CLAIMS

1. A method for configuring role-based digital twins, comprising:

receiving, by a processing system having one or more processors, an organizational definition of an industrial plant operation, wherein the organizational definition defines a set of roles within the industrial plant operation;

generating, by the processing system, an organizational digital twin of the industrial plant operation based on the organizational definition, wherein the organizational digital twin is a digital representation of an organizational structure of the industrial plant operation;

determining, by the processing system, a set of relationships between different roles within the set of roles based on the organizational definition;

determining, by the processing system, a set of settings for a role from the set of roles based on the determined set of relationships;

linking an identity of a respective individual to the role;

determining, by the processing system, a configuration of a presentation layer of a role-based digital twin corresponding to the role based on the settings of the role that is linked to the identity, wherein the configuration of the presentation layer defines a set of states that is depicted in the role-based digital twin associated with the role;

determining, by the processing system, a set of data sources that provide data corresponding to the set of states, wherein each data source provides one or more respective types of data; and

configuring one or more data structures that is received from the one or more data sources, wherein the one or more data structures ~~are~~ is configured to provide data used to populate one or more of the set of states in the role-based digital twin.

2. The method of claim 1, wherein the organizational definition further identifies a set of physical assets of the industrial plant operation.

3. The method of claim 1, wherein determining the set of relationships includes parsing the organizational definition to identify a reporting structure and one or more business units of the industrial plant operation.

4. The method of claim 3, wherein the set of relationships ~~are~~ is inferred from the reporting structure and the business units.

5. The method of claim 1, further comprising linking a set of identities to the set of roles, wherein each identity corresponds to a respective role from the set of roles.

6. The method of claim 1, wherein the role-based digital twin integrates with an industrial plant operation resource planning system that operates on the organizational digital twin that represents the set of roles in the industrial plant operation, such that changes in the industrial plant operation resource planning system are automatically reflected in the organizational digital twin.

7. The method of claim 1, wherein the organizational structure includes hierarchical components.

~~8. The method of claim 7, wherein the hierarchical components are embodied in a graph data structure.~~

~~9.~~8. The method of claim 1, wherein the set of settings for the set of roles includes role-based permission settings.

~~10.~~9. The method of claim 8~~9~~, wherein the role-based permission settings are based on hierarchical components defined in the organizational definition.

~~11.~~10. The method of claim 1, wherein the set of settings for the set of roles includes role-based preference settings.

~~12. The method of claim 11, wherein the role-based preference settings are configured based on a set of role-specific templates.~~

~~13. The method of claim 12, wherein the set of templates includes at least one of a CEO template, a COO template, a CFO template, a counsel template, a board member template, a CTO template, a chief marketing officer template, an information technology manager template, a chief information officer template, a chief data officer template, an investor template, a customer template, a vendor template, a supplier template, an engineering manager template, a project manager template, an operations manager template, a sales manager template, a salesperson template, a service manager template, a maintenance operator template, or a business development template.~~

~~14.~~11. The method of claim 1, wherein the set of settings for the set of roles includes role-based taxonomy settings.

~~15.~~12. The method of claim 11~~14~~, wherein the taxonomy settings identify a taxonomy that is used to characterize data that is presented in the role-based digital twin, such that the data is presented in a taxonomy that is linked to the role corresponding to the role-based digital twin.

~~16. The method of claim 15, wherein the set of taxonomies includes at least one of a CEO taxonomy, a COO taxonomy, a CFO taxonomy, a counsel taxonomy, a board member taxonomy, a CTO taxonomy, a chief marketing officer taxonomy, an information~~

~~technology manager taxonomy, a chief information officer taxonomy, a chief data officer taxonomy, an investor taxonomy, a customer taxonomy, a vendor taxonomy, a supplier taxonomy, an engineering manager taxonomy, a project manager taxonomy, an operations manager taxonomy, a sales manager taxonomy, a salesperson taxonomy, a service manager taxonomy, a maintenance operator taxonomy, or a business development taxonomy.~~

~~17. The method of claim 1, wherein at least one role of the set of roles is selected from among a CEO role, a COO role, a CFO role, a counsel role, a board member role, a CTO role, an information technology manager role, a chief information officer role, a chief data officer role, a human resources manager role, an investor role, an engineering manager role, an accountant role, an auditor role, a resource planning role, a public relations manager role, a project manager role, an operations manager role, a research and development role, an engineer role, including but not limited to mechanical engineer, electrical engineer, semiconductor engineer, chemical engineer, computer science engineer, data science engineer, network engineer, or some other type of engineer, and a business development role.~~

~~18. The method of claim 17, wherein the at least one role is selected from among a factory manager role, a factory operations role, a factory worker role, a power plant manager role, a power plant operations role, a power plant worker role, an equipment service role, and an equipment maintenance operator role.~~

