Artificial Intelligence - Lab Project

Psychological pattern analysis
A Personalized Depression Detection System

Introduction

Our goal is to build a personalized depression detection system. The system should be based on a local area, specially targeted towards the students and faculty members of Shahjalal University and Science and Technology. The subject will get a set of questions, and from the responses the system shall provide an accurate measurement of whether or not the subject is under depression. The source of questions should be various aspects and topics involved in the selected area and individual criteria. The set of questions asked to any individual subject will be auto-generated by an intelligent system, which will measure the previous responses of the subject and asks new questions to reach an accurate measurements.

Review on depression and detection system

Depression is a state of low mood and aversion to activity or apathy that can affect a person's thoughts, behavior, feelings and sense of well-being.[1]

Severity

People with a depressed mood can feel sad, anxious, empty, hopeless, helpless, worthless, guilty, irritable, angry, ashamed or restless. They may lose interest in activities that were once pleasurable, experience loss of appetite or overeating, have problems concentrating, remembering details or making decisions, experience relationship difficulties and may contemplate, attempt or commit suicide. Insomnia, excessive

---

[1] Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5). American Psychiatric Association. 2013.

sleeping, fatigue, aches, pains, digestive problems or reduced energy may also be present.[2]

Causes

There are multiple causes of depression. Adversity in Childhood, life events and changes that may precipitate depressed mood, inferiority complex about various physical and mental aspects, certain medications and several drugs of abuse, subjects personality, a number of infectious diseases (nutritional deficiencies, neurological conditions), a number of psychiatric syndromes(Major Depressive Disorder, bipolar disorder, borderline personality disorder, post-traumatic stress disorder, adjustment disorder) etc are known causes for depression.[3]

Assessment

Questionnaires and checklists such as the *Beck Depression Inventory* can be used by a *mental health provider* to help detect, and assess the severity of depression.[4]

Beck Depression Inventory

The Beck Depression Inventory (BDI, BDI-1A, BDI-II), created by Aaron T. Beck, is a *21-question multiple-choice self-report inventory*, one of the most widely used psychometric tests for measuring the severity of depression.[5]

In its current version, the BDI-II is designed for individuals aged 13 and over, and is composed of items relating to symptoms of depression such as hopelessness and irritability, cognition such as guilt or feelings of being punished, as well as physical symptoms such as fatigue, weight loss, and lack of interest in sex.[6]

---

[2] "NIMH · Depression". nimh.nih.gov. Retrieved 15 October 2012.
[3] https://www.wikiwand.com/en/Depression_(mood)
[4] Kovacs, M. (1992). Children's Depression Inventory. North Tonawanda, NY: Multi-Health Systems, Inc.
[5] https://www.wikiwand.com/en/Beck_Depression_Inventory
[6] Beck AT (1972). Depression: Causes and Treatment. Philadelphia: University of Pennsylvania Press. ISBN 0-8122-1032-8.

Beck drew attention to the importance of "negative cognitions" described as sustained, inaccurate, and often intrusive negative thoughts about the self. In his view, it was the case that these cognitions caused depression, rather than being generated by depression.[7]

Two factor approach to depression

Depression can be thought of as having two components:

1. Affective Component (e.g. Mood)
2. Physical or "somatic" component (e.g. Loss of appetite)

The BDI-II reflects this and can be separated into two subscales. The purpose of the subscales is to help determine the primary cause of a patient's depression.

Affective subscale: It contains 8 items: pessimism, past failures, guilty feelings, punishment feelings, self-dislike, self-criticalness, suicidal thoughts or wishes, and worthlessness.

Somatic subscale: It consists of the other 13 items: sadness, loss of pleasure, crying, agitation, loss of interest, indecisiveness, loss of energy, change in sleep patterns, irritability, change in appetite, concentration difficulties, tiredness and/or fatigue, and loss of interest in sex.

