these values, the material removal tool path can be set or adjusted. In some implementations, the machine offsets can each be output as vectors, and based on these vectors, the material removal tool path can be adjusted in

WHAT IS CLAIMED IS:

1. A method for recontouring a component defining one or more sections, the method comprising:

obtaining, by one or more computing devices, a data set comprised of a plurality of subsets each comprised of one or more parameters indicative of a condition of one of the sections of the component and one or more parameters indicative of a condition of a recontouring system;

inputting, by the one or more computing devices, the data set into a cluster of machine-learned models, each subset being input into a respective machine-learned model;

determining, by the one or more computing devices, a machine offset for each section of the component based at least in part on the one or more parameters indicative of the condition of the section and based at least in part on the one or more parameters indicative of the condition of the recontouring system;

obtaining, by the one or more computing devices, the machine offset for each section of the component as outputs of their respective machine-learned models;

adjusting, by the one or more computing devices, a material removal tool path of the recontouring system based at least in part on the machine offsets; and

machining the component utilizing the material removal tool path, and

wherein the one or more parameters indicative of the condition of the recontouring system include a measured step, wherein the measured step is measured during a post-inspection process of a first component defining one or more first sections, the first component being machined prior to the component by the recontouring system and defining a regenerated portion and a non-regenerated portion after being machined, the measured step being measured along the first component for each of the first sections as a distance between an edge of the non-regenerated portion to an edge of the regenerated portion.

2. The method of claim 1, wherein the component defines a reference datum plane, and wherein the one or more parameters indicative of the condition of one of the one or more sections of the component includes an angular deviation of the component with respect to the reference datum plane.

3. The method of claim 1, wherein the component defines a vertical direction, and wherein the method further comprises:

adding a deposited material to the component prior to obtaining the data set, and wherein the deposited material extends along the vertical direction between a top and a bottom;

wherein the condition of the component includes a step position indicative of a distance between the top and the bottom of the deposited material.

4. The method of claim 1, wherein the recontouring system comprises a material removal tool, and wherein the condition of the recontouring system includes a tool state indicative of a condition of the material removal tool.

5. The method of claim 1, wherein the method further comprises:

recontouring the first component machined prior to the component, the recontouring of the first component comprising:

obtaining, by the one or more computing devices, a first data set comprised of one or more first subsets each comprised of one or more first parameters indicative of a condition of one of the first sections of the first component;

inputting, by the one or more computing devices, the first data set into the cluster of machine-learned models, each first subset being input into a respective machine-learned model;

determining, by the one or more computing devices, a first machine offset for each first section of the first component based at least in part on the one or more first parameters indicative of the respective conditions of the first sections of the first component;

obtaining, by the one or more computing devices, the first machine offset for each first section of the first component as outputs of their respective machine-learned models;

adjusting, by the one or more computing devices, a first material removal tool path based at least in part on the first machine offsets; and

machining the first component utilizing the adjusted first material removal tool path;

performing the post-inspection process on the first component.

6. The method of claim 1, wherein after inputting, the method further comprises:

processing, by the one or more computing devices, each subset in its respective machine-learned model in parallel.

7. The method of claim 1, wherein the machine-learned models are neural networks.

8. A method for recontouring a component of a gas turbine engine using a recontouring system, the component defining a plurality of sections, the method comprising:

obtaining, by one or more computing devices, a data set comprised of a plurality of subsets, each subset comprised of one or more parameters indicative of a condition of one of the sections of the component and a condition of the recontouring system;

inputting, by the one or more computing devices, the data set into a machine-learned model comprised of a plurality of neural networks, each subset being input into a respective neural network;

determining, by the one or more computing devices, a machine offset for each section of the component based at least in part on the one or more parameters indicative of the condition of the section and the condition of the recontouring system;

obtaining, by the one or more computing devices, the machine offset for each section of the component as outputs of their respective neural networks;

adjusting, by the one or more computing devices, a material removal tool path of the recontouring system based at least in part on the machine offsets; and

machining the component utilizing the material removal tool path, and

wherein the parameter indicative of the condition of the recontouring system is a measured step, wherein the measured step is measured during a post-inspection process of a first component defining one or more first sections, the first component being machined prior to the component by the recontouring system and defining a regenerated portion and a non-regenerated portion after being machined, the measured step being measured along the first component for each of the first sections as a distance between an edge of the non-regenerated portion to an edge of the regenerated portion.

9. The method of claim 8, wherein the recontouring system comprises a material removal tool, the material removal tool comprises an abrasive belt, and wherein one of the one or more parameters indicative of the condition of ~~one of the sections of the component~~ the recontouring system is a tool state indicative of a condition of the material removal tool, and wherein the condition of the material removal tool is descriptive of a thickness of the abrasive belt.

