CLAIMS

1. A method for preparing fungal biomass comprising the step of cultivating at least one fungal strain according to conditions of fungal biomass cultivation, wherein said fungal biomass is characterized by a target property, wherein the method further comprises predicting how to cultivate said fungal biomass to achieve said target property, comprising the prediction steps of:
   a) providing a target property of the fungal biomass as an input;
   b) predicting conditions of fungal biomass cultivation based on the input provided in a) using a computer implemented pipeline of at least two previously trained mathematical models, wherein the pipeline comprises the steps of:
      b1) performing at least one intermediate prediction based on the input provided in a) using first of the at least two previously trained mathematical models, wherein output of said intermediate prediction constitutes an input for second of the at least two previously trained mathematical models in the pipeline, and
      b2) predicting the conditions of fungal biomass cultivation by second of the at least two previously trained mathematical models in the pipeline based on the output of the intermediate prediction in b1); and
   c) outputting the predicted conditions of fungal biomass cultivation;

   wherein at least one of the at least two previously trained mathematical models in the pipeline is a regression model and wherein at least one of the at least two previously trained mathematical models in the pipeline is a clustering model or a classification model.

2. A method for preparing fungal biomass comprising the step of cultivating at least one fungal strain according to conditions of fungal biomass cultivation, wherein said fungal biomass is characterized by a target property, wherein the method further comprises predicting a target property of said fungal biomass based on the conditions of fungal biomass cultivation, comprising the prediction steps of:
   a) providing conditions of fungal biomass cultivation as an input;
   b) predicting a target property of the fungal biomass based on the input provided in a) using a computer implemented pipeline of at least two previously trained mathematical models, wherein the pipeline comprises the steps of
      b1) performing at least one intermediate prediction based on the input provided in a) using first of the at least two previously trained mathematical models, wherein output of said

intermediate prediction constitutes an input for second of the at least two previously trained mathematical models in the pipeline, and

b2) predicting the target property of the fungal biomass by second of the at least two previously trained mathematical models in the pipeline based on the output of the intermediate prediction in b1); and

c) outputting the predicted target property of the fungal biomass;

wherein at least one of the at least two previously trained mathematical models in the pipeline is a regression model and wherein at least one of the at least two previously trained mathematical models in the pipeline is a clustering model or a classification model.

3. A method for predicting conditions of fungal biomass cultivation, the method comprising the steps of:

a) providing a target property of the fungal biomass as an input;

b) predicting conditions of fungal biomass cultivation based on the input provided in a) using a computer implemented pipeline of at least two previously trained mathematical models, wherein the pipeline comprises the steps of

b1) performing at least one intermediate prediction based on the input provided in a) using first of the at least two previously trained mathematical models, wherein output of said intermediate prediction constitutes an input for second of the at least two previously trained mathematical models in the pipeline, and

b2) predicting the conditions of fungal biomass cultivation by second of the at least two previously trained mathematical models in the pipeline based on the output of the intermediate prediction in b1); and

c) outputting the predicted conditions of fungal biomass cultivation.

wherein at least one of the at least two previously trained mathematical models in the pipeline is a regression model and wherein at least one of the at least two previously trained mathematical models in the pipeline is a clustering model or a classification model.

4. A method for predicting a property of the fungal biomass, the method comprising the prediction steps of:

a) providing conditions of fungal biomass cultivation as an input;

b) predicting a target property of the fungal biomass based on the input provided in a) using a computer implemented pipeline of at least two previously trained mathematical models, wherein the pipeline comprises the steps of

b1) performing at least one intermediate prediction based on the input provided in a) using first of the at least two previously trained mathematical models, wherein output of said intermediate prediction constitutes an input for second of the at least two previously trained mathematical models in the pipeline, and

b2) predicting the target property of the fungal biomass by second of the at least two previously trained mathematical models in the pipeline based on the output of the intermediate prediction in b1); and

c) outputting the predicted target property of the fungal biomass;

wherein at least one of the at least two previously trained mathematical models in the pipeline is a regression model and wherein at least one of the at least two previously trained mathematical models in the pipeline is a clustering model or a classification model.

