



International Journal of Emerging Technologies in Computational and Applied Sciences (IJETCAS)

www.iasir.net

A Survey on Affective Learning Context Discovery Using Emotional Intelligence

I. Samuel Peter James¹, Dr. P. Ramasubramanian², D. Magdalene Delight Angeline³

^{1,2,3} Department of Computer Science

¹Research Scholar, Bharathiyar University, Coimbatore, ² Principal, Annai Vailankani College of Engineering, Kanyakumari, ³ Assistant Professor, Dr.G.U.Pope College of Engineering, Thoothukudi
^{1,2,3} Tamilnadu, INDIA

Abstract: Emotions play an important role in our daily lives. Human spend large amount of time in observing the emotions of others, understanding what these signals mean, determining how to respond, and dealing with his own complex emotional experiences. Without emotions, the life of human has no meaning, joy, richness and connection with others. The ability to identify emotion is one of the characteristic of emotional intelligence. Emotional Intelligence is directly linked to academic success for non computing human, but not for computing human. However, computing and non computing solution differed significantly on emotional intelligence. This paper scrutinizes the key elements of emotion and the potential of feelings and physiological changes as reliable guide for emotion recognition.

Keywords: Academic performance, Computing students, Emotional Intelligence, Emotion recognition, Physiological analysis, Psychological recognition

I. Introduction

Emotional Intelligence is a combination of three types of adaptive abilities: “appraisal and expression of emotion, regulation of emotion, and utilization of emotions in solving problems” [46]. Emotional intelligence refers to a person’s capacity to use emotion proactively, both his or her own emotions and those of others around them, and on both a conscious and sub-conscious level, as a tool to enhance reasoning and decision-making. Several definitions for intelligence are available, although intelligence is typically defined about a person’s ability to adapt to the environment and to learn from experience. Spearman [45] first proposed that intelligence contains a single general ability as well as more specific abilities. This view has been extended by Car-roll who has proposed hierarchical models with general ability at the top and in sequence exact abilities at lower levels. Gardner proposed a theory of multiple intelligences where eight distinct intelligences function is independent of another: linguistic, logical–mathematical, spatial, musical, bodily–kinesthetic, interpersonal, intrapersonal, and naturalist. Gardner has also considered on the possible survival of existential and spiritual intelligences.

Emotional intelligence when presented with emotional stimuli, a person experiences the autonomic reactions and expressive behaviors associated with an emotion. The term emotional response is used to indicate the person’s experience of emotion. Recent definitions of emotion have either emphasized the external stimuli that trigger emotion, or the internal responses involved in the emotional state [26]. According to Perlovsky [38], [39] emotion is a really significant communications and to internal states associated to feelings. Love, hate, courage, fear, joy, sadness, pleasure, and disgust are described in both psychological and physiological terms.

Emotions are an important part in all human interactions as they not only impact our social interactions but much of our decision making as well. Sivaraman sriram, xiaobu yuan (2012) [48] proposed an enhanced approach for classifying Emotions using Customized decision tree algorithm.

This paper is organized to survey methodology to create valid framework for emotional context. Section II provides the literature review of various researches. Section III provides the impact of emotion in learning. Section IV discusses various data mining algorithms used for classification. This paper concludes in Section V with a discussion of possible research direction.

II. Literature Review

Recent research in psychology, neuroscience, cognitive science, and neuro economics has shown that emotions play a key role in learning and decision making. In particular, emotional neuroscience has shown that the categorizing emotional feeling provide fundamental values for the guidance of behavior and is significant in the emotional function of the brain [36]. Moren and Balkenius [35] have suggested a framework that combines emotions, motivations and action selection together based on Mowrer's two process theory of learning. Loewenstein and Lerner [29] have proposed two different ways where expected and immediate emotions control

decision making. Expected emotions consist of predictions about the emotional consequences of decision outcomes maximizing positive emotions and minimizing negative emotions. Immediate emotions are experienced at the time of decision making that reflects the combined effects of preventive influences and secondary influences. It is generally accepted that human emotions are a major motivational factor of human behaviors [9]. In a narrower context, the relationships between consumer emotions and their buying behaviors also recognized [51], [41].