10. The method of claim 8, wherein the method further comprises:

recontouring the first component machined prior to the component, the recontouring of the first component comprising:

obtaining, by the one or more computing devices, a first data set comprised of a plurality of first subsets, each first subset comprised of one or more first parameters indicative of a condition of one of the sections of the first component and a condition of the recontouring system;

inputting, by the one or more computing devices, the first data set into the machine-learned model comprised of the plurality of neural networks, each first subset being input into a respective neural network;

determining, by the one or more computing devices, a first machine offset for each first section of the first component based at least in part on the one or more first parameters indicative of the condition of the first section and the condition of the recontouring system;

obtaining, by the one or more computing devices, the first machine offset for each first section of the first component as outputs of their respective neural networks;

adjusting, by the one or more computing devices, a material removal tool path based at least in part on the first machine offsets; and

machining the first component utilizing the material removal tool path;

performing the post-inspection process on the first component.

11. The method of claim 8, wherein during determining, the machine offsets for each section are determined in parallel.

12. The method of claim 8, wherein the neural networks are deep neural networks.

13. The method of claim 8, wherein the component is at least one of an engine blade and a fan blade of the gas turbine engine.

14. The method of claim 8, wherein the component defines a reference datum plane and a vertical direction, and wherein the recontouring system comprises a material removal tool, and wherein the method further comprises:

adding a deposited material to the component prior to obtaining the data set, and wherein the deposited material extends along the vertical direction between a top and a bottom;

recontouring the first component machined prior to the component, the recontouring of the first component comprising:

obtaining, by the one or more computing devices, a first data set comprised of a plurality of first subsets, each first subset comprised of one or more first parameters indicative of a

condition of one of the sections of the first component and a condition of the recontouring system;

inputting, by the one or more computing devices, the first data set into the machine-learned model comprised of the plurality of neural networks, each first subset being input into a respective neural network;

determining, by the one or more computing devices, a first machine offset for each first section of the first component based at least in part on the one or more first parameters indicative of the condition of the first section and the condition of the recontouring system;

obtaining, by the one or more computing devices, the first machine offset for each first section of the first component as outputs of their respective neural networks;

adjusting, by the one or more computing devices, a material removal tool path based at least in part on the first machine offsets; and

machining the first component utilizing the material removal tool path, wherein after machining, the component defines a regenerated portion and a non-regenerated portion;

performing the post-inspection process on the first component; and

wherein the one or more parameters indicative of the condition of one of the sections of the component include:

an angular deviation of the component with respect to the reference datum plane; and

a step position indicative of a distance between the top and the bottom of the deposited material,

wherein the parameter indicative of the condition of the recontouring system is one of a plurality of parameters indicative of the condition of the recontouring system used to determine, by the one or more computing devices, the machine offset for each section of the component, and wherein the plurality of parameters indicative of the condition of the recontouring system include:

a tool state indicative of a condition of the material removal tool.

15. A method for recontouring a blade of a gas turbine engine using a recontouring system, the blade defining a plurality of sections, the method comprising:

obtaining, by one or more computing devices, a data set comprised of a plurality of subsets, each subset corresponding to one of the plurality of sections of the blade and comprising one or more parameters indicative of a condition of the corresponding section of the blade and a condition of the recontouring system;

inputting, by the one or more computing devices, the data set into a machine-learned model comprised of a plurality of neural networks, each subset being input into a respective neural network;

determining, by the one or more computing devices, a machine offset for each section of the blade based at least in part on the one or more parameters indicative of the condition of the section and the condition of the recontouring system;

obtaining, by the one or more computing devices, the machine offset for each section of the blade as outputs of their respective neural networks;

adjusting, by the one or more computing devices, a material removal tool path of the recontouring system based at least in part on the machine offsets; and

machining the blade utilizing the material removal tool path, and

wherein the parameter indicative of the condition of the recontouring system is a measured step, wherein the measured step is measured during a post-inspection process of a first component defining one or more first sections, the first component being machined prior to the component by the recontouring system and defining a regenerated portion and a non-regenerated portion after being machined, the measured step being measured along the first component for each of the first sections as a distance between an edge of the non-regenerated portion to an edge of the regenerated portion.

16. The method of claim 15, wherein one of the parameters indicative of the condition of one of the sections of the blade is a twist angle.

17. The method of claim 15, wherein the blade defines a vertical direction, and wherein one of the parameters indicative of the condition of one of the sections of the blade is a length of the blade along the vertical direction.

18. The method of claim 15, wherein the blade is a compressor blade.

19. The method of claim 15, wherein the blade is a turbine blade.