5. The method of any one of preceding claims, wherein the conditions of fungal biomass cultivation comprise information on the culture medium and the fermentation process variables, preferably consist of information on the culture medium and the fermentation process variables, preferably:
wherein the information on the culture medium includes the concentration/amount of nutrients that must be present in the fermentation broth for growing the fungal biomass, such as preferred carbon source and sugars in culture medium, preferred nitrogen source, protein concentration, optimal C/N ratio, minerals, vitamins, amino acids, as well as information on the production of the medium, such as side stream information and extraction conditions, and/or

wherein the fermentation process variables include the settings of fermenter devices, such as temperature, pH, dissolved oxygen concentration, stirring or agitation speed, impeller type, and harvest time.

6. The method of any one of preceding claims, wherein the target property of the fungal biomass is selected from fungal strain, nutritional profile, texture, yield, taste attributes, smell attributes, aroma attributes, mouthfeel attributes, consistency, edibility, and colour, preferably wherein the target property of the fungal biomass is more than one property selected from fungal strain, nutritional profile, texture, yield, taste attributes, smell attributes, aroma attributes, mouthfeel attributes, consistency, edibility, and colour, preferably:
wherein the target property of the fungal biomass is selected from fungal strain, nutritional profile, texture, yield and taste attributes, preferably wherein the target property of the fungal biomass is more than one property selected from fungal strain, nutritional profile, texture, yield and taste

attributes, and/or

wherein the nutritional profile comprises one or more properties selected from sugar content, amino acid composition, content of vitamin B12, content of metabolites, mineral content, vitamin content, carbohydrate content, fiber content, fatty acid content, lipid content and protein content.

7. The method of any one of preceding claims, wherein the regression model has been trained using the output of the high-throughput screening (HTS) experiment(s) performed using fungal species, preferably wherein the output of the HTS experiment(s) comprises one or more of fungal strain, sugar consumption, biomass yield, growth rate, protein content and cultivation conditions, cellulose content, hemicellulose content, carbon content, crude protein content, C:P ratio, moisture, mineral content, extraction conditions variables, texture type of biomass, shear force of biomass and nutritional profile of biomass more preferably wherein the output of the HTS experiment(s) comprises one or more of sugar consumption, biomass yield, growth rate, protein content and cultivation conditions, and shear force of biomass,

and/or

wherein said clustering model or said classification model has been trained using data libraries comprising edible fungi information and side stream information, preferably:

wherein the edible fungi information is one or more selected from of fungal strain, edibility, fruiting season, lifestyle, habitat, seasonality, functional compounds, geographical location, availability of the fungal strain, substrate and climate, taste and/or smell, cultivation conditions, and nutritional profile of biomass,

and/or

wherein the side stream information is one or more selected from extraction conditions for obtaining a medium, shelf-life, country of origin, industry of origin industry of use, yearly production volumes, lignin content, cellulose content, hemicellulose content, carbon content, nitrogen content, crude protein content, C:P ratio (carbon to phosphorus), C:N ratio (carbon to nitrogen), moisture, crude fiber content, fat content, ash content, nitrogen content, calorific value, density, information on typical usage, greenhouse gas emissions of original product, mineral content, calcium content, phosphorus content, potassium content, sodium content, magnesium content, manganese content, zinc content, copper content, and iron content,

and/or

wherein the data libraries are clustered mined data libraries, wherein the data originates from the literature and public domain, and wherein the similar data are grouped together.

8. The method of any one of claims 1 to 7, wherein the target property of the fungal biomass is a fungal strain, and wherein the output of the step b1) is another fungal strain or a list of fungal strains characterized by similarity to the fungal strain of the fungal biomass,
preferably wherein the first mathematical model is a clustering model and the second previously trained mathematical model is a regression model.

9. The method of any one of claims 1 to 7, wherein the target property of the fungal biomass is nutritional profile, and wherein the output of b1) is at least one fungal strain with said nutritional profile, preferably:
wherein the first previously trained mathematical model is a classification model, and wherein the second previously trained mathematical model is a regression model,
and/or
wherein in step c) in addition to the conditions of fungal biomass cultivation predicted in b2), the at least one fungal strain of b1) is also outputted.

10. The method of any one of claims 1 to 7, wherein the target property of the fungal biomass is texture or taste attributes, and wherein the output of b1) is a fungal strain with said texture or said taste attributes, respectively, preferably:
wherein the first previously trained mathematical model is a classification model, and wherein the second previously trained mathematical model is a regression model,
and/or
wherein in step c) in addition to the conditions of fungal biomass cultivation predicted in step b2), the at least one fungal strain of b1) is outputted.

