CLAIMS

What is claimed is:

1) A system comprising:

one or more processors; and

one or more non-transitory memory storage devices storing computer instructions configured to run on the one or more processors and perform:

constructing a hierarchical training data set; and

~~applying machine-learning to~~ training a neural network using the hierarchical training data set to determine at least one first optimal control input value of a first control input for a first controlled device of multiple controlled devices;

wherein the multiple controlled devices comprise at least two controlled devices, at least one other controlled device and at least one further controlled device;

wherein:

the at least two controlled devices are associated with a first controlled device classification and a second controlled device classification;

the at least one other controlled device is not associated with the first controlled device classification;

the at least one further controlled device is associated with the first controlled device classification but not associated with the second controlled device classification; and

the second controlled device classification is a sub-classification of the first controlled device classification;

wherein:

constructing the hierarchical training data set comprises:

receiving a first training data set, the first training data set consisting of first training data having been generated by the first controlled device;

determining that the first training data set is inadequate to fully form the hierarchical training data set such that the first training data set does not include an optimal value of the first control input for each potential combination of controlled device inputs and controlled device outputs;

receiving a second training data set, the second training data set consisting of second training data having been generated by at least two

controlled devices of the multiple controlled devices, and the at least two controlled devices comprising the first controlled device; and

supplementing the first training data set with the second training data set to form the hierarchical training data set.;

determining that the first training data set and the second training data set are inadequate to fully form the hierarchical training data set such that the first and second training data sets do not include an optimal value of the first control input for each potential combination of controlled device inputs and controlled device outputs;

receiving a third training data set, the third training data set consisting of third training data having been generated by all of the multiple controlled devices;

supplementing the first training data set and the second training data set with the third training data set to form the hierarchical training data set; and

using the hierarchical training data set with the trained neural network and the controlled device inputs to determine the controlled device outputs.

2) The system of claim 1 wherein:

the multiple controlled devices consist of the at least two controlled devices.

3) The system of any one of claims 1 or 2 wherein:

constructing the hierarchical training data set further comprises:

determining that the first training data set and the second training data set are inadequate to fully form the hierarchical training data set;

receiving a third training data set, the third training data set consisting of third training data having been simulated for the multiple controlled devices; and

supplementing the first training data set and the second training data set with the third training data set to form the hierarchical training data set.

4) The system of claim 1 wherein:

the multiple controlled devices comprise the at least two controlled devices and at least one other controlled device.

~~5) The system of claim 4 wherein:~~

~~the at least two controlled devices are associated with a first controlled device classification; and~~

~~the at least one other controlled device is not associated with the first controlled device classification.~~

~~6) The system of claim 1 wherein:~~

~~the multiple controlled devices comprise the at least two controlled devices and at least one other controlled device; and~~

~~constructing the hierarchical training data set further comprises:~~

~~determining that the first training data set and the second training data set are inadequate to fully form the hierarchical training data set;~~

~~receiving a third training data set, the third training data set consisting of third training data having been generated by all of the multiple controlled devices; and~~

~~supplementing the first training data set and the second training data set with the third training data set to form the hierarchical training data set.~~

~~7) The system of claim 6 wherein:~~

~~the multiple controlled devices further comprises at least one further controlled device;~~

~~the at least two controlled devices are associated with a first controlled device classification and a second controlled device classification;~~

~~the at least one other controlled device is not associated with the first controlled device classification;~~

~~the at least one further controlled device is associated with the first controlled device classification but not associated with the second controlled device classification; and the second controlled device classification is a sub-classification of the first controlled device classification.~~

~~8)~~2. The system of claim ~~7~~1 wherein:

the first controlled device classification is a model of the multiple controlled devices; and

the second controlled device classification is a version of the model of the multiple controlled devices.

~~9)~~3. The system of claim ~~6~~1 wherein:

constructing the hierarchical training data set further comprises:

determining that the first training data set, the second training data set, and the third training data set are inadequate to fully form the hierarchical training data set;

receiving a fourth training data set, the fourth training data set consisting of fourth training data having been simulated for the multiple controlled devices; and

supplementing the first training data set, the second training data set, and the third training data set with the fourth training data set to form the hierarchical training data set.

~~10)~~4. The system of claim ~~9~~3 wherein:

the multiple controlled devices further comprises at least one further controlled device;

the at least two controlled devices are associated with a first controlled device classification and a second controlled device classification;

the at least one other controlled device is not associated with the first controlled device classification;

the at least one further controlled device is associated with the first controlled device classification but not associated with the second controlled device classification; and

the second controlled device classification is a sub-classification of the first controlled device classification.