~~19.~~13. A system for data collection in an industrial environment, the system comprising:

an industrial system comprising a plurality of components, and a plurality of sensors each operatively coupled to at least one of the plurality of components;

a sensor communication circuit structured to interpret a plurality of sensor data values in response to a sensed parameter group;

a pattern recognition circuit structured to determine a recognized pattern value in response to at least a portion of the plurality of sensor data values;

a sensor learning circuit structured to update the sensed parameter group in response to the recognized pattern value; wherein the sensor communication circuit is further structured to adjust the interpreting of the plurality of sensor data values in response to the updated sensed parameter group, wherein the sensor learning circuit is further structured to update the sensed parameter group by updating a network path configuration corresponding to at least one sensor from the sensed parameter group; and

a reporting circuit, wherein the sensed parameter group is associated with a role-based taxonomy setting, and the role-based taxonomy setting is further associated with at least one reporting rule for reporting the update to the sensed parameter group to at least one role taxonomy including among the role-based taxonomy setting.

~~20.~~14. The system of claim ~~19~~13, wherein the sensed parameter group comprises a fused plurality of sensors, and wherein the recognized pattern value further includes a secondary value comprising a value determined in response to the fused plurality of sensors.

~~21. The system of claim 20, wherein the pattern recognition circuit and the sensor learning circuit are further structured to iteratively perform the determining the recognized pattern value and the updating the sensed parameter group to improve a sensing performance value.~~

~~22. The system of claim 21, wherein the sensing performance value comprises at least one performance determination including: a signal to noise performance for detecting a value of interest in the industrial system; a network utilization of the plurality of sensors in the industrial system; an effective sensing resolution for a value of interest in the industrial system; or a power consumption value for a sensing system in the industrial system, the sensing system including the plurality of sensors.~~

~~23. The system of claim 21, wherein the sensing performance value comprises a signal to noise performance for detecting a value of interest in the industrial system.~~

~~24. The system of claim 21, wherein the sensing performance value comprises a network utilization of the plurality of sensors in the industrial system.~~

~~25. The system of claim 21, wherein the sensing performance value comprises an effective sensing resolution for a value of interest in the industrial system.~~

~~26. The system of claim 21, wherein the sensing performance value comprises a power consumption value for a sensing system in the industrial system, the sensing system including the plurality of sensors.~~

~~27. The system of claim 21, wherein the sensing performance value comprises a calculation efficiency for determining the secondary value.~~

~~28. The system of claim 27, wherein the calculation efficiency comprises at least one of: processor operations to determine the secondary value, memory utilization for determining the secondary value, a number of sensor inputs from the plurality of sensors for determining the secondary value, and supporting data long term storage for supporting the secondary value.~~

~~29. The system of claim 21, wherein the sensing performance value comprises one of an accuracy or a precision of the secondary value.~~

~~30. The system of claim 21, wherein the sensing performance value comprises a redundancy capacity for determining the secondary value.~~

~~31. The system of claim 21, wherein the sensing performance value comprises a lead time value for determining the secondary value.~~

~~32. The system of claim 31, wherein the secondary value comprises a component overtemperature value.~~

~~33. The system of claim 31, wherein the secondary value comprises one of a component maintenance time, a component failure time, or a component service life.~~

~~34. The system of claim 31, wherein the secondary value comprises an off nominal operating condition affecting a product quality produced by an operation of the industrial system.~~

~~35. The system of claim 19, wherein the plurality of sensors comprises at least one analog sensor.~~

~~36. The system of claim 19, wherein at least one of the sensors comprises a remote sensor.~~

~~37. The system of claim 20, wherein the secondary value comprises at least one of a virtual sensor output value; a process prediction value; a process state value; a component prediction value; a component state value; or a model output value having the sensor data values from the fused plurality of sensors as an input.~~

~~38. The system of claim 20, wherein the fused plurality of sensors further comprises at least one of a vibration sensor and a temperature sensor; a vibration sensor and a pressure sensor; a vibration sensor and an electric field sensor; a vibration sensor and a heat flux sensor; a vibration sensor and a galvanic sensor; or a vibration sensor and a magnetic sensor.~~

~~39.~~15. The system of claim ~~19~~13, wherein the sensor learning circuit is further structured to update the sensed parameter group to form the updated sensed parameter group by performing at least one additional operation including updating a sensor selection of the sensed parameter group; updating a sensor sampling rate of at least one sensor from the sensed parameter group; updating a sensor resolution of at least one sensor from the sensed parameter group; updating a storage value corresponding to at least one sensor from the sensed parameter group; updating a priority corresponding to at least one sensor from the sensed parameter group; and updating at least one of a sampling rate, sampling order, or sampling phase.

