Anxiety Detection using Machine Learning Techniques

OVERVIEW

Anxiety is a common mental health condition that can cause feelings of worry, nervousness, and fear. It can interfere with daily life and lead to physical symptoms such as headaches, stomachaches, and difficulty sleeping. In some cases, anxiety can even lead to thoughts of suicide.

There are many different types of anxiety disorders, including generalized anxiety disorder (GAD), panic disorder, social anxiety disorder, and specific phobias.

- **GAD** is characterized by excessive worry and anxiety that is difficult to control.
- **Panic disorder** is characterized by sudden, unexpected panic attacks that can cause physical symptoms such as chest pain, shortness of breath, and dizziness.
- **Social anxiety disorder** is characterized by a fear of social situations that can lead to avoidance of social interactions.

Anxiety can interfere with work, school, relationships, and leisure activities.

Symptoms and Methods to detect anxiety:

There are two types of effects of anxiety on people:

1. Physical symptoms
2. Psychological symptoms

Physical symptoms:
- Rapid heart rate
- Sweating
- Trembling
- Shortness of breath
- Chest pain
- Dizziness
- Nausea
- Fatigue

Psychological symptoms:

- Excessive worry
- Fear
- Avoidance behavior
- Irritability
- Difficulty concentrating
- Sleep problems
- Feeling on edge

Methods that are used to detect anxiety: (mostly used in Research Papers)

- Clinical interviews
- Self-report questionnaires
- Physiological measures
- Neuropsychological tests
- Biosignals

Ways to collect data for anxiety detection:

1. **Self-report questionnaires**: (STAI) and (GAD-7).
2. **Physiological measures:**. These measures can include heart rate, blood pressure, respiration rate, and skin conductance.
3. **Neuropsychological tests:** (WCST) and Stroop Test.
4. **Biosignals:** Biosignals can be used to assess anxiety by tracking changes in heart rate, blood pressure, respiration rate, skin conductance, and brain activity.
5. **Wearable devices**: Wearable devices are devices that can be worn on the body to collect data about the wearer's activity, heart rate, blood pressure, and other physiological measures.
6. **Social media**: Social media data can be used to assess anxiety by tracking changes in people's language, sentiment, and behavior.

These are the main 4 tests used to measure Anxiety:

- **State-Trait Anxiety Inventory (STAI)**: It is used to measure anxiety. It consists of two 20-item scales:
    1. state anxiety (how you feel right now) and
    2. trait anxiety (how you typically feel).

State Trait Anxiety Inventory

Read each statement and select the appropriate response to indicate how you feel right now, that is, at this very moment. There are no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe your present feelings best.

	1	2	3	4
	Not at all	A little	Somewhat	Very Much So

	1	2	3	4
1. I feel calm	1	2	3	4
2. I feel secure	1	2	3	4
3. I feel tense	1	2	3	4
4. I feel strained	1	2	3	4
5. I feel at ease	1	2	3	4
6. I feel upset	1	2	3	4
7. I am presently worrying over possible misfortunes	1	2	3	4
8. I feel satisfied	1	2	3	4
9. I feel frightened	1	2	3	4
10. I feel uncomfortable	1	2	3	4
11. I feel self confident	1	2	3	4
12. I feel nervous	1	2	3	4
13. I feel jittery	1	2	3	4
14. I feel indecisive	1	2	3	4
15. I am relaxed	1	2	3	4
16. I feel content	1	2	3	4
17. I am worried	1	2	3	4

- **Generalized Anxiety Disorder Questionnaire (GAD-7)**: It is a self-report questionnaire that is used to screen GAD. It consists of 7 items that assess symptoms of GAD.

