

CLAIMS

1. A method for updating a vibration fault level state of an industrial environment comprising:
 - 5 receiving a request from a client application to update the vibration fault level state of the industrial environment;
 - retrieving at least one digital twin that corresponds to the industrial environment, wherein the at least one digital twin is capable of fulfilling the request;
 - retrieving at least one dynamic model that corresponds to the industrial
 - 10 environment, wherein the at least one dynamic model is configured to predict occurrences of vibration fault level states based on an input data set;
 - determining a condition that is associated with the vibration fault level states;
 - selecting at least one data source from a set of available data sources based on the input dataset of the at least one dynamic model, wherein the selecting is based on the at
 - 15 least one data source including data that indicates the condition;
 - obtaining data that indicates the condition from the selected at least one data source;
 - determining an output of the at least one dynamic model using the obtained data as one input of the at least one dynamic model;
 - 20 determining a prediction of an occurrence of the vibration fault level state of the at least one retrieved digital twin based on the output of the at least one dynamic model; and
 - updating the vibration fault level state of the industrial environment based on the prediction of the occurrence of the vibration fault level state of the at least one digital twin.
- 25 2. The method of claim 1, wherein the request is received from at least one of:
 - a client application that corresponds to at least one of the industrial environment and/or one or more industrial entities within the industrial environment, or at least one industrial entity within the industrial environment.
- 30 3. The method of claim 1, wherein the at least one digital twin corresponds to at least one industrial entity within the industrial environment.

4. The method of claim 1, wherein the input dataset of the at least one dynamic model includes a vibration data item and at least one additional data item including at least one of: temperature, pressure, humidity, wind, rainfall, tide, storm surge, cloud cover, snowfall, visibility, radiation, audio, video, image, water level, quantum, flow rate, signal power, signal frequency, motion, velocity, acceleration, lighting level, analyte concentration, biological compound concentration, metal concentration, or organic compound concentration data.
5. The method of claim 1, wherein the selected data sources include at least one of:
an Internet of Things connected device, and
a machine vision system.
6. The method of claim 1, wherein the retrieving the at least one dynamic model includes identifying the at least one dynamic model based on at least one property of the industrial environment indicated in the request and a corresponding type of the at least one digital twin.
7. The method of claim 6, wherein the at least one dynamic model is identified using a lookup table.
8. The method of claim 1, wherein the condition includes at least one of: a temperature, a pressure, a humidity, a heat flux, a magnetic field, an electric field, an electric current, a voltage, a capacitance, an inductance, an air flow, a fluid flow, an air particulate, a fluid particulate, a chemical, a displacement, a speed, an acceleration, an inertia, a friction, a sound, a light, a torque, a mechanical resistance, or a load.
9. The method of claim 1, wherein the industrial environment includes an engine, the condition associated with the vibration fault level state includes an overheating of the engine, and the data that indicates the condition includes a temperature of the engine.
10. The method of claim 1, wherein the industrial environment includes at least one bearing, the condition associated with the vibration fault level state includes a temperature

change of the at least one bearing, and the data that indicates the condition includes a temperature of the at least one bearing.

11. The method of claim 1, wherein the industrial environment includes a water pump,
5 the condition associated with the vibration fault level state includes a mechanical stress of a driveshaft of the water pump, and the data that indicates the condition includes a torsion of the driveshaft of the water pump.

12. The method of claim 1, wherein the vibration fault level state includes at least one
10 of: an alarm vibration fault level state, a critical vibration fault level state, a suboptimal vibration fault level state, or a normal vibration fault level state.

13. The method of claim 1, wherein the at least one dynamic model includes at least
one of: a neural network, a recursive neural network, a Bayesian neural network, a
15 regression-based model, a decision tree, a prediction tree, a classification tree, a Hidden Markov Model, a computer vision model, a k-means clustering model, a k-nearest-neighbor classifier, a genetic algorithm, a Bayesian case model, or a Gaussian mixture model.

20 14. The method of claim 1, further comprising: displaying a presentation of the vibration fault level state, wherein the presentation indicates at least one of: a vibration characteristic, a harmonic peak, a vibration severity unit, a vibration fault level state, a recommendation, a prediction, a probability of failure, a maintenance history, a time to failure, a cost of downtime, a probability of downtime, a cost of repair, a cost of machine
25 replacement, a probability of shutdown, or a manufacturing key performance indicator.