40. The system of claim 39, wherein the pattern recognition circuit is further structured to determine the recognized pattern value by at least one of determining a signal effectiveness of at least one sensor of the sensed parameter group and the updated sensed parameter group relative to a value of interest; determining a sensitivity of at least one sensor of the sensed parameter group and the updated sensed parameter group relative to the value of interest; determining a predictive confidence of at least one sensor of the sensed parameter group and the updated sensed parameter group relative to the value of interest; determining a predictive delay time of at least one sensor of the sensed parameter group and the updated sensed parameter group relative to the value of interest; determining a predictive accuracy of at least one sensor of the sensed parameter group and the updated sensed parameter group relative to the value of interest; determining a predictive precision of at least one sensor of the sensed parameter group and the updated sensed parameter group relative to the value of interest; or updating the recognized pattern value in response to external feedback.

41. The system of claim 40, wherein the value of interest comprises at least one value including a virtual sensor output value; a process prediction value; a process state value; a component prediction value; a component state value; or a model output value having the sensor data values from a fused plurality of sensors as an input.

42. The system of claim 19, wherein the pattern recognition circuit is further structured to access cloud based data comprising a second plurality of sensor data values, the second plurality of sensor data values corresponding to at least one offset industrial system.

43. The system of claim 42, wherein the sensor learning circuit is further structured to access the cloud based data comprising a second updated sensor parameter group corresponding to the at least one offset industrial system.

44. The system of claim 19, wherein the at least one role taxonomy is at least one of a CEO taxonomy, a COO taxonomy, a CFO taxonomy, a counsel taxonomy, a board member taxonomy, a CTO taxonomy, a chief marketing officer taxonomy, an information technology manager taxonomy, a chief information officer taxonomy, a chief data officer taxonomy, an investor taxonomy, a customer taxonomy, a vendor taxonomy, a supplier taxonomy, an engineering manager taxonomy, a project manager taxonomy, an operations manager taxonomy, a sales manager taxonomy, a salesperson taxonomy, a service manager taxonomy, a maintenance operator taxonomy, or a business development taxonomy.

45. A system for data collection in an industrial environment having a self sufficient data acquisition box for capturing and analyzing data in an industrial process, the system comprising:

a data circuit for analyzing a plurality of sensor inputs; and

a network control circuit for sending and receiving information related to the plurality of sensor inputs to an external system, wherein the information sent and received by the network control system is based at least in part on a role based reporting rule and encoded with role based information that is used by the external system to report the information sent and received to a specified role taxonomy, wherein the system provides sensor data to one or more other systems for data collection, and wherein the data circuit dynamically reconfigures a route by which the system sends the sensor data based on how many devices are requesting the information.

46. The system of claim 45, wherein the system further comprises a plurality of network communication interfaces.

47. The system of claim 46, wherein the network control circuit bridges another system for data collection from one network to another using the plurality of network communication interfaces.

48. The system of claim 45, wherein the network control circuit implements a network of systems for data collection using an intercommunication protocol selected from a list comprising: multi hop, mesh, serial, parallel, ring, real time and hub and spoke.

49. The system of claim 45, wherein the system continuously provides a single copy of its information to another system for data collection and directs requesters of its information to the another system for data collection.

50. The system of claim 45, wherein at least one of the one or more other systems for data collection has different operational characteristics than the system.

51. The system of claim 50, wherein the different operational characteristics are selected from a list comprising: power, storage, network connectivity, proximity, reliability, duty cycle.

52. The system of claim 45, wherein, after a configurable time period, the system stores only digests of the information and discards underlying information.

53. The system of claim 45, wherein the data circuit dynamically nominates one of the other systems for data collection capable of providing the sensor data to replace the system.

54. The system of claim 53, wherein the nomination is triggered by a detection of a system failure mode.

55. The system of claim 45, wherein the network control circuit arranges the system into a redundant storage network.

56. The system of claim 45, wherein the system accumulates data received from the other systems for data collection while an upstream network connection is unavailable, and then sends all accumulated data once the upstream network connection is restored.

57. The system of claim 45, wherein the system further comprises an intelligent agent circuit that combines the sensor data between the system and the other systems for data collection.

58. The system of claim 57, wherein the intelligent agent circuit chooses what sensor data to collect or store based on a machine learning algorithm.

59. The system of claim 45, wherein the analyzing further comprises detecting anomalies in the information.

60. The system of claim 45, wherein the system dynamically reconfigures where it sends data and what quantity of data it sends based on an availability of the other systems for data collection.

61. The system of claim 60, wherein the system further comprises a plurality of network communication interfaces.

62. The system of claim 61, wherein the system dynamically reconfigures where it sends data and what quantity of data it sends based on requests received over one or more of the plurality of network communication interfaces.

63. The system of claim 61, further comprising a data filter circuit configured to dynamically adjust what portion of the information is sent based on instructions received over one or more of the plurality of network communication interfaces.

64. The system of claim 60, wherein the system dynamically reconfigures where it sends data and what quantity of data it sends based on an operating parameter of at least one of the system or one of the other systems for data collection.

