CLAIMS

1. A computer-implemented method comprising:

receiving, by a computing device, information associated with a set of value chain network entities of a value chain network, the information generated by at least one of: a set of sensors of the set of value chain network entities, a set of IoT devices configured to collect data relating to the set of value chain network entities, or a set of APIs configured to publish data relating to the set of value chain network entities;

providing the information to a set of Artificial Intelligence (AI)-based learning models, wherein at least one member of the set of AI-based learning models is trained on a training data set of a set of value chain network entities operating data to classify at least one of: an operating state, a fault condition, an operating flow, or a behavior of at least one value chain entity of the set of value chain network entities;

determining a procurement action to be taken in the value chain network based upon, at least in part, an output of the set of AI-based learning models; and

executing the procurement action to facilitate an improvement of at least one of: the operating state, the fault condition, the operating flow, or the behavior of at least the one entity of the set of value chain network entities.

2. The computer-implemented method of claim 1 further comprising at least one of:

providing an alert describing the procurement action that was executed,

providing real-time information on supplier performance,

monitoring for compliance of suppliers and procurement teams,

automatically generating purchase orders associated with the procurement action,

automatically processing invoice processing associated with the procurement action, and

unifying data associated with warehouse management, inventory management, order management, analytics to optimize an omnichannel fulfillment.

3. The computer-implemented method of claim 1, wherein the information includes past behavior over time, historical data, and current data.

4. The computer-implemented method of claim 1, wherein executing the procurement action includes at least one of:

resolving an out-of-stock situation, and

predicting when to place an order based upon, at least in part, upstream data.

5. The computer-implemented method of claim 1, wherein the set of the value chain network entities includes at least one of: products, suppliers, producers, manufacturers, retailers, businesses, owners, operators, operating facilities, customers, consumers, workers, mobile devices, wearable devices, distributors, resellers, supply chain infrastructure facilities, supply chain processes, logistics processes, reverse logistics processes, demand prediction processes, demand management processes, demand aggregation processes, machines, ships, barges, warehouses, maritime ports, airports, airways, waterways, roadways, railways, bridges, tunnels, online retailers, ecommerce sites, demand factors, supply factors, delivery systems, floating

assets, points of origin, points of destination, points of storage, points of use, networks, information technology systems, software platforms, distribution centers, fulfillment centers, containers, container handling facilities, customs, export control, border control, drones, robots, robotic handling systems, 3D printers, vehicles, autonomous vehicles, hauling facilities, waterways, or port infrastructure facilities.

6. The computer-implemented method of claim 1, wherein the set of AI-based learning models includes at least one of: a transformer model, a convolutional neural network, a deep learning model trained on a set of outcomes of the value chain network entity, a supervised model, a semi-supervised model, an unsupervised model, or a reinforcement model.

7. The computer-implemented method of claim 1, wherein the training data set for the set of AI-based learning models includes one of a set of objects or events that are labeled to classify the set of objects or events according to a classification taxonomy that includes at least one of: the operating state, the fault condition, the operating flow, or the behavior.

8. The computer-implemented method of claim 1, wherein the procurement action is executed by a value chain network digital twin.

9. A computing system including one or more processors and one or more memories configured to perform operations comprising:

receiving, by a computing device, information associated with a set of value chain network entities of a value chain network, the information generated by at least one of: a set of sensors of the set of value chain network entities, a set of IoT devices configured to collect data relating to the set of value chain network entities, or a set of APIs configured to publish data relating to the set of value chain network entities;

providing the information to a set of Artificial Intelligence (AI)-based learning models, wherein at least one member of the set of AI-based learning models is trained on a training data set of a set of value chain network entities operating data to classify at least one of: an operating state, a fault condition, an operating flow, or a behavior of at least one value chain entity of the set of value chain network entities;

determining a procurement action to be taken in the value chain network based upon, at least in part, an output of the set of AI-based learning models; and

executing the procurement action to facilitate an improvement of at least one of: the operating state, the fault condition, the operating flow, or the behavior of at least the one entity of the set of value chain network entities.

10. The computing system of claim 9, wherein the operations further comprise at least one of:

providing an alert describing the procurement action that was executed,

providing real-time information on supplier performance,

monitoring for compliance of suppliers and procurement teams,

automatically generating purchase orders associated with the procurement action and

automatically processing invoice processing associated with the procurement action and

unifying data associated with warehouse management, inventory management, order management, analytics to optimize an omnichannel fulfillment.

11. The computing system of claim 9, wherein the information includes past behavior over time, historical data, and current data.

12. The computing system of claim 9, wherein executing the procurement action includes resolving an out-of-stock situation.

13. The computing system of claim 9, wherein executing the procurement action includes predicting when to place an order based upon, at least in part, upstream data.

14. The computing system of claim 9, wherein the set of AI-based learning models includes at least one of: a transformer model, a convolutional neural network, a deep learning model trained on a set of outcomes of the value chain network entity, a supervised model, a semi-supervised model, an unsupervised model, or a reinforcement model.

15. The computing system of claim 9, wherein the training data set for the set of AI-based learning models includes one of a set of objects or events that are labeled to classify the set of objects or events according to a classification taxonomy that includes at least one of: the operating state, the fault condition, the operating flow, or the behavior.