GAD-7 Anxiety

Over the last two weeks, how often have you been bothered by the following problems?	Not at all	Several days	More than half the days	Nearly every day
1. Feeling nervous, anxious, or on edge	0	1	2	3
2. Not being able to stop or control worrying	0	1	2	3
3. Worrying too much about different things	0	1	2	3
4. Trouble relaxing	0	1	2	3
5. Being so restless that it is hard to sit still	0	1	2	3
6. Becoming easily annoyed or irritable	0	1	2	3
7. Feeling afraid, as if something awful might happen	0	1	2	3

Column totals _____ + _____ + _____ + _____ =

Total score _____

If you checked any problems, how difficult have they made it for you to do your work, take care of things at home, or get along with other people?			
Not difficult at all	Somewhat difficult	Very difficult	Extremely difficult
☐	☐	☐	☐

Scoring GAD-7 Anxiety Severity

This is calculated by assigning scores of 0, 1, 2, and 3 to the response categories, respectively, of "not at all," "several days," "more than half the days," and "nearly every day." GAD-7 total score for the seven items ranges from 0 to 21.

0–4: minimal anxiety

5–9: mild anxiety

10–14: moderate anxiety

15–21: severe anxiety

- **Wisconsin Card Sorting Test (WCST):** In the WCST, the participant is presented with a series of cards with different shapes, colors, and numbers. The participant is asked to sort the cards according to a rule that changes without warning. The WCST is a sensitive measure of anxiety, and it can be used to help diagnose anxiety disorders.

Correct!

(2)

Use the mouse to select the pile on which the card should be sorted.

(1)
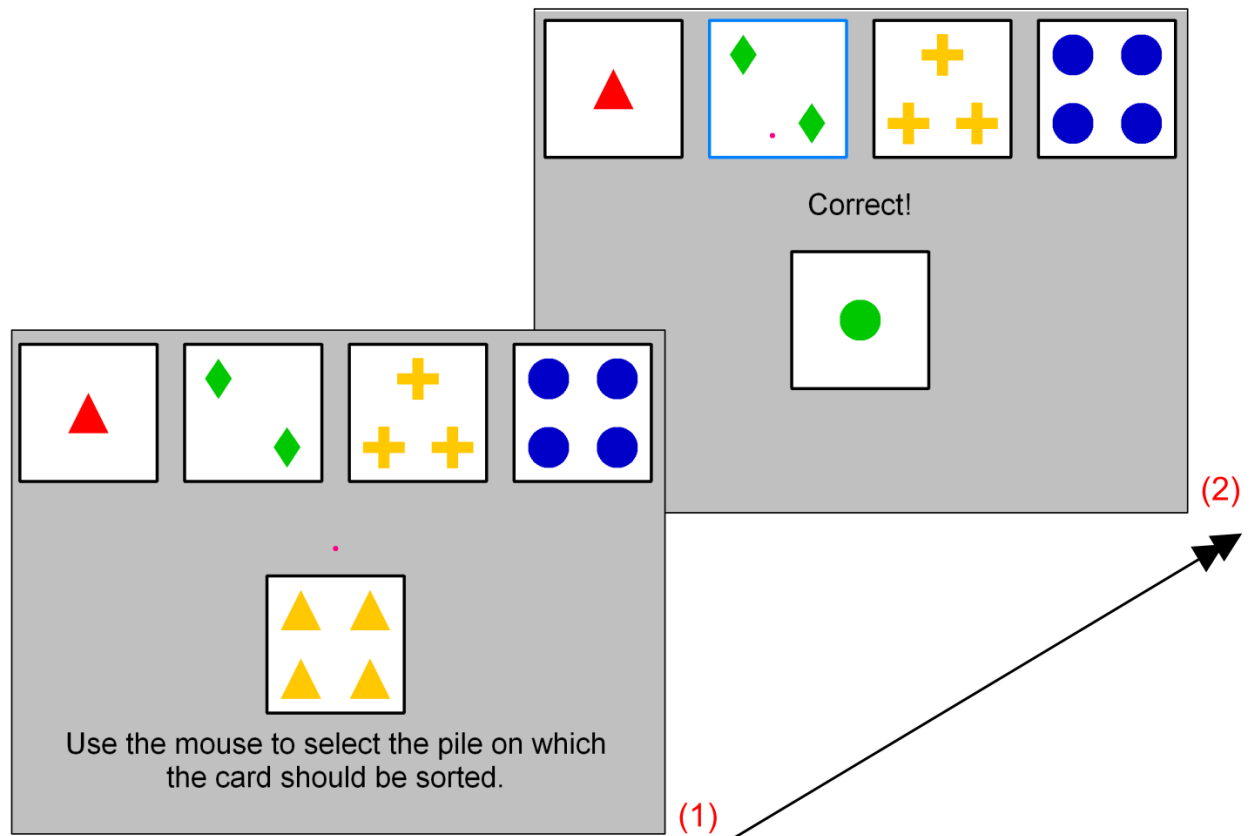
- **Stroop Test:** In the Stroop Test, the participant is presented with a series of words that are printed in different colors. The participant is asked to name the color of the ink, rather than the word itself. The Stroop Test is a sensitive measure of anxiety, and it can be used to help diagnose anxiety disorders.