65. The system of claim 45, wherein the specified role type is at least one of a CEO taxonomy, a COO taxonomy, a CFO taxonomy, a counsel taxonomy, a board member taxonomy, a CTO taxonomy, a chief marketing officer taxonomy, an information technology manager taxonomy, a chief information officer taxonomy, a chief data officer taxonomy, an investor taxonomy, a customer taxonomy, a vendor taxonomy, a supplier taxonomy, an engineering manager taxonomy, a project manager taxonomy, an operations manager taxonomy, a sales manager taxonomy, a salesperson taxonomy,

~~a service manager taxonomy, a maintenance operator taxonomy, or a business development taxonomy.~~

~~66. A method for data collection in an industrial environment, the method comprising:~~

~~receiving, at a switch, analog data from a plurality of variable groups of analog sensor inputs;~~

~~monitoring the analog data from the plurality of variable groups of analog sensor inputs;~~

~~adaptively scheduling data collection of the switch;~~

~~determining a noise value including at least one of ambient noise, local noise, or vibration noise;~~

~~using machine learning to forecast a mechanical state of a machine based at least in part on the determined noise value; and~~

~~reporting the forecasted mechanical state of the machine to an entity associated with a role type stored within a role taxonomy.~~

~~67. The method of claim 66, further comprising performing internet protocol (IP) front-end end signal conditioning to improve a signal-to-noise ratio of at least one of the analog sensor inputs.~~

~~68. The method of claim 66, further comprising predicting a state of at least one of a component or a process of the industrial environment in response to the determined noise value.~~

~~69. The method of claim 66, further comprising utilizing a transfer function to determine a relative phase of a first one of the analog sensor inputs to a second one of the analog sensor inputs.~~

~~70. The method of claim 66, wherein the role taxonomy is at least one of a CEO taxonomy, a COO taxonomy, a CFO taxonomy, a counsel taxonomy, a board member taxonomy, a CTO taxonomy, a chief marketing officer taxonomy, an information technology manager taxonomy, a chief information officer taxonomy, a chief data officer taxonomy, an investor taxonomy, a customer taxonomy, a vendor taxonomy, a supplier taxonomy, an engineering manager taxonomy, a project manager taxonomy, an operations manager taxonomy, a sales manager taxonomy, a salesperson taxonomy, a service manager taxonomy, a maintenance operator taxonomy, and a business development taxonomy.~~

~~71. A data collection and processing system, comprising:~~

~~variable groups of sensor inputs, each of the variable groups of sensor inputs operationally coupled to an industrial environment;~~

~~a switch comprising multiple sensor channels configured to receive long blocks of high sampling rate data from one or more of the variable groups of sensor inputs; and~~

~~a data management feature that includes multiple routes communicatively coupling the variable groups of sensor inputs to the multiple sensor channels, wherein the switch is configured to use hierarchical templates to perform one of creating or adjusting one of the multiple routes, and wherein the data management feature includes multiple reporting routes for distributing data from the multiple sensor channels to at least one entity associated with a role type stored within a role taxonomy.~~

~~72. The data collection and processing system of claim 71, further comprising a controller configured to store calibration data and a maintenance history of one or more sensors associated with the variable groups of sensor inputs.~~

~~73. The data collection and processing system of claim 71, wherein the switch is further configured to provide a continuously monitored alarm in response to one of more inputs from the variable groups of sensor inputs.~~

~~74. The data collection and processing system of claim 71, wherein the switch is configured to perform internet protocol (IP) front end end signal conditioning to improve a signal to noise ratio of one or more of the sensor channels.~~

~~75. A data collection and processing system, comprising:~~

~~variable groups of sensor inputs, each of the variable groups of sensor inputs operationally coupled to an industrial environment;~~

~~a switch comprising multiple sensor channels configured to receive long blocks of high sampling rate data from one or more of the variable groups of sensor inputs; and~~

~~a data management feature that includes a controller configured to perform intelligent management of data collection frequency bands obtained by one or more of the variable groups of sensor inputs, and wherein the intelligent management of data collection is based at least in part on a data collection rule relating to a data requirement of at least one entity associated with a role type stored within a role taxonomy.~~

~~76. The data collection and processing system of claim 75, wherein the controller is configured to store calibration data and a maintenance history of one or more sensors associated with the variable groups of sensor inputs.~~

77. The data collection and processing system of claim 75, wherein the switch is further configured to provide a continuously monitored alarm in response to one or more inputs from the variable groups of sensor inputs.

78. The data collection and processing system of claim 75, wherein the switch is configured to perform internet protocol (IP) front-end end signal conditioning to improve a signal-to-noise ratio of one or more of the sensor channels.

79. A data collection and processing system, comprising:

variable groups of sensor inputs, each of the variable groups of sensor inputs operationally coupled to an industrial environment;

a switch comprising multiple sensor channels configured to receive long blocks of high-sampling rate data from one or more of the variable groups of sensor inputs; and

a data management feature that includes a controller comprising a neural net expert system, wherein the neural net expert system is configured to perform intelligent management of data collection frequency bands obtained by at least one of the variable groups of sensor inputs, and wherein the neural net expert system is configured to manage data based at least in part on a rule associated with a role type stored within a role taxonomy.