The two subscales were moderately correlated at 0.57, suggesting that the physical and psychological aspects of depression are related rather than totally distinct.[8] [9]

---

[7] Allen JP (2003). "An Overview of Beck's Cognitive Theory of Depression in Contemporary Literature". Retrieved 2004-02-24.

[8] Storch EA, Roberti JW, Roth DA (2004). "Factor structure, concurrent validity, and internal consistency of the Beck Depression Inventory-Second Edition in a sample of college students". Depression and Anxiety. 19 (3): 187–9. doi:10.1002/da.20002. PMID 15129421.

[9] Steer RA, Ball R, Ranieri WF, Beck AT (January 1999). "Dimensions of the Beck Depression Inventory-II in clinically depressed outpatients". Journal of clinical psychology. 55 (1): 117–28. doi:10.1002/(SICI)1097-4679(199901)55:1<117::AID-JCLP12>3.0.CO;2-A. PMID 10100838.

Review on Similar Projects

- http://treat-depression.com/depression-test

  It is an online depression detection test based on Beck Depression Inventory. After the test it gives a verdict about the degree of depression, also suggests advise for possible diagnostics and medication.

- http://psychologytoday.tests.psychtests.com/take_test.php?idRegTest=3353

  It is a Bipolar Depression Test. Short and quick test consisting of only 4 questions. After finishing this test, you will receive a detailed, personalized interpretation of your score that includes diagrams and information on the test topic.

- http://psychologytoday.tests.psychtests.com/take_test.php?idRegTest=1308

  An in dept test on Depression, consisting of 101 questions. This assessment is designed to determine whether you presently have, or are at risk for developing a depressive disorder, along with assessing whether your mindset makes you more prone to depression. After finishing the test, you will receive a Snapshot Report with an introduction, a graph and a personalized interpretation for one of your test scores. Further information and detailed review requires purchase.

- http://www.netdoctor.co.uk/quizzes/goldbergdepression

  A modified version of BDI (Beck's Depression Inventory), Goldberg's depression test, consisting of total 18 questions. It measure depression level into 6 categories.

- http://psychcentral.com/quizzes/depquiz.htm

  18 question based depression detection system, presumably a modified Goldberg's depression test which takes consideration of the age and gender of the subject.

- http://healthnet.umassmed.edu/mhealth/HAMD.pdf

  A variant of BDI.

- http://healthnet.umassmed.edu/mhealth/ZungSelfRatedDepressionScale.pdf

  A variant of BDI.

- http://healingheartscc.com/docs/first_steps/FS_DepressionQuiz.pdf

  Can be considered as a variation of BDI.

- http://www.integraonline.org/assessments/grief_depression_inventory.pdf

  In this test, a series of paragraphs are provided that are paired: One describes

how a person who is depressed might respond, the other a person who is actively grieving an important loss or life change. It measures whether the subject's present state: grieving, depression, both, or neither.

- http://www.fresno.ucsf.edu/pediatrics/downloads/edinburghscale.pdf
  Test based on ten questions, focused on postnatal depression.

Our Assessment Plan

We have analyzed dozens of Depression detection tests that could be found online. Also performed field research on many available sites that provide free psychological and depression tests. After in dept study and review session, we decided to use a modified BDI (Beck's Depression Inventory) as our assessment system.

It will take the primary BDI as source. We shall derive many questions that are localized and personalized based on the region we selected. Each question will then be categorized into 21 groups. Each group will represent a derivation from the original questions of BDI. Based on the similarity of questions and answers, we shall divide marks on the chosen answers.

As there will me multiple questions per group, we have to decide which question to select from each of the group. This decision will be left to an automated system. Which will select the next question based on subjects personal attributes. The attributes could be: age, gender, profession (student, teacher, clerks etc), nationality, birth-district, house location, room environment etc. This topic is still ongoing research.

Beck's Depression Inventory

This depression inventory can be self-scored. The scoring scale is at the end of the questionnaire.

