

What is claimed is:

1. A method, comprising:
 - receiving a plurality of target attributes associated with a chemical product formulation and a plurality of priority values of the plurality of target attributes;
 - determining, based on (1) a first neural network, (2) the plurality of target attributes and (3) the plurality of priority values, a plurality of sample formulations, each sample formulation from the plurality of sample formulations including a plurality of ingredients;
 - determining a plurality of scores based on the plurality of sample formulations, each score from the plurality of scores being associated with a sample formulation from the plurality of sample formulations;
 - selecting, based on the plurality of scores and the plurality of target attributes, a sample formulation from the plurality of sample formulations having a score greater than remaining scores from the plurality of scores;
 - determining an origin associated with the sample formulation; and
 - when the origin is included in a pre-determined group, generating a report including the sample formulation as the chemical product formulation.
2. The method of claim 1, wherein:
 - the plurality of sample formulations is a first plurality of sample formulations;
 - the sample formulation is a first sample formulation;
 - the method further includes:
 - modifying a plurality of weights associated with the first neural network to determine a second plurality of sample formulations;
 - selecting a second sample formulation from the second plurality of sample formulations; and
 - the report includes the second sample formulation as the chemical product formulation.
3. The method of claim 1, wherein:
 - the plurality of sample formulations is a first plurality of sample formulations;
 - the sample formulation is a first sample formulation;
 - the method further includes:
 - modifying the first sample formulation to generate a modified sample formulation;

determining, based on the first neural network and the modified sample formulation, a second plurality of sample formulations; and

the report includes a second sample formulation selected from the second plurality of sample formulations as the chemical product formulation.

4. The method of claim 1, further comprising:
 - repeating until a pre-determined condition is met:
 - determining a new plurality of sample formulations; and
 - selecting a new sample formulation from the new plurality of sample formulations.
5. The method of claim 1, wherein:
 - the plurality of target attributes includes at least one of a class, a viscosity, or a pH level.
6. The method of claim 1, wherein:
 - the first neural network includes a recurrent subnetwork.
7. The method of claim 1, wherein:
 - the chemical product formulation is a skin care product.
8. A non-transitory processor-readable medium storing code representing instructions to be executed by a processor, the code comprising code to cause the processor to:
 - receive a plurality of target attributes for a chemical formulation;
 - encode the plurality of target attributes to generate a signal;
 - determine, using a first neural network with the signal as a first input, (1) a chemical data sequence including a plurality of ingredients and (2) a plurality of characteristic values, each ingredient from the plurality of ingredients associated with a characteristic value from the plurality of characteristic values;
 - determine, using a second neural network and with the chemical data sequence and the plurality of characteristic values as a second input, a plurality of scores of the plurality of ingredients and associated with the plurality of target attributes;
 - modify a plurality of weights associated with the first neural network to increase the plurality of scores and generate a modified neural network;

determine, based on the modified neural network, a modified chemical data sequence including a modified plurality of ingredients; and

generate a report including the chemical formulation having the modified chemical data sequence associated with the plurality of target attributes.

9. The non-transitory processor-readable medium of claim 8, wherein the chemical formulation is a personal care product formulation.

10. The non-transitory processor-readable medium of claim 8, wherein the code to cause the processor to generate the report further includes code to cause the processor to:

determine, using the modified chemical data sequence as a third input, an origin associated with the modified chemical data sequence; and

generate the report when the origin is included in a pre-determined group.

11. The non-transitory processor-readable medium of claim 8, wherein:

each characteristic value from the plurality of characteristic values is associated with a concentration percentage of an ingredient from the plurality of ingredients and from a plurality of concentration percentages.

12. The non-transitory processor-readable medium of claim 8, wherein:

each characteristic value from the plurality of characteristic values is associated with a mixing stage of an ingredient from the plurality of ingredients and from a plurality of mixing stages.

13. The non-transitory processor-readable medium of claim 8, wherein:

the plurality of target attributes includes at least one of a class, a viscosity, or a pH level.

14. The non-transitory processor-readable medium of claim 8, wherein the code to encode the plurality of target attributes to generate a signal includes code to cause the processor to perform one-hot encoding.

15. The non-transitory processor-readable medium of claim 8, wherein the code to encode the plurality of target attributes to generate the signal includes code to cause the processor to

map the plurality of target attributes to a pre-determined set of discrete values when the plurality of target attributes is continuous.

16. The non-transitory processor-readable medium of claim 8, wherein:
the first neural network includes a recurrent subnetwork and one or more output layers,
the recurrent subnetwork includes stacked long short-term memory cells, and
the one or more output layers includes time-distributed dense layers.
17. The non-transitory processor-readable medium of claim 8, wherein the code further includes code to cause the processor to:
receive a base chemical data sequence,
the code to determine the chemical data sequence includes the code to cause the processor to determine the chemical data sequence based on the base chemical data sequence.
18. The non-transitory processor-readable medium of claim 8, wherein:
each target attribute from the plurality of target attributes is associated with a priority value from a plurality of priority values,
the code to cause the processor to modify the plurality of weights associated with the first neural network is based on the plurality of priority values.
19. The non-transitory processor-readable medium of claim 8, wherein the code further includes code to cause the processor to train the first neural network using a stochastic gradient descent with backpropagation technique based on a training data set.
20. The non-transitory processor-readable medium of claim 8, wherein the code to cause the processor to modify the plurality of weights further includes code to cause the processor to:
modify the plurality of weights using reinforcement learning.
21. The non-transitory processor-readable medium of claim 8, wherein the code further includes code to cause the processor to:
repeat determining a new chemical data sequence until a pre-determined condition is met.

22. An apparatus, comprising:
- a processor; and
 - a memory operatively coupled to the processor, the memory storing code representing instructions to be executed by a processor, the code comprising code to cause the processor to:
 - receive a plurality of target attributes associated with a chemical product formulation;
 - determine, based on a first neural network, a first plurality of sample formulations associated with the plurality of target attributes, each sample formulation from the first plurality of sample formulations including a plurality of ingredients;
 - determine a first plurality of scores, each score from the first plurality of scores associated with a sample formulation from the first plurality of sample formulations;
 - select, based on the first plurality of scores and the plurality of target attributes, a first sample formulation from the first plurality of sample formulations having a score greater than remaining scores from the first plurality of scores;
 - determine, based on the first neural network and the first sample formulation, a second plurality of sample formulations;
 - determine a second plurality of scores, each score from the second plurality of scores associated with a sample formulation from the second plurality of sample formulations;
 - select, based on the second plurality of scores and the plurality of target attributes, a second sample formulation from the second plurality of sample formulations having a score greater than remaining scores from the second plurality of scores;
 - determine an origin associated with the second sample formulation; and
 - when the origin is included in a pre-determined group, generate a report including the second sample formulation as the chemical product formulation.
23. The apparatus of claim 22, wherein the code further includes code to cause the processor to:
- repeat until a pre-determined condition is met:
 - determining a new plurality of sample formulations; and
 - selecting a new sample formulation from the new plurality of sample formulations.