80. The data collection and processing system of claim 79, wherein the controller is configured to store calibration data and a maintenance history of one or more sensors associated with the variable groups of sensor inputs.

81. The data collection and processing system of claim 79, wherein the switch is further configured to provide a continuously monitored alarm in response to one or more inputs from the variable groups of sensor inputs.

82. The data collection and processing system of claim 79, further comprising at least one additional switch, and wherein each of the switches comprises a corresponding complex programmable logic device (CPLD), each CPLD configured to control a corresponding switch.

83. A data collection and processing system, comprising:

variable groups of sensor inputs operationally coupled to an industrial environment;

a switch communicatively coupled to the variable groups of sensor inputs; and

a controller configured to continuously monitor data from multiple variable groups of sensor inputs, wherein continuously monitoring comprises adaptively

scheduling data collection of the switch, and reporting a future state of the industrial environment based on a rule associated with a role type stored within a role taxonomy.

84. The data collection and processing system of claim 83 wherein the controller is further configured to determine a noise value from one or more of an ambient noise, a local noise, or a vibration noise; and wherein the controller is further configured to predict a state of at least one of a component or a process of the industrial environment in response to the determined noise value.

85. The data collection and processing system of claim 83, wherein the controller is further configured to use smart route changes based on at least one of incoming data or alarms, and to provide simultaneous dynamic data from the multiple variable groups of sensor inputs in response to the one of incoming data or alarms.

86. The data collection and processing system of claim 83, wherein the controller is further configured to perform machine pattern recognition based on a fusion of a selected plurality of the variable groups of sensor inputs.

87. The data collection and processing system of claim 83, wherein the controller is further configured to utilize a transfer function to determine a relative phase of a first one of the sensor inputs to a second one of the sensor inputs.

88. The data collection and processing system of claim 83, wherein the controller is further configured to perform machine pattern analysis based on a selected plurality of the variable groups of sensor inputs, and wherein the machine pattern analysis comprises anticipated state information for the industrial environment.

89. The data collection and processing system of claim 83, further comprising a cloud-based policy automation engine comprising at least one of: a sensor selection of the variable groups of sensor inputs; a sensor deployment of variable groups of sensor inputs; a sensor fusion of the variable groups of sensor inputs; or a data storage profile of the variable groups of sensor inputs; wherein the controller is further configured to selectively communicate at least a portion of the data of the multiple variable groups of sensor inputs to a cloud based storage, and wherein the communication to the cloud-based storage is organized by a quantitative weighting of relevance of the data of the multiple variable groups of sensor to at least one role type stored within a role taxonomy.

90. The data collection and processing system of claim 83, wherein the controller is further configured to implement a self organizing data marketplace, the self organizing data

marketplace including at least a portion of the data from the variable groups of sensor inputs.

91. The data collection and processing system of claim 90, wherein the controller is further configured to implement a self-organizing data pool based on at least one of: sensor utilization, data utilization, or yield metrics.

92. The data collection and processing system of claim 83, wherein the controller is further configured to train an artificial intelligence (AI) model based on industry specific feedback relating to the industrial environment.

93. A method for data collection in an industrial environment, the method comprising:

receiving, at a switch, data from one or more variable groups of sensor inputs;

monitoring the data from the one or more variable groups of sensor inputs;

adaptively scheduling data collection at the switch;

determining one or more noise values including one of an ambient noise, a local noise, or a vibration noise;

using machine learning to forecast a future state of the industrial environment based at least in part on the determined one or more noise values; and

reporting the forecasted future state of the industrial environment to an entity associated with a role type stored within a role taxonomy.

94. The method of claim 93, further comprising performing internet protocol (IP) front-end end signal conditioning to improve a signal-to-noise ratio of the one or more variable groups of sensor inputs.

95. The method of claim 93, further comprising predicting a state of at least one of a component or a process of the industrial environment in response to one or more of the determined noise values.

96. The method of claim 93, further comprising utilizing a transfer function to determine a relative phase between a first sensor input from one of the variable groups of sensor inputs and a second sensor input from one of the variable groups of sensor inputs.

97. A method, comprising:

by a sensor communication circuit, interpreting data from a plurality of input sensors, wherein each of the plurality of input sensors is operationally coupled to a component of an industrial environment;

by a controller, operating a self-organizing network on the data from the plurality of input sensors, thereby determining a structure in the data;

by the controller, determining a relevance of the determined structure in the data to at least one role type stored within a role taxonomy;

by the controller, determining a reduced dimensionality view of the data in response to the determined structure in the data, wherein the reduced dimensionality view comprises fewer dimensions than the data from the plurality of input sensors, and wherein the reduced dimensionality view further comprises a graphical element representing at least one of: mechanical portions of a machine of the industrial environment, or a sensor from the plurality of input sensors that provided data; and

providing the reduced dimensionality view to a user interface that is associated with at least one entity associated with the at least one role type stored within the role taxonomy.