Goleman identifies five major aspects of emotional intelligence: self-awareness, self-regulation, motivation, empathy, and social skill. A person recognizes emotion in the stimuli without experiencing the reactions and behaviors associated with emotion [16]. Emotional intelligence consists of the ability to recognize, express, and have emotions, coupled with the ability to regulate these emotions, harness them for constructive purposes, and skillfully handle the emotions of others. The skills of emotional intelligence have been argued to be a better predictor than Intelligence quotient for measuring aspects of success in life. Another unexplored predictor of student performance is EI [17]. Lazarus *et al.* [24] proposed coping strategies that are defined as cognitive and behavioral strategy employed by individuals to work with real problems and difficulties.

Some studies have considered the relationship among coping strategies, gender, and academic performance. Campbell-Sills, *et al.* [5] identified that emotion focused managing strategies were associated with academic elasticity. In particular, coping strategies are “thoughts or actions that people sometimes engage in when under stress” [6]. Two major functions of coping exist: regulating stressful emotions and altering the person-environment relation causing the distress [24], [7]. Recently, accessing physiological responses has gained increasing attention in characterizing the emotional states ([21], [22], [23], [40]). Most of the facial expression analyzers developed a small set of prototypic emotional facial expressions, i.e., fear, sadness, disgust, anger, surprise, and happiness ([32], [33], [37]) that is followed from the large body of psychological research ([8], [12], [20]) which argues that these “basic” emotions have corresponding prototypic facial displays.

Nowadays, music performance plays a central role in music culture. Understanding and formalizing expressive music performance is an extremely challenging problem that in the past has been studied from different perspectives ([4], [13], [15], [47]). The approaches used are mainly based on statistical analysis [43], mathematical modeling [50], and analysis-by-synthesis [14]. Also, the classification of musical emotions is done by using an extended linear discriminant analysis (pLDA) [19].

Recently developed computational-intelligence-based techniques proposed neural-fuzzy methods for the modeling of the relationship between the physiological parameters and the workload level ([52], [53]). The neural and fuzzy models are used for the physiological parameters-based modeling of emotion [31] and alertness level [28].

Research on the educational field focuses on recruiting as well as retaining students into computing curriculum has becomes a great challenge. The research result implies that from 2000 to 2004, computer science (CS) enrollments have declined by more than 30%. Enrollments of students into other computing disciplines information technology (IT) and information systems (IS) are also at an all time low [44]. Reasons to explain the lack of student interest in computing usually focus on economic factor, such as outsourcing [18].

In the research paper [34], lyrics based emotion classification is done. In this a method for lyrics based emotion classification is text-based using feature selection by partial syntactic analysis. Classification of emotion require the choice of emotion model, as such existing research on music emotion use Thayer model, tellegen-watson – Clark model. Thayer model is efficient including the pillar representing stress and energy to classify emotion polarity. In the study, examined emotion extracted through application of the syntactic analysis rule and classified them on basis of lyrics.

Recent work investigating off-task behavior and student emotion has begun to raise questions about whether off-task behavior is universally unproductive for learning [3]. Recent work has examined emotional components of off-task behavior. [2] have investigated affect and off-task behavior in several computer-based learning environments. Observers noted whether students were in one of seven emotional states: boredom, confusion, frustration, engaged concentration, surprise, delight and neutral. The study found that students were most likely to be bored, confused, or frustrated while performing gaming the system behaviors. Additionally, boredom and confusion were significant predictors of students’ future gaming behavior. This same line of research has begun to investigate whether off-task behavior is an effective strategy for regulating specific negative affective states in intelligent tutoring systems. Baker *et al.* [3] found evidence that off-task behavior may reduce subsequent levels of boredom. These findings, combined with evidence that some types of off-task behavior are harmful for learning and some types are not harmful, suggest that off-task behavior may not be as universally harmful to learning as was previously believed.

