CLAIMS

1. A computational method for detection of infection and sepsis, the method comprising:

storing patient health data in a data store for a plurality of patients, the patient health data for a patient comprising a plurality of data items comprising a plurality of clinical data items obtained from one or more clinical data sources, a plurality of patient measurement data obtained from one or more wearable, home, and community based biomedical sensors, and a plurality of symptoms obtained from the patient;

generating and storing a plurality of sepsis prediction models and a general population sepsis prediction model each trained using the stored patient health data wherein the general population sepsis prediction model is generated by training a sepsis prediction model on a general population of patients drawn from the plurality of patients and generating each of the plurality of sepsis prediction models comprises:

identifying a training cohort of similar patients according to a patient similarity measure wherein each patient similarity measure is determined using a different combination of data items in the patient health data, one or more similarity functions and/or one or more similarity criterion; and

training a sepsis prediction model using the training cohort of similar patients;

obtaining patient health data for a monitored patient, the patient health data comprising a plurality of clinical data items obtained from one or more clinical data sources, a plurality of patient measurement data obtained from one or more wearable, home, and community based biomedical sensors, and a plurality of symptoms obtained from the patient;

selecting a sepsis prediction model from the plurality of sepsis prediction models for monitoring the monitored patient, where the sepsis prediction model is selected by identifying the sepsis prediction model with the training cohort most similar to the monitored patient, and if no similar training cohort can be identified then selecting the general population sepsis prediction model;

using the selected sepsis prediction model to monitor the monitored patient to detect infection and sepsis events, and generating electronic alerts if an infection and sepsis event is detected;

repeating the selecting step in response to a change in the patient health data of the monitored patient over time; and

repeating the generating and storing step in response to one or more confirmations of detected infection and sepsis events.

2. The method as claimed in claim 1, wherein the one or more clinical data sources comprises electronic medical records and a clinician user interface configured to receive clinical notes from a clinician.

~~3. The method as claimed in claim 1 or 2, wherein one or more of the plurality of patient measurement data obtained from the monitored patient comprises repeated measurements of one or more vital signs, with each measurement having an associated time.~~

~~4. The method as claimed in any one of claims 1 to 3, wherein the one or more personal, home, and community based biomedical sensors comprise one or more wearable sensors and vital sign sensors.~~

~~5. The method as claimed in any one of claims 1 to 4, wherein one or more of the plurality of patient symptoms obtained from the monitored patient are obtained and entered using a patient user interface executing on a mobile computing apparatus.~~

~~6. The method as claimed in any one of claims 1 to 5, wherein each sepsis prediction model is a machine learning classifier which is configured to monitor updates to patient health data for the monitored patient and generate an alert if an infection and sepsis event is detected.~~

~~7. The method as claimed in any one of claims 1 to 6, wherein identifying the sepsis prediction model with the training cohort most similar to the monitored patient comprises:~~

~~filtering the plurality of sepsis prediction models to identify a set of similar models based on one or more current symptoms, one or more current disease conditions and one or more current vital signs of the monitored patients; and~~

~~selecting a model from the set of similar models based on the model in the set of similar models in which the training cohort of patients have the most similar set of medical conditions to the monitored patient.~~

~~8. The method as claimed in claim 7, wherein~~

~~filtering the plurality of sepsis prediction models is performed by calculating a similarity score for each model which is a weighted sum of the of the similarity between one or more current symptoms, one or more current disease conditions and one or more current vital sign measurements of the monitored patient, and the corresponding one or more symptoms and one or more vital sign measurements of patients in the training cohort of the respective model; and~~

~~selecting a model from the set of similar models is performed by calculating, for each model in the set of similar scores, a total similarity score by, for one or more medical conditions, determining a similarity score between the medical condition of the monitored patient and corresponding medical condition for each patient in the training cohort of the respective model and multiplying the similarity score by a weight for the medical condition, and then summing each of the weighted similarity scores to obtain the total similarity score; and selecting the model with the highest total similarity score.~~

~~9. The method as claimed in any one of claims 1 to 8, further comprising storing a plurality of trigger conditions and repeating the selecting step is performed in response to an update in patient health data satisfying one or more of the trigger conditions.~~

~~10. The method as claimed in any one of claims 1 to 9, wherein the electronic alert comprises an alert to a clinician via a clinician user interface, and wherein the clinician user interface is configured to allow the clinician to confirm the validity of the infection and sepsis event, and one or more confirmations are used to trigger repeating the generating and storing step.~~