98. The method of claim 97, further comprising determining that a condition of interest has occurred within the industrial environment, wherein operating the self organizing network on the data from the plurality of input sensors further comprises applying back calculation to the condition of interest to determine a failed part related to the condition of interest, and wherein the reduced dimensionality view comprises a graphical representation of the failed part related to the condition of interest.

99. The method of claim 98, wherein the graphical representation of the failed part related to the condition of interest further comprises a map of highlighted data collection routes that reflect paths of data from at least one of the plurality of input sensors that contributes to calculating the condition of interest.

100. The method of claim 97, further comprising determining that a condition of interest has occurred within the industrial environment, wherein operating the self organizing network on the data from the plurality of input sensors further comprises applying back calculation to the condition of interest to determine a data collection system configuration template associated with the condition of interest, and wherein the reduced dimensionality view comprises a graphical representation of the data collection system configuration template associated with the condition of interest.

101. The method of claim 100 wherein the graphical representation of a failed part related to the condition of interest further comprises a map of data collection configured by the data collection system configuration template, with highlighted routes in a data collection system that reflect paths of data from at least one sensor to at least one data collector for data that contributes to calculating the condition of interest.

~~102. The method of claim 97, wherein the reduced dimensionality view comprises a heat map.~~

~~103. The method of claim 97, wherein operating the self organizing network comprises applying competitive learning to the data from the plurality of input sensors to determine the structure in the data.~~

~~104. The method of claim 97, wherein determining the reduced dimensionality view comprises at least one operation including determining an unlabeled data value of the data from the plurality of input sensors; the method further comprising determining that the data from the plurality of input sensors comprises vibration data from an unknown source within the industrial environment; or providing a frequency value corresponding to an unlabeled data value of the data from the plurality of input sensors.~~

~~105. The method of claim 97, wherein determining the reduced dimensionality view comprises determining an unlabeled data value of the data from the plurality of input sensors, the method further comprising accepting a user input on the user interface, and labeling the unlabeled data value in response to a user input on the user interface.~~

~~106. A system, comprising:~~

~~a sensor communication circuit structured to interpret a plurality of sensor data values from a plurality of input sensors, wherein each of the plurality of input sensors is operationally coupled to a component of an industrial environment;~~

~~a controller configured to:~~

~~operate a self organizing network on the data from the plurality of input sensors, thereby determining a structure in the data; and~~

~~determine a reduced dimensionality view of the data in response to the determined structure in the data and in response to a relevance of the determined structure in the data to at least one role type stored within a role taxonomy, wherein the reduced dimensionality view comprises fewer dimensions than the data from the plurality of input sensors, and wherein the reduced dimensionality view further comprises a plurality of graphical elements representing mechanical portions of a machine of the industrial environment; and~~

~~a user interface configured to display the reduced dimensionality view.~~

~~107. The system of claim 106, wherein the plurality of graphical elements further comprises mechanical portions of the machine of the industrial environment that are associated with a condition of interest.~~

~~108. The system of claim 107, wherein the reduced dimensionality view further comprises a second plurality of graphical elements representing data collectors in the industrial environment associated with the plurality of input sensors.~~

~~109. The system of claim 108, wherein the reduced dimensionality view further comprises a plurality of highlighted graphical elements representing sensors from the plurality of input sensors that provided data outside an acceptable range of data.~~

~~110. The system of claim 109, wherein the user interface is further configured to provide a list of conditions of interest to a user, and to select the condition of interest in response to a user selection from the list of conditions.~~

~~111. The system of claim 110, wherein the controller is further configured to provide a data collection system configuration template in response to the user selection from the list of conditions, and wherein the data collection system configuration template facilitates configuring a data collection system to collect data for calculating the condition of interest.~~

~~112. The system of claim 106, wherein the mechanical portions comprise at least one of a bearing, a shaft, a rotor, or a housing of the machine of the industrial environment.~~

~~113. An apparatus, comprising:~~

~~a user interface configured to provide a list of conditions of interest to at least one entity associated with a role type stored within a role taxonomy, and to select a condition of interest in response to a user selection from the list of conditions; and~~

~~a controller configured to:~~

~~operate a self-organizing network on data from a plurality of input sensors, the plurality of input sensors operationally coupled to a component of an industrial environment; and~~

~~determine a reduced dimensionality view of the data in response to a determined structure in the data and further in response to the selected condition of interest, wherein the reduced dimensionality view a plurality of graphical elements representing mechanical portions of a machine of the industrial environment associated with the condition of interest, wherein the reduced dimensionality view further comprises a plurality of highlighted graphical elements representing sensors from the plurality of input sensors that provided data outside an acceptable range of data, and wherein the user interface is further configured to display the reduced dimensionality view.~~

~~114. The apparatus of claim 113, wherein the controller is further configured to provide a data collection system configuration template in response to the user selection from the list of conditions, and wherein the data collection system configuration template facilitates configuring a data collection system to collect data for calculating the condition of interest.~~