III. Emotions In Learning

In the past few decades, operations research, AI, EI and computer science have had remarkable success creating

software systems that achieves best possible solutions, even for multifaceted problems. This study focused on rarely measured intrapersonal variables, coping strategies, emotional intelligence, and their effects on academic success for computing majors. In psychological literature several example found on how emotion and mood affect the individual and group decision making process.

Researchers have looked at skills needed for computing professionals to be successful, focusing on cognitive skills [11], [25]. Researchers and practitioners have expressed the need for high emotional intelligence and soft skills among computing professionals [1], [49]. Several studies have investigated the relationship among coping strategies, resilience, gender, and academic performance. In a study of undergraduate students, Campbell-Sills, et al. [5] found that emotion-focused coping strategies were significantly associated with low academic resilience. Like-wise, when assessing Latino students, dysfunctional coping strategies were inversely related to school competencies [16]. Various researchers concentrated on the emotional behavior of a person and examined perceptual behavioral process. L.Maat proposed a Multimodal Affective User Interface (MAUI) framework [30] that is used to recognize user emotions by sensing their various user-centered modalities.

Researchers are studying the role of emotions in artificial intelligence (AI) from a variety of viewpoints: to develop agents and robots that interact more gracefully with humans, to develop systems that use the analog of emotions to aid their own reasoning, or to create agents or robots that more closely model human emotional interactions and learning [27].

A. Is emotion having a consequence on learning?

Emotions such as anger, anxiety, and sadness have the potential to distract learners learning efforts by interfering with their ability to attend to the tasks at hand. Emotions can interfere with learners learning in several ways including

- Limiting the capacity to balance emotional issues
- Creating concern specifically about individual class work
- Triggering emotional responses to classroom events.

Some learners have difficulty in learning because their minds are cluttered with distracting thoughts and memories.

If a person is working to manage with emotions, each does not have enough resources available to engage in learning. In this situation, an extra prompt is essential for a person to help them with learning. Some learner needs communicative time with the facilitator to help process their feelings or resolve a problem. In some cases, the distraction may be temporary, such as a bad day or a fight with a friend. Some learners need counseling to recover from their emotional problems.

The process and act of learning is a consequent of emotion or the feelings it generates. Hence, if emotions produce positive feelings then learning is predictable. The best learning takes place when a positive feeling toward a task enables to use what a person knows, while motivating to extend that knowledge and build on it.

IV. Data Mining Approaches For Emotion Classification

Data Mining is a collection of techniques for efficient automated discovery of previously unknown, valid, novel, useful and understandable patterns in large databases. Emotion detection from text is a relatively new classification task. Classification of Human Emotions using different machine learning techniques is one of the phenomenal researches in today's world. Classification is the process of finding a model that describes and distinguishes data classes. The model is derived based on the analysis of a set of training data. The model is used to predict the class label of objects for which the class label is unknown.

A. Machine Learning

Machine learning studies how to automatically learn to make accurate predictions based on past observation. The classification problems classify examples into given set of categories.

B. Clustering

Clustering is the process of examining a collection of “points,” and grouping the points into “clusters” according to some distance measure. The goal is that points in the same cluster have a small distance from one another, while points in different clusters are at a large distance from one another. Cluster analysis means grouping a set of data objects into clusters. The aim of cluster analysis is to classify the objects into clusters, especially in such a way that two objects of the same cluster are more similar than the objects of other clusters. The objects can be of various characteristics. It is possible to cluster animals, plants, text documents, economic data etc. The two major approaches to clustering – hierarchical and agglomerative – Clustering is unsupervised classification: no predefined classes.

C. Naive Bayes Classifier

Naive Bayes classifier is based on Bayes theorem. It's a baseline classification algorithm. Naive Bayes classifier assumes that the classes for classification are independent. Bayesian classification is very simple and it shows high accuracy and speed when applied to large data bases. It works on one assumption that is the effect of an attribute value on a given class is independent of the values of the other attributes. This assumption is called class conditional independence [42]. Bayesian classification can predict class membership probabilities, such as probability that a given tuple belongs to a particular class [10]. The Naive Bayesian classification predicts that the tuple X belongs to the class C_i .