~~11.~~1. A computational apparatus configured for the detection of infection and sepsis in a monitored patient, the apparatus comprising:

one or more processors;

one or more memories operatively associated with the one or more processors;

a data store configured to store patient health data for a plurality of patients, the patient health data for a patient comprising a plurality of data items comprising a plurality of clinical data items obtained from one or more clinical data sources, a plurality of patient measurement data obtained from one or more wearable, home, and community based biomedical sensors, and a plurality of symptoms obtained from the patient via a patient user interface;

wherein the one or more memories comprise instructions to configure the one or more processors to:

generate and store in a model store a plurality of sepsis prediction models and a general population sepsis prediction model each trained using the stored patient health data obtained from the data store, wherein the general population sepsis prediction model is generated by training a sepsis prediction model on a general population of patients drawn from the plurality of patients and generating each of the plurality of sepsis prediction models comprises:

identifying a training cohort of similar patients according to a patient similarity measure wherein each patient similarity measure is determined using a different combination of data items in the patient health data, one or more similarity functions and/or one or more similarity criterion; and

training a sepsis prediction model using the training cohort of similar patients;

obtain patient health data for a monitored patient, the patient health data comprising a plurality of clinical data items obtained from one or more clinical data sources, a plurality of patient measurement data obtained from one or more wearable, home, and community based biomedical sensors, and a plurality of symptoms obtained from the patient;

select a sepsis prediction model from the plurality of sepsis prediction models for monitoring the monitored patient, where the sepsis prediction model is selected by identifying the sepsis prediction

model with the training cohort most similar to the monitored patient, and if no similar training cohort can be identified then selecting the general population sepsis prediction model;

use the selected sepsis prediction model to monitor the monitored patient to detect infection and sepsis events, and generating electronic alerts if an infection and sepsis event is detected;

repeat the selecting step in response to a change in the patient health data of the monitored patient over time; and

repeat the generating and storing step in response to one or more confirmations of detected infection and sepsis events.

~~12.~~2. The computational apparatus as claimed in claim ~~11~~1, wherein the one or more memories further comprise instructions to further configure the one or more processors to provide a clinician user interface wherein the one or more clinical data sources comprises electronic medical records and the clinician user interface is configured to receive clinical notes from a clinician.

~~13.~~3. The computational apparatus as claimed in claim ~~11~~ 1 or ~~12~~2, wherein one or more of the plurality of patient measurement data obtained from the monitored patient comprises repeated measurements of one or more vital signs, with each measurement having an associated time.

~~14.~~4. The computational apparatus as claimed in any one of claims ~~11~~ 1 to ~~13~~3, wherein the one or more personal, home, and community based biomedical sensors comprise one or more wearable sensors and vital sign sensors.

~~15.~~5. The computational apparatus as claimed in any one of claims ~~11~~ 1 to ~~14~~4, wherein one or more of the plurality of patient symptoms obtained from the monitored patient are obtained and entered using a patient user interface executing on a mobile computing apparatus.

~~16.~~6. The computational apparatus as claimed in any one of claims ~~11~~ 1 to ~~15~~5, wherein each sepsis prediction model is a machine learning classifier which is configured to monitor updates to patient health data for the monitored patient and generate an alert if an infection and sepsis event is detected

~~17.~~7. The computational apparatus as claimed in any one of claims ~~11~~ 1 to ~~16~~6, wherein identifying the sepsis prediction model with the training cohort most similar to the monitored patient comprises:

filtering the plurality of sepsis prediction models to identify a set of similar models based on one or more current symptoms and one or more current vital signs of the monitored patients; and

selecting a model from the set of similar models based on the model in the set of similar models in which the training cohort of patients have the most similar set of medical conditions to the monitored patient.

~~18.~~8. The computational apparatus as claimed in claim ~~17~~7, wherein

filtering the plurality of sepsis prediction models is performed by calculating a similarity score for each model which is a weighted sum of the of the similarity between one or more current symptoms and one or more current vital sign measurements of the monitored patient, and the corresponding one or more symptoms and one or more vital sign measurements of patients in the training cohort of the respective model; and

selecting a model from the set of similar models is performed by calculating, for each model in the set of similar scores, a total similarity score by, for one or more medical conditions, determining a similarity score between the medical condition of the monitored patient and corresponding medical condition for each patient in the training cohort of the respective model and multiplying the similarity score by a weight for the medical condition, and then summing each of the weighted similarity scores to obtain the total similarity score; and selecting the model with the highest total similarity score.

~~19.~~9. The computational apparatus as claimed in any one of claims ~~11~~ 1 to ~~18~~8, wherein the one or more memories are further configured to store a plurality of trigger conditions and repeating the selecting step is performed in response to an update in patient health data satisfying one or more of the trigger conditions.

~~20.~~10. The computational apparatus as claimed in any one of claims ~~11~~ 1 to ~~19~~9, wherein the one or more memories further comprise instructions to further configure the one or more processors to provide a clinician user interface, wherein the electronic alert comprises an alert sent to a clinician via the clinician user interface, and the clinician user interface is configured to allow the clinician to confirm the validity of the infection and sepsis event, and one or more confirmations are used to trigger repeating the generating and storing step.