1.
- 0   I do not feel sad.
- 1   I feel sad
- 2   I am sad all the time and I can't snap out of it.
- 3   I am so sad and unhappy that I can't stand it.

2.
- 0   I am not particularly discouraged about the future.
- 1   I feel discouraged about the future.
- 2   I feel I have nothing to look forward to.
- 3   I feel the future is hopeless and that things cannot improve.

3.
- 0   I do not feel like a failure.
- 1   I feel I have failed more than the average person.
- 2   As I look back on my life, all I can see is a lot of failures.
- 3   I feel I am a complete failure as a person.

4.
- 0   I get as much satisfaction out of things as I used to.
- 1   I don't enjoy things the way I used to.
- 2   I don't get real satisfaction out of anything anymore.
- 3   I am dissatisfied or bored with everything.

5.
- 0   I don't feel particularly guilty
- 1   I feel guilty a good part of the time.
- 2   I feel quite guilty most of the time.
- 3   I feel guilty all of the time.

6.
- 0   I don't feel I am being punished.
- 1   I feel I may be punished.
- 2   I expect to be punished.
- 3   I feel I am being punished.

7.
- 0   I don't feel disappointed in myself.
- 1   I am disappointed in myself.
- 2   I am disgusted with myself.
- 3   I hate myself.

8.
- 0   I don't feel I am any worse than anybody else.
- 1   I am critical of myself for my weaknesses or mistakes.

	2	I blame myself all the time for my faults.
	3	I blame myself for everything bad that happens.

9.

	0	I don't have any thoughts of killing myself.
	1	I have thoughts of killing myself, but I would not carry them out.
	2	I would like to kill myself.
	3	I would kill myself if I had the chance.

10.

	0	I don't cry any more than usual.
	1	I cry more now than I used to.
	2	I cry all the time now.
	3	I used to be able to cry, but now I can't cry even though I want to.

11.

	0	I am no more irritated by things than I ever was.
	1	I am slightly more irritated now than usual.
	2	I am quite annoyed or irritated a good deal of the time.
	3	I feel irritated all the time.

12.

	0	I have not lost interest in other people.
	1	I am less interested in other people than I used to be.
	2	I have lost most of my interest in other people.
	3	I have lost all of my interest in other people.

13.

	0	I make decisions about as well as I ever could.
	1	I put off making decisions more than I used to.
	2	I have greater difficulty in making decisions more than I used to.
	3	I can't make decisions at all anymore.

14.

	0	I don't feel that I look any worse than I used to.
	1	I am worried that I am looking old or unattractive.
	2	I feel there are permanent changes in my appearance that make me look unattractive
	3	I believe that I look ugly.

15.

	0	I can work about as well as before.
	1	It takes an extra effort to get started at doing something.
	2	I have to push myself very hard to do anything.
	3	I can't do any work at all.

16.

	0	I can sleep as well as usual.
	1	I don't sleep as well as I used to.
	2	I wake up 1-2 hours earlier than usual and find it hard to get back to sleep.
	3	I wake up several hours earlier than I used to and cannot get back to sleep.

17.
     0   I don't get more tired than usual.
     1   I get tired more easily than I used to.
     2   I get tired from doing almost anything.
     3   I am too tired to do anything.

18.
     0   My appetite is no worse than usual.
     1   My appetite is not as good as it used to be.
     2   My appetite is much worse now.
     3   I have no appetite at all anymore.

19.
     0   I haven't lost much weight, if any, lately.
     1   I have lost more than five pounds.
     2   I have lost more than ten pounds.
     3   I have lost more than fifteen pounds.

20.
     0   I am no more worried about my health than usual.
     1   I am worried about physical problems like aches, pains, upset stomach, or constipation.
     2   I am very worried about physical problems and it's hard to think of much else.
     3   I am so worried about my physical problems that I cannot think of anything else.