Using the formula

$$P\left(\frac{C_i}{X}\right) = \frac{P\left(\frac{X}{C_i}\right)P(C_i)}{P(X)}$$

Where $P\left(\frac{C_i}{X}\right)$ is maximum posteriori hypothesis for the class C_i . As $P(X)$ is constant for all classes, only $P\left(\frac{X}{C_i}\right)P(C_i)$ needed to be maximized. Naive Bayes requires low processing memory and less time for execution.

D. Logistic Regression

Logistic regression is a technique from statistics for classifying tuples by considering values of input fields. It is applicable for categorical as well as numerical class attributes whereas linear regression requires only numerical class attributes. In this technique, set of equations are generated that link the input field values to the probabilities related with each of the output field categories or classes. Once the model is built, it can be used to calculate probabilities for new tuples. For each tuple, a probability of membership is calculated for each possible output category or class label. The class category or value with the maximum probability is assigned as the predicted output value for that tuple. Probabilities calculation is carried out in this technique by a logistic model equation.

V. Conclusion

Emotion is believed to interact with all skill of intelligence in the human brain. Emotions, largely over-looked in early efforts to develop machine intelligence, are increasingly regarded as an area for important research. More than a few suggested challenge areas are available to look into in upcoming works. A clearer understanding of the relationships between heritable and non heritable factors and behavior is something that psychologists and educators have been interested in for a long time. A complex context in learning process also can be analyzed using emotional intelligence. In future, emotion can be used as a response for strengthening learning.

VI. References

- [1] M. Bagshaw, "Emotional intelligence: Using brain power you never knew you had," Eng. Manage. J., vol. 13, no. 6, pp. 13–19, 2004.
- [2] Baker, R.S., D'Mello, S.K., Rodrigo, S.K., and Graesser, A.C., "Better to be frustrated than bored: The incidence, persistence, and impact of learners' cognitive-affective states during interactions with three different computer-based learning environments", International Journal of Human-Computer Studies, 68, 223-241.
- [3] Baker, R.S., Moore, G., Wagner, A., Kalka, J., Salvi, A., Karabinos, M., Ashe, C., and Yaron, D., "The dynamics between student affect and behavior occurring outside of educational software", Proceedings of the 4th International Conference on Affective Computing and Intelligent Interaction, 14-24
- [4] R. Bresin, "Articulation rules for automatic music performance," in Proc. Int. Computer Music Conf., San Francisco, CA, 2002, pp. 294–297.
- [5] L.C.Campbell-Sills, L.Sharon, Stein and B.Murray, "Relationship of resilience to personality, coping, and psychiatric symptoms in young adults," Behaviour. Res. Therapy, vol. 44, no. 4, pp. 1–15, 2005.
- [6] C.S. Carver, M.F. Scheier and J.K. Weintraub, "Assessing coping strategies: A theoretically based approach," Personality Social Psych., vol. 56, no. 2, pp. 267–283, 1989.
- [7] H.F.Crean, "Social support, conflict, major life stressors, and adaptive coping strategies in latino middle school students: An integrative model," J Adolescent Res., vol. 19, no. 6, pp. 657–676, 2004.
- [8] C.Darwin, The Expression of the Emotions in Man and Animals", Chicago, IL: Univ. of Chicago Press, 1965.
- [9] R.J.Dolan, "Emotion, Cognition, and Behavior Science", vol. 298, no. 5596, pp. 1191-1194, 2002.
- [10] P. Domingos, M. Pazzani, "On the optimality of the simple Bayesian classifier under zero-one loss", Machine Learning, 29 (2–3) (1997) 103–130.
- [11] M.Eierman and H.K.Schultz, "Preparing MIS students for the future: A curriculum," J. Educ. Manage. Inf. Syst., vol. 3, no. 1, pp. 47–52, 1995.
- [12] P.Ekman, "Emotions Revealed", New York: Times Books, 2003.
- [13] A.L.Foster, "Student interest in computer science plummets," Chronicle Higher Educ., vol. 51, no. 38, p. 38, 2005.
- [14] A.Friberg, R.Bresin, L.Fryden. and J.Sunberg, "Musical punctuation on the micro level: automatic identification and performance of small melodic units", J. New Music Res., vol. 27, no. 3, pp. 217–292, 1998.
- [15] A.Gabrielsson, "The performance of music", in The Psychology of Music, D. Deutsch, Ed., 2nd ed. New York: Academic, 1999.
- [16] A.Gabrielsson, "Perceived emotion and felt emotion: Same or different?", Music. Sci., vol. Special Issue 2001–2002, no. Special Issue, 2001/2002, pp. 123–147, 2002.
- [17] D.Goleman, Emotional Intelligence. New York: Bantam Books, 1995

