

Detection and Identification of Head and Neck Cancer Using Hybrid Image Processing Technique

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Abstract: Head and Neck cancers are the most common type of cancer in the world and account for 6% of all tumors. Most of head and neck cancers are squamous cell carcinomas that develop in the upper throat as a result of exposure to risk factors. It usually presents itself in an advanced stage in older men. Cancer can start any place in the body. It starts when cells grow abnormally and crowd out normal cells. This makes it difficult for the body to work the way it should. The medical imaging tools play an important role in the early diagnosis of cancer. Medical imaging has emerged as a non-invasive tool for diagnosis of diseases. So it is important to identify cancer and know its stages in order to determining treatment options that may be tailored to needs. Here we are introducing hybrid image processing technique for noise reduction, segmentation and classification to detect and identify stages of cancer in head and neck.

Index Terms— Head and Neck Cancer, Hybrid Image Processing Techniques.

I. INTRODUCTION

The word emotion ostensibly appeared in the year 1570-80 and it is derived from Middle French word *esmovoir* and in Latin *ēmōvĕre* means move the feelings. *What is emotion? is it feeling?* Since sixteen century to today the philosophers, psychologists and researchers have been trying to define the word emotion in various ways. Mandler (1984) stated that *“too many psychologists fail to accept today that there is no commonly, even superficially, acceptable definition of what a psychology of emotion is about”* [34]. Chaplin and Krawiec said that *“one of the difficulties that has stood in the way of an acceptable theory of emotions has been disagreement over definitions”* [14].

Paul R. Kleinginna, Jr., and Anne M. Kleinginna from Georgia Southern College published a paper during 1981, which includes 92 definitions and 9 skeptical statements from a variety of sources in the literature of emotion. These definitions and statements were classified into an outline of 11 categories, on the basis of the emotional phenomena or theoretical issues emphasized [65]. Some of the important definitions later 1981 are listed below.

Table 1: Definitions of emotion

Authors	Definition
R.Ezhilarasi, R.I.Minub, 2012 [71]	<i>“Emotions are a key semantic component for human communication. Effective communication between humans is</i>

	<i>only accomplished when both the meaning and the emotion of the communication are understood by all parties involved”.</i>
Descartes et al. (de Sousa, 2008) [68]	<i>“Emotions are made up of primary emotions and are measured in function to a limited number of finite dimensions (ex. level of stimulation, intensity, pleasure or aversion, one's own intention or that of others, etc.)”</i>
Hockenbury & Hockenbury, 2007 [37]	<i>“An emotion is a complex psychological state that involves three distinct components: a subjective experience, a physiological response, and a behavioral or expressive response”.</i>
Scherer, 2005[48]	<i>“In general, emotion can be seen as a sort of process that involves different parts, including subjective feeling, cognition, physical expression, the tendency of action or desires, and the neurological process”.</i>
Frijda, 1986 [59]	<i>“Non-instrumental (discrete, individualized) behaviors, non-instrumental behavioral traits, physiological changes and assessment experiences on the subject, being generated by</i>

	<i>external or mental events and primarily by the signification of such events”.</i>
Lazarus, 1991[69]	<i>“He highlights that appraisals are necessary and sufficient for emotion. Adding that the notion of coping allows an individual to choose strategies to confront future problems”.</i>
Ortony and Turner, 1990 [1]	<i>“Emotions are valence reactions to events, agents or objects”.</i>
Greenspan, 1988 [61]	<i>“Emotion is a conscious mental process affecting a major component of the body; it also has a lot of influence on one's thought and action, notably to plan social interaction strategies”.</i>

Kleinginna, P. R. et al., 1981 [49]	<i>“Emotion is a complex phenomenon, with subtle interactions among subjective and objective factors”.</i>
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In the book “The Expression of the Emotions in Man and Animals”, Charles Darwin (1872/1965) [18] defended the argument that emotion expressions are evolved and adaptive (at least at some point in the past) and serve an important communicative function. In medicine the emotion is defined as “An intense mental state that arises subjectively rather than through conscious effort and is often accompanied by physiological changes [24]”. In science it is “A psychological state that arises spontaneously rather than through conscious effort and is sometimes accompanied by physiological changes; a feeling [25]”.

II. STUDY OF EMOTIONS