21.
     0   I have not noticed any recent change in my interest in sex.
     1   I am less interested in sex than I used to be.
     2   I have almost no interest in sex.
     3   I have lost interest in sex completely.

INTERPRETING THE BECK DEPRESSION INVENTORY (BDI-II)

Add up the score for each of the 21 questions by counting the number to the right of each question you marked. The highest possible total for the whole test would be sixty-three and the lowest possible score for the test would be zero. This would mean you circles zero on each question. You can evaluate your depression according to the Table below.

A PERSISTENT SCORE OF 17 OR ABOVE INDICATES THAT YOU MAY NEED TREATMENT.

Total Score	Levels of Depression
0-10	= These ups and downs are considered normal
11-16	= Mild mood disturbance
17-20	= Borderline clinical depression
21-30	= Moderate depression
31-40	= Severe depression
over 40	= Extreme depression

INTERPRETING THE BECK ANXIETY INVENTORY (BAI)

<u>**Scoring Key**</u>
Not At All   = 0
Mildly   = 1
Moderately   = 2
Severely   = 3

Add up the score for each of the 21 questions by using the scoring key above. The highest possible total for the whole test would be sixty-three. Since the lowest possible score for each question is zero, the lowest possible score for the test would be zero. This would mean you circles zero on each question. You can evaluate your anxiety according to the Table below which is based on the 1993 revisions.

<u>Total Score</u>	<u>Levels of Anxiety</u>
0-7	= Minimal level of anxiety
8-15	= Mild anxiety
16-25	= Moderate anxiety
26-63	= Severe depression

INTERPRETING THE BECK SCALE FOR SUICIDE (BSS)

If the client responses with a 0 (0= no desire) to items 4 and 5 then skip ahead to items 20 and 21. The client does not need to complete items 6 through 17.

If the client responses with a 1 or 2 to items 4 and 5 then you would instruct them to complete all the items on the scale. When they complete the scale you would add up the score for each of the first 19 questions by counting the number to the right of each question you marked.

Items 20 and 21 are not part of the total scale score. They are provided to help gather additional clinical information for the therapist. The manual contains general cutoff guidelines, although the author recommends that cut-off scores should be based upon clinical decisions. Generally scores above 24 are considered to be a clinical cutoff implying this client is at a significant risk for suicide.

INTERPRETING THE BECK HOPELESSNESS SCALE (BHS)

Scoring Template
Count one point if any of the items were answered with the following responses:

1. FALSE	6. FALSE	11. TRUE	16. TRUE
2. TRUE	7. TRUE	12. TRUE	17. TRUE
3. FALSE	8. FALSE	13. FALSE	18. TRUE
4. TRUE	9. TRUE	14. TRUE	19. FALSE
5. FALSE	10. FALSE	15. FALSE	20. TRUE

Add up the total points based on the scoring template above to find a total scale score. The user bases his or her interpretation on the total scale score. The manual contains general cutoff guidelines, although the author recommends that cut-off scores should be based upon clinical decisions. Generally scores above 8 or 9 are considered to be a clinical cutoff implying this client is at a greater risk for suicide.

Collected from:

1. www.hr.ucdavis.edu/asap/pdf_files/Beck_Depression_Inventory.pdf
2. https://www.researchgate.net/file.PostFileLoader.html?id=54218f6cd039b194688b456d&assetKey=AS%3A273559476211718%401442233069881

Papers for further review:

1. Yuan-Pang Wang, Clarice Gorenstein. *Psychometric properties of the Beck Depression Inventory-II: a comprehensive review.* Revista Brasileira de Psiquiatria. 2013;35:416–431
2. Jodi L. Viljoen, Grant L. Iverson, Stephanie Griffiths, and Todd S. Woodward. *Factor Structure of the Beck Depression Inventory— II in a Medical Outpatient Sample.* Journal of Clinical Psychology in Medical Settings, Vol. 10, No. 4, December 2003 (°C 2003)