- [18] ITAA, From Myth to Reality: Changing the Image of Information Technology Task Force Rep., 1998. Available: <http://www.ita.org/workforce/studies/image.html>
- [19] Jonghwa Kim, "Emotion Recognition Based on Physiological Changes in Music Listening", IEEE Transactions on Pattern Analysis And Machine Intelligence, Vol. 30, No. 12, pp. 2067-2083, December 2008.
- [20] D. Keltner and P. Ekman., "Facial expression of emotion", In M.Lewis and J Haviland-Jones (eds) Handbook of emotions, 2nd edition. New York: Guilford, 2000, pp. 236-249.
- [21] K.H. Kim, S.W. Bang and S.R. Kim, "Emotion recognition system using short-term monitoring of physiological signals," Med. Biol. Eng. Comput., vol. 42, no. 3, pp. 419-427, May 2004.
- [22] J. Kim and E. Andre, "Emotion recognition using physiological and speech signal in short-term observation," inProc. Percept. Interactive Technol., 2006, vol. 4021, pp. 53-64.
- [23] J. Kim and E. Andre, "Emotion recognition based on physiological changes in music listening," IEEE Trans. Pattern Anal. Mach. Intell., vol. 30, no. 12, pp. 2067-2083, Dec. 2008.
- [24] R.S. Lazarus and S. Folkman, Stress, Appraisal, and Coping. New York: Springer-Verlag, 1984.
- [25] D.M.S. Lee, E.M. Trauth and D. Farwell, "Critical skills and knowledge requirements of IS professionals: A joint academic/industry investigation," MIS Quar., vol. 19, no. 3, pp. 313-340, 1995.
- [26] D.S.Levine, "Neural network modeling of emotion" ,Phys. Life Rev., vol. 4, pp. 37-63, 2007.
- [27] D.I.Lewin, "Why is that computer laughing?," IEEE Intell. Syst., vol.16, no. 5, pp. 79-81, Sep./Oct. 2001.
- [28] C.T.Lin, L.W.Ko, I.F.Chung, T.Y.Huang, Y.C.Chen, T.P.Jung and S.F.Liang, "Adaptive EEG-based alertness estimation system by using ICA-based fuzzy neural networks," IEEE Trans. Circuits Syst. I, Reg. Papers, vol. 53, no. 11, pp. 2469-2476, Nov. 2006.
- [29] G.Loewenstein and J.S.Lerner, "The Role of Affect in Decision Making," Handbook of Affective Science: 619-642, 2003.
- [30] L.Maat and M.Pantic., "Gaze-x: Adaptive affective multimodal inter-face for single-user office scenarios," inProc. ACM Int. Conf. Multi-modal Interfaces, 2006, pp. 171-178.
- [31] R.L.Mandryk and M.S.Atkins, "A fuzzy physiological approach for continuously modeling emotion during interaction with play technologies," Int. J. Hum.-Comput. Stud., vol. 65, no. 4, pp. 329-347, Apr. 2007.
- [32] A.M.Martinez, "Matching expression variant faces," Vis. Res., vol. 43, no. 9, pp. 1047-1060, 2003.
- [33] K.Mase, "Recognition of facial expression from optical flow," IEICE Trans., vol. E74, no. 10, pp. 3474-3483, 1991.
- [34] Minh Kim, Hyuk-Chul Kwon, "Lyrics-based Emotion Classification using Feature Selection by Partial Syntactic Analysis", IEEE, 2011
- [35] J.Moren and C.Balkenius, "Reflections on Emotion." Cybernetics and Systems 2000.