~~115. A system for data collection in an industrial environment, comprising:~~

~~a plurality of wearable haptic stimulators that produce stimuli;~~

~~a plurality of sensors operationally coupled to a machine of the industrial environment;~~

~~a processor logically disposed between the plurality of sensors and the wearable haptic stimulators, the processor configured to:~~

~~receive data from the plurality of sensors representative of a sensed condition of the machine;~~

~~determine a relevance of the sensed condition of the machine to at least one role type stored within a role taxonomy;~~

~~determine at least one haptic stimulation that corresponds to the received data; and send at least one signal in response to the at least one haptic stimulation, wherein at least one of the plurality of wearable haptic stimulators is responsive to the at least one signal, wherein the at least one haptic stimulation represents an effect on the machine in the industrial environment resulting from the sensed condition, and wherein an effect on the machine in the industrial environment is presented as an effect on at least one of the plurality of wearable haptic stimulators and reported to at least one entity associated with the at least one role type stored within the role taxonomy.~~

~~116. The system of claim 115, wherein the effect from at least one haptic stimulation at least one of a list of stimuli including tactile, vibration, heat, sound, force, odor, or motion.~~

~~117. The system of claim 115, wherein a vibrating effect on the machine in the industrial environment is presented as vibrating at least one of the plurality of wearable haptic stimulators.~~

~~118. The system of claim 115, wherein a heating effect on the machine in the industrial environment is presented as an increase in temperature of at least one of the plurality of wearable haptic stimulators.~~

~~119. The system of claim 115, wherein an electrical effect on the machine in the industrial environment is presented as a change in sound produced by at least one of the plurality of wearable haptic stimulators.~~

120. The system of claim 115, wherein at least one of the plurality of wearable haptic stimulators including at least one of a glove, a ring, a wrist band, a wristwatch, an arm band, head gear, a belt, a necklace, a shirt, footwear, pants, overalls, coveralls, or safety goggles.

121. The system of claim 115, wherein the at least one signal comprises an alert of a condition of interest in the industrial environment.

122. The system of claim 121, wherein the at least one haptic stimulation produced in response to the alert of a condition of interest is repeated by at least one of the plurality of wearable haptic stimulators until an acceptable response is detected.

123. A monitoring system for collecting data related to an industrial environment, the monitoring system comprising:

a data collector communicatively coupled to a plurality of input channels, wherein the plurality of input channels comprises data relating to an aspect of an industrial production process and data relating to at least one role type stored within a role taxonomy;

a data storage structured to store a plurality of detection values that corresponds to the plurality of input channels;

a data analysis circuit structured to interpret at least a subset of the plurality of detection values to determine a state value comprising at least one of a process state or a component state;

an optimization circuit structured to analyze a subset of the plurality of detection values and the state value using at least one of a neural net or an expert system to determine a signal effectiveness of at least one of the plurality of input channels relative to the state value, and to provide an adjustment recommendation based, at least in part, on the signal effectiveness; and

an analysis response circuit structured to adjust the industrial production process in response to the adjustment recommendation.

124. The monitoring system of claim 123, wherein the optimization circuit is further structured to provide the adjustment recommendation as one of an equipment change for a component of the industrial production process, or an equipment operating parameter change for the component of the industrial production process.

125. The monitoring system of claim 123, wherein the optimization circuit is further structured to provide the adjustment recommendation as a process parameter change for the industrial production process.

126. The monitoring system of claim 125, wherein the process parameter change comprises a command to rebalance process loads between components of the industrial production process.

127. The monitoring system of claim 126, wherein the optimization circuit is further structured to provide the process parameter change to achieve at least one of: extending a life of one of the components of the industrial production process, improving a probability of success of the industrial production process, or facilitating maintenance on one of the components of the industrial production process.

128. The monitoring system of claim 126, wherein the optimization circuit is further structured to provide the process parameter change to facilitate maintenance of one of the components of the industrial production process.

129. The monitoring system of claim 128, wherein the optimization circuit is further structured to facilitate the maintenance of one of the components by performing at least one operation including extending a maintenance interval of one of the components; synchronizing a first maintenance interval of a first one of the components with a second maintenance interval of a second one of the components; and differentiating the first maintenance interval of the first one of the components from the second maintenance interval of the second one of the components.

130. The monitoring system of claim 128 wherein the optimization circuit is further structured to facilitate the maintenance of one of the components by aligning a maintenance interval of one of the components with an external reference time.

131. The monitoring system of claim 130, wherein the external reference time comprises at least one time including a planned shutdown time for the industrial production process, a time that is past an expected completion time of the industrial production process, or a scheduled maintenance time for one of the components.

132. The monitoring system of claim 123, wherein the optimization circuit is further structured to determine a sensitivity of at least one of the plurality of input channels relative to the state value.

133. The monitoring system of claim 123, wherein the optimization circuit is further structured to determine a predictive accuracy of at least one of the plurality of input channels relative to the state value.