Name: _____   Date: _____

1.Please read the words in order.
2.Please read the colour in order.

blue   red   yellow   blue   red

yellow   blue   yellow   green   yellow

red   blue   green   blue   red

blue   blue   blue   blue   yellow

blue   blue   red   red   green

red   blue   green   blue   red

red   yellow   yellow   yellow   yellow

yellow   blue   yellow   green   green

green   blue   blue   blue   yellow

yellow   red   green   yellow   blue

These are some of the most Common diagnosis we use in patients (Inputs recomended by a doctor):

F41.1 (generalized anxiety disorder)

F43.23 (adjustment disorder with mixed anxiety and depressed mood)

F43.22 (adjustment disorder with anxiety)

F33.1 (major depressive disorder, recurrent, moderate)

F43.20 (adjustment disorder, unspecified)

F41.9 (anxiety disorder, unspecified)

F43.21 (adjustment disorder with depressed mood)

F43.12 (post-traumatic stress disorder, chronic)

F34.1 (dysthymic disorder)

F43.10 (post-traumatic stress disorder, unspecified)

F32.1 (major depressive disorder, single episode, moderate)

F33.0 (major depressive disorder, recurrent, mild)

F32.9 (major depressive disorder, single episode, unspecified)

F90.2 (attention-deficit hyperactivity disorder, combined type)

F60.9 (personality disorder, unspecified)

F40.228 (other natural environment type phobia)

F43.25 (adjustment disorder w mixed disturb of emotions and conduct)

F06.1 (catatonic disorder due to known physiological condition)

F33.2 (major depressive disorder, recurrent severe without psychotic features)

F41.0 (panic disorder without agoraphobia)

F90.0 (attention-deficit hyperactivity disorder, predominantly inattentive type)

F32.0 (major depressive disorder, single episode, mild)

F42.2 (mixed obsessional thoughts and acts)

F84.0 (childhood autism)

Anxiety Disorder symptoms (can be choosen for our dataset)

- Age
- Gender
- Herat rate
- Average sleep Duration
- Exercise frequency
- Caffeine intake
- Alcohol consumption
- Childhood trauma
- Recent Major Life Event

Datasets:

https://dataverse.harvard.edu/dataset.xhtml?persistentId=doi:10.7910/DVN/N42LWG

https://www.kaggle.com/datasets/sahasourav17/students-anxiety-and-depression-da

https://www.kaggle.com/datasets/thedevastator/uncover-global-trends-in-mental-health-disorder

https://www.kaggle.com/datasets/divyansh22/online-gaming-anxiety-d

Questionnaire for anxiety disorder:

https://www.psycom.net/anxiety-test

https://screening.mhanational.org/screening-tools/anxiety/?layout=actions_neutral

https://dcf.psychiatry.ufl.edu/files/2011/05/HAMILTON-ANXIETY.pdf

https://www.phqscreeners.com/images/sites/g/files/g10060481/f/201412/PHQ9_English%20for%20Canada_0.pdf