~~11)~~5. The system of claim ~~10~~4 wherein:

the first controlled device classification is a model of the multiple controlled devices; and

the second controlled device classification is a version of the model of the multiple controlled devices.

~~12)~~6. The system of ~~any one of~~ claim 1~~s 1 to 11~~ wherein:

the multiple controlled devices are multiple water generating units; and

the first controlled device is a first water generating unit.

~~13)~~7. The system of ~~any one of claims 1 to 12~~ claim 6 wherein:

the first control input is one of an actuator speed or a circulator speed.

~~14)~~8. The system of ~~any one of claims 1 to 13~~ claim 1 wherein:

the computer instructions further are configured to perform:

applying machine-learning to the hierarchical training data set to determine at least one second optimal control input value of a second control input for the first controlled device of the multiple controlled devices.

~~15)~~9. The system of claim ~~14~~8 wherein:

the multiple controlled devices are multiple water generating units;

the first controlled device is a first water generating unit;

the first control input is an actuator speed; and

the second control input is a circulator speed.

~~16)~~10. A method being implemented via execution of computer instructions configured to run ~~at~~on one or more processors and configured to be stored ~~at~~on one or more non-transitory memory storage devices, the method comprising:

constructing a hierarchical training data set; and

~~applying machine-learning to~~ training a neural network using the hierarchical training data set to determine at least one first optimal control input value of a first control input for a first controlled device of multiple controlled devices;

the multiple controlled devices comprise the at least two controlled devices, at least one other controlled device and at least one further controlled device;

the at least two controlled devices are associated with a first controlled device classification and a second controlled device classification;

the at least one other controlled device is not associated with the first controlled device classification;

the at least one further controlled device is associated with the first controlled device classification but not associated with the second controlled device classification; and

the second controlled device classification is a sub-classification of the first controlled device classification;

wherein:

constructing the hierarchical training data set comprises:

receiving a first training data set, the first training data set consisting of first training data having been generated by the first controlled device;

determining that the first training data set is inadequate to fully form the hierarchical training data set such that the first training data set does not include an optimal value of the first control input for each potential combination of controlled device inputs and controlled device outputs;

receiving a second training data set, the second training data set consisting of second training data having been generated by at least two controlled devices of the multiple controlled devices, and the at least two controlled devices comprising the first controlled device; and

supplementing the first training data set with the second training data set to form the hierarchical training data set.;

determining that the first training data set and the second training data set are inadequate to fully form the hierarchical training data set such that the first and second training data sets do not include an optimal value of the first control input for each potential combination of controlled device inputs and controlled device outputs;

receiving a third training data set, the third training data set consisting of third training data having been generated by all of the multiple controlled devices; and

supplementing the first training data set and the second training data set with the third training data set to form the hierarchical training data set;

determining that the first training data set, the second training data set, and the third training data set are inadequate to fully form the hierarchical training data set such that the first, second and third training data sets do not include an optimal value of the first control input for each potential combination of controlled device inputs and controlled device outputs;

receiving a fourth training data set, the fourth training data set consisting of fourth training data having been simulated for the multiple controlled devices;

supplementing the first training data set, the second training data set, and the third training data set with the fourth training data set to form the hierarchical training data set; and

using the hierarchical training data set with the trained neural network and the controlled device inputs to determine the controlled device outputs.

~~17) The method of claim 16 wherein:~~

~~the multiple controlled devices comprise the at least two controlled devices and at least one other controlled device; and~~

~~constructing the hierarchical training data set further comprises:~~

~~determining that the first training data set and the second training data set are inadequate to fully form the hierarchical training data set;~~

~~receiving a third training data set, the third training data set consisting of third training data having been generated by all of the multiple controlled devices; and~~

~~supplementing the first training data set and the second training data set with the third training data set to form the hierarchical training data set.~~

~~18) The method of claim 17 wherein:~~

~~constructing the hierarchical training data set further comprises:~~

~~determining that the first training data set, the second training data set, and the third training data set are inadequate to fully form the hierarchical training data set;~~

~~receiving a fourth training data set, the fourth training data set consisting of fourth training data having been simulated for the multiple controlled devices; and~~

~~supplementing the first training data set, the second training data set, and the third training data set with the fourth training data set to form the hierarchical training data set.~~

~~19)~~11. The method of ~~any one of claims 16 to 18~~ claim 10 wherein:

the multiple controlled devices are multiple water generating units; and

the first controlled device is a first water generating unit.