134. A computer-implemented method for collecting data related to an industrial environment, the computer-implemented method comprising:

collecting data, using a data collector communicatively coupled to a plurality of input channels, wherein the plurality of input channels comprises data relating to an aspect of an industrial production process;

storing a plurality of detection values that corresponds to the plurality of input channels; interpreting at least a subset of the plurality of detection values to determine a state value comprising at least one of a process state or a component state;

analyzing a subset of the plurality of detection values and the state value, using at least one of a neural net or an expert system, and providing an adjustment recommendation for the industrial production process, the adjustment recommendation, at least in part, in response to a sensitivity of at least one of the plurality of input channels relative to the state value;

adjusting the industrial production process in response to the adjustment recommendation;

determining a relevance of the adjustment recommendation to at least one role type stored within a role taxonomy; and

reporting the adjustment to the industrial production process to at least one entity associated with the role type stored within the role taxonomy.

135. The computer implemented method of claim 134, further comprising providing the adjustment recommendation in response to a signal effectiveness of at least one of the plurality of input channels relative to the state value.

136. The computer implemented method of claim 134, further comprising providing the adjustment recommendation in response to a predictive confidence of at least one of the plurality of input channels relative to the state value.

137. The computer implemented method of claim 134, further comprising providing the adjustment recommendation in response to a predictive accuracy of at least one of the plurality of input channels relative to the state value.

138. The computer implemented method of claim 134, wherein adjusting the industrial production process comprises rebalancing process loads between components of the industrial production process to achieve at least one of: extending a life of one of a plurality of components of the industrial production process, improving a probability of success of the industrial production process, or facilitating maintenance on one of the plurality of components of the industrial production process.

139. The computer implemented method of claim 134, wherein adjusting the industrial production process comprises facilitating maintenance on a component of the industrial

production process to achieve at least one of extending a maintenance interval of the component; synchronizing a first maintenance interval of the component with a second maintenance interval of a second component of the industrial production process; and differentiating the first maintenance interval of the component from the second maintenance interval of the second component of the industrial production process.

140. The computer implemented method of claim 134, wherein adjusting the industrial production process comprises facilitating maintenance on a component of the industrial production process to align a maintenance interval of a component of the industrial production process with an external reference time.

141. The computer implemented method of claim 140, wherein the external reference time comprises at least one time including a planned shutdown time for the industrial production process, a time that is past an expected completion time of the industrial production process, or a scheduled maintenance time for a second component of the industrial production process.

142. An apparatus for collecting data related to an industrial environment, the apparatus comprising:

a data collector component, communicatively coupled to a plurality of input channels, wherein the plurality of input channels comprises data from and data about an element of an industrial production process, the element comprising at least one of: a machine, a component, a system, a sub system, an ambient condition, a state, a workflow, or a process;

a data storage component configured to store a plurality of detection values that corresponds to the plurality of input channels;

a data analysis component configured to interpret at least a subset of the plurality of detection values to determine a state value, wherein the state value comprises at least one of: a sensor state, a process state, or a component state;

an optimization component configured to analyze a subset of the plurality of detection values, and the state value using at least one of a neural net or an expert system, and to determine a predictive accuracy of at least one of the plurality of input channels relative to the state value, and to provide an adjustment recommendation based, at least in part, on the predictive accuracy;

an analysis response component configured to adjust the industrial production process in response to the adjustment recommendation;

a relevance calculation component to determine a relevance of the adjustment recommendation to at least one role type stored within a role taxonomy; and

a reporting component to report the adjustment to the industrial production process to at least one entity associated with the role type stored within the role taxonomy.

143. The apparatus of claim 142, wherein adjusting the industrial production process comprises rebalancing process loads between components to achieve at least one of: extending a life of one of a plurality of components of the industrial production process, improving a probability of success of the industrial production process, or facilitating maintenance on one of the plurality of components of the industrial production process.

144. The apparatus of claim 142, wherein the optimization component is further configured to provide the adjustment recommendation as a process parameter change for the industrial production process.

145. The apparatus of claim 144, wherein the process parameter change comprises a command to rebalance process loads between components of the industrial production process.

146. The apparatus of claim 145, wherein the optimization component is further configured to provide the process parameter change to achieve at least one of: extending a life of one of the components of the industrial production process, improving a probability of success of the industrial production process, or facilitating maintenance on one of the components of the industrial production process.

147. The apparatus of claim 146, wherein the optimization component is further configured to facilitate the maintenance of one of the components by performing at least one operation including extending a maintenance interval of one of the components; synchronizing a first maintenance interval of a first one of the components with a second maintenance interval of a second one of the components; differentiating the first maintenance interval of the first one of the components from the second maintenance interval of the second one of the components; and aligning a maintenance interval of one of the components with an external reference time.

148. The apparatus of claim 147, wherein the external reference time comprises at least one time including a planned shutdown time for the industrial production process, a time that is past an expected completion time of the industrial production process, or a scheduled maintenance time for one of the components.