CLAIMS

1. A computer system for establishing an electroencephalogram (EEG) model for discriminating between alert and fatigue states, comprising:
a receiver module for receiving:
an alert state segment illustrative of an alert state of at least one subject; and
one or more EEG fatigue data segments illustrative of a fatigue state of the at least one subject;

a segment selector for selecting one of the one or more fatigue data segments and setting it to be an assumed maximum fatigue segment;

an EEG classifier trainer for training an EEG classifier by extracting an EEG feature space from the alert state segment and assumed maximum fatigue segment based on the alert state segment and assumed maximum fatigue segment defining respectively opposite ends of a fatigue spectrum;

a maximum fatigue identifier module for identifying a segment of maximum fatigue by applying the EEG classifier to each of the fatigue data segments;

a segment comparator for determining if the segment of maximum fatigue is consistent with the assumed maximum fatigue segment;

a limit setter for:

setting the segment of maximum fatigue as a revised assumed maximum fatigue segment, if the segment of maximum fatigue is inconsistent with the assumed maximum fatigue segment; and

supplying the EEG classifier trainer with the revised assumed maximum fatigue segment, and using the EEG classifier trainer to train the EEG classifier by extracting an EEG feature space from the alert state segment and revised assumed maximum fatigue segment based on the alert state segment and revised assumed maximum fatigue segment defining respectively opposite ends of a fatigue spectrum; and

a model output module for setting the EEG classifier as the EEG model for discriminating between alert and fatigue states in segments of EEG data.

2. The computer system of claim 1, further comprising a discriminator system configured to apply the EEG model to determine if one or more subsequently recorded EEG segments are each representative of a fatigue state or an alert state.

3. The computer system of claim 1, wherein the EEG classifier is configured to extract the EEG feature space by calculating spectral power ratios for the alert state segment and assumed maximum fatigue segment.

4. The computer system of claim 3, wherein the EEG classifier is configured to extract the EEG feature space by calculating spectral envelopes for the alert state segment and assumed maximum fatigue segment.

5. The computer system of claim 4, wherein the EEG classifier is configured to calculate Gaussian parameters for the spectral power ratios and spectral envelopes.

6. The computer system of claim 1, wherein the maximum fatigue identifier comprises a scorer configured to determine a score for each of the one or more EEG fatigue data segments, and the segment comparator is configured to determine that the maximum fatigue is inconsistent with the assumed maximum fatigue segment if:

    the score for the segment of maximum fatigue is greater than that for the assumed maximum fatigue segment; or
    the score for the segment of maximum fatigue is greater than the score for the assumed maximum fatigue segment by at least a predetermined amount.

7. The computer system of claim 1, further comprising a segmenter, the receiver module being configured to receive the one or more EEG fatigue data segments by receiving a period of EEG fatigue data and segmenting

the EEG fatigue data into the one or more EEG fatigue data segments using the segmenter.

8. The computer system of claim 1, wherein the segmenter is configured to segment the EEG fatigue data into overlapping segments, a first half of each segment overlapping a preceding segment and a latter half of each segment overlapping a succeeding segment.

9. A computer process for establishing an electroencephalogram (EEG) model for discriminating between alert and fatigue states, comprising:

i. receiving:

an alert state segment illustrative of an alert state of at least one subject; and

one or more EEG fatigue data segments illustrative of a fatigue state of the at least one subject;

ii. selecting one of the one or more fatigue data segments and setting it to be an assumed maximum fatigue segment based on the alert state segment and assumed maximum fatigue segment defining respectively opposite ends of a fatigue spectrum;

iii. training an EEG classifier by extracting an EEG feature space from the alert state segment and assumed maximum fatigue segment;

iv. identifying a segment of maximum fatigue by applying the EEG classifier to each of the fatigue data segments;

v(1). if the segment of maximum fatigue is inconsistent with the assumed maximum fatigue segment:

setting the segment of maximum fatigue as the assumed maximum fatigue segment; and

performing steps iii. to v.; and

v(2). if the segment of maximum fatigue is consistent with the assumed maximum fatigue segment, setting the EEG classifier as the EEG model for discriminating between alert and fatigue states in EEG data.

10. A computer process according to claim 9, wherein a length of the alert state segment and the assumed maximum fatigue segment are the same.

11. A computer process according to claim 9, wherein the EEG feature space is based on spectral power ratios for the alert state segment and assumed maximum fatigue segment.

12. A computer process according to claim 11, wherein the EEG feature space is based on spectral envelopes for the alert state segment and assumed maximum fatigue segment.

13. A computer process according to claim 9, wherein the EEG classifier is used to determine a score for each of the one or more EEG fatigue data segments, and the maximum fatigue is inconsistent with the assumed maximum fatigue segment if:

    the score for the segment of maximum fatigue is greater than that for the assumed maximum fatigue segment; or
    the maximum fatigue is greater than the assumed maximum fatigue segment by at least a predetermined amount.

14. A computer process according to claim 9, wherein receiving one or more EEG fatigue data segments comprises receiving a period of EEG data and segmenting the EEG fatigue data into the one or more EEG fatigue data segments.

15. A computer process according to claim 14, wherein segmenting the EEG fatigue data into the one or more EEG fatigue data segments comprises segmenting the EEG fatigue data into overlapping segments, a first half of each segment overlapping a preceding segment and a latter half of each segment overlapping a succeeding segment.

16. A computer process according to claim 9, wherein selecting one of the one or more fatigue data segments comprises randomly selecting a segment from the one or more fatigue data segments.

17. A computer process according to claim 9, wherein setting the EEG classifier as the EEG model comprises:

    setting the segment of maximum fatigue as a revised assumed maximum fatigue segment;

    performing step iii. using the alert state segment and revised assumed maximum fatigue segment; and

    setting the EEG classifier to be the EEG model.

18. A computing system for discriminating between alert and fatigue states in EEG data, comprising:

    a model applicator module for applying an EEG model established by the computer process of claim 9, to EEG data;

    an EEG receiver for receiving a subsequently received EEG segment; and

    an alert module for producing an alert if the model applicator module determines the subsequently received EEG segment is indicative of fatigue.