~~20)~~12. The method of ~~any one of claims 16 to 19~~ claim 11 wherein:

the first control input is one of an actuator speed or a circulator speed.

~~21)~~13. The method of ~~any one of claims 16 to 20~~ claim 10 further comprising:

~~applying machine-learning to~~ training the neural network using the hierarchical training data set to determine at least one second optimal control input value of a second control input for the first controlled device of the multiple controlled devices.

~~22)~~14. The method of claim ~~21~~13 wherein:

the multiple controlled devices are multiple water generating units;

the first controlled device is a first water generating unit;

the first control input is an actuator speed; and

the second control input is a circulator speed.

~~23)~~15. A system comprising:

one or more processors; and

one or more non-transitory memory storage devices storing computer instructions configured to run on the one or more processors and perform:

constructing a hierarchical training data set; and

~~applying machine-learning to~~ training a neural network using the hierarchical training data set to determine at least one first optimal control input value of a first control input for a first controlled device of multiple controlled devices; and

~~applying machine-learning to~~ training the neural network using the hierarchical training data set to determine at least one second optimal control input value of a second control input for the first controlled device of the multiple controlled devices;

wherein:

the multiple controlled devices further comprises at least one further controlled device;

the at least two controlled devices are associated with a first controlled device classification and a second controlled device classification;

the at least one other controlled device is not associated with the first controlled device classification;

the at least one further controlled device is associated with the first controlled device classification but not associated with the second controlled device classification;

the second controlled device classification is a sub-classification of the first controlled device classification;

the first controlled device classification is a model of the multiple controlled devices; and

the second controlled device classification is a version of the model of the multiple controlled devices;

~~wherein:~~

the multiple controlled devices comprise the at least two controlled devices and at least one other controlled device; and

constructing the hierarchical training data set comprises:

receiving a first training data set, the first training data set consisting of first training data having been generated by the first controlled device;

determining that the first training data set is inadequate to fully form the hierarchical training data set such that the first training data set does not include an optimal value of the first control input for each potential combination of controlled device inputs and controlled device outputs;

receiving a second training data set, the second training data set consisting of second training data having been generated by at least two controlled devices of the multiple controlled devices, and the at least two controlled devices comprising the first controlled device;

supplementing the first training data set with the second training data set to form the hierarchical training data set;

determining that the first training data set and the second training data set are inadequate to fully form the hierarchical training data set such that the first and second training data sets do not include an optimal value of the first control input for each potential combination of controlled device inputs and controlled device outputs;

receiving a third training data set, the third training data set consisting of third training data having been generated by all of the multiple controlled devices;

determining that the first training data set, the second training data set, and the third training data set are inadequate to fully form the hierarchical training data set such that the first, second and third training data sets do not include an optimal value of the first control input for each potential combination of controlled device inputs and controlled device outputs;

receiving a fourth training data set, the fourth training data set consisting of fourth training data having been simulated for the multiple controlled devices; ~~and~~

supplementing the first training data set, the second training data set, and the third training data set with the fourth training data set to form the hierarchical training data set~~.~~; and

using the hierarchical training data set with the trained neural network and the controlled device inputs to determine the controlled device outputs.

~~24) The system of claim 23 wherein:~~

~~the multiple controlled devices further comprises at least one further controlled device;~~

~~the at least two controlled devices are associated with a first controlled device classification and a second controlled device classification;~~

~~the at least one other controlled device is not associated with the first controlled device classification;~~

~~the at least one further controlled device is associated with the first controlled device classification but not associated with the second controlled device classification;~~

~~the second controlled device classification is a sub-classification of the first controlled device classification;~~

~~the first controlled device classification is a model of the multiple controlled devices; and~~

~~the second controlled device classification is a version of the model of the multiple controlled devices.~~

~~25)~~16. The system of ~~any one of claims 23 to 24~~ claim 15 wherein:

the multiple controlled devices are multiple water generating units; and

the first controlled device is a first water generating unit.

17. The system of claim 16, wherein the controlled device outputs of the first controlled device comprises a quantity of water generated by the first water generating unit; and, wherein the at least one first optimal control input value corresponds to a maximum quantity of water generated by the first water generating unit.

18. The system of claim 16, wherein the controlled device outputs is a function of one or more free inputs comprising one or more of: an ambient temperature at the first water generating unit, an ambient relative humidity at the first water generating unit, and a solar insolation flux at the first water generating unit.