- [36] J.Panksepp, Affective Neuroscience, Oxford University Press 1998.
- [37] M.Pantic and L.J.M.Rothkrantz, "Toward an affect-sensitive multimodal human computer interaction" ,Proc. IEEE, vol. 91, no. 9, pp. 1370-1390, Sep. 2003.
- [38] L.I. Perlovsky, "Toward physics of the mind: Concepts, emotions, consciousness, and symbols", Phys. Life Rev., vol. 3, no. 1, pp. 23-55, Jan.2006.
- [39] L.I. Perlovsky, "Integrated emotions, cognition, and language," inProc. Int. Joint Conf. Neural Network., 2006, pp. 1570-1575.
- [40] R.W. Picard, E.Vyzas and J. Healey, "Toward machine emotional intelligence: analysis of affective physiological state," Pattern Analysis and Machine Intelligence, IEEE Transactions on, vol. 23, no. 10, pp. 1175-1191, Oct 2001.
- [41] F.Piron, "A Comparison of Emotional Reactions Experienced by Planned, Unplanned and Impulse Purchasers," Advances in Consumer Research, vol. 20, nos. 341-344, pp. 199-204, 1993.
- [42] M.S.Prasad Babu, Bendi Venkata Ramana, Boddu Raja Sarath Kumar, "New Automatic Diagnosis of Liver Status Using Bayesian Classification"
- [43] B.H. Repp, "Diversity and commonality in music performance: an analysis of timing microstructure in Schumann's Traumeri", J. Acoust. Soc. Amer., vol. 104, pp. 2546-2568, 1992.
- [44] D. Robb, "New recruits still scarce", Computerworld, vol. 40, no. 29, p. 36, 2006.
- [45] Spearman, C. E. (1904). "General intelligence" objectively determined and measured. American Journal of Psychology, 15,201-293.
- [46] N.S. Schutte, J.M. Malouff, L.E. Hall, D.J. Haggerty, J.T. Cooper, C.J. Golden and L. Dornheim, "Development and validation of a measure of emotional intelligence," Personality Ind. Differences, vol. 25, no. 2, pp. 167-177, 1998.
- [47] C. E. Seashore, Ed., "Objective Analysis of Music Performance", Iowa City: Univ. Iowa Press, 1936.
- [48] Sivaraman sriram, xiaobu yuan, "An enhanced approach for classifying emotions using customized decision tree algorithm", IEEE, 2012
- [49] J.Surmacz, "The hard truth: Soft skills matter", CIO Mag., Jan. 2005 Available: http://www.cio.com/archive/011505/tl_numbers.html
- [50] N. Todd, "The dynamics of dynamics: a model of musical expression," J. Acoust. Soc. Amer., vol. 91, pp. 3540-3550, 1992.
- [51] P. Weinberg and W. Gottwald, "Impulsive Consumer Buying as a Result of Emotion," J. Business Research, vol. 10, no. 1, pp. 43-57, 1982.
- [52] G.F. Wilson and C.A.Russell, "Real-time assessment of mental workload using psycho physiological measures and artificial neural networks," Hum. Factors, vol. 45, no. 4, pp. 635-643, 2003.
- [53] G.F.Wilson and C.A.Russell, "Operator functional state classification using multiple psycho physiological features in an air traffic control task," Hum. Factors, vol. 45, no. 3, pp. 381-389, 2003.