11. The method of any one of claims 1 to 7, wherein the target property of the fungal biomass is fungal strain, wherein the output of step b1) is optimal medium for said fungal strain, and wherein the conditions of fungal biomass cultivation predicted in step b2) comprise information on the side stream and extraction conditions for obtaining a medium suitable for the production of said fungal strain, preferably consists of information on the side stream and extraction conditions for obtaining a medium suitable for the production of said fungal strain,
preferably wherein the first previously trained mathematical model is a regression model and wherein the second previously trained mathematical model is a clustering model.

12. The method of any one of claims 1 to 11, wherein the computer implemented pipeline of at least two previously trained mathematical models includes exactly two previously trained mathematical models, or wherein the computer implemented pipeline of at least two previously trained mathematical models includes at least three, preferably at least four previously trained mathematical models, preferably:

    wherein in c) yield associated with the conditions of fungal cultivation is also outputted, and/or

    wherein the target property or conditions of fungal biomass cultivation outputted in step c) of the prediction constitute an input in step a) of the prediction in the method of any one of claims 1 to 12.

13. The method for preparing fungal biomass of any one of claims 1, 2 or 5 to 12, wherein the step of cultivating at least one fungal strain according to conditions of fungal biomass cultivation is a submerged fermentation step,

    and/or

    wherein the at least one fungal strain is selected from Basidiomycota, Ascomycota, Pezizomycotina, Agaromycotina, Pezizomycetes, Agaricomycetes, Sordariomycetes, Pezizales, Boletales, Cantharellales, Agaricales, Polyporales, Russulales, Auriculariales, Hypocreales, Morchellaceae, Tuberaceae, Pleurotaceae, Agaricaceae, Marasmiaceae, Cantharellaceae, Hydnaceae, Boletaceae, Meripilaceae, Polyporaceae, Strophariaceae, Lyophyllaceae, Tricholomataceae, Omphalotaceae, Physalacriaceae, Schizophyllaceae, Sclerodermataceae, Ganodermataceae, Sparassidaceae, Hericiaceae, Bondarzewiaceae, Cordycipitaceae, Auriculariaceae, and Fistulinacea, or wherein the at least one fungal strain is selected from mold species, preferably selected from Aspergillus spp., Fusarium spp., Neurospora spp., Paecilomyces spp., Rhizopus spp., or wherein the at least one fungal strain is selected from non-mold species, specifically selected from Agaricus spp., Bjerkandera spp., Boletus spp., Calvatia spp., Cordyceps spp., Flammulina spp., Fomitopsis spp., Ganoderma spp., Grifola spp., Hericium spp., Hyphoroma spp., Inonotus spp., Laetiporus spp., Lentinula spp., Lepista spp., Morchella spp., Mycetinis spp., Panus spp., Pholiota spp., Pleurotus spp., Piptoporus spp., Polyporus spp., Sparassis spp., Tremella spp., Trametes spp., Tricholoma spp., Tuber spp., and Wolfiporia spp,

    and/or

    wherein at least one edible fungi is co-cultivated with algae, preferably selected from Haematoccus pluvialis, and Chlorella vulgaris, and/or with cyanobacteria.

14. A fungal biomass, obtainable according to the method of any one of claims 1, 2 and 5 to 13, or a food product, comprising said fungal biomass, or a cosmetic product comprising said fungal biomass,

preferably wherein the fungal biomass comprises at least one fungal strain selected from mold species, preferably selected from Aspergillus spp., Fusarium spp., Neurospora spp., Paecilomyces spp., Rhizopus spp, or wherein the at least one fungal strain is selected from non-mold species, specifically selected from Agaricus spp., Bjerkandera spp., Boletus spp., Calvatia spp., Cordyceps spp., Flammulina spp., Fomitopsis spp., Ganoderma spp., Grifola spp., Hericium spp., Hyphoroma spp., Inonotus spp., Laetiporus spp., Lentinula spp., Lepista spp., Morchella spp., Mycetinis spp., Panus spp., Pholiota spp., Pleurotus spp., Piptoporus spp., Polyporus spp., Sparassis spp., Tremella spp., Trametes spp., Tricholoma spp., Tuber spp., and Wolfiporia spp.

15. A system configured for executing the prediction steps described in any one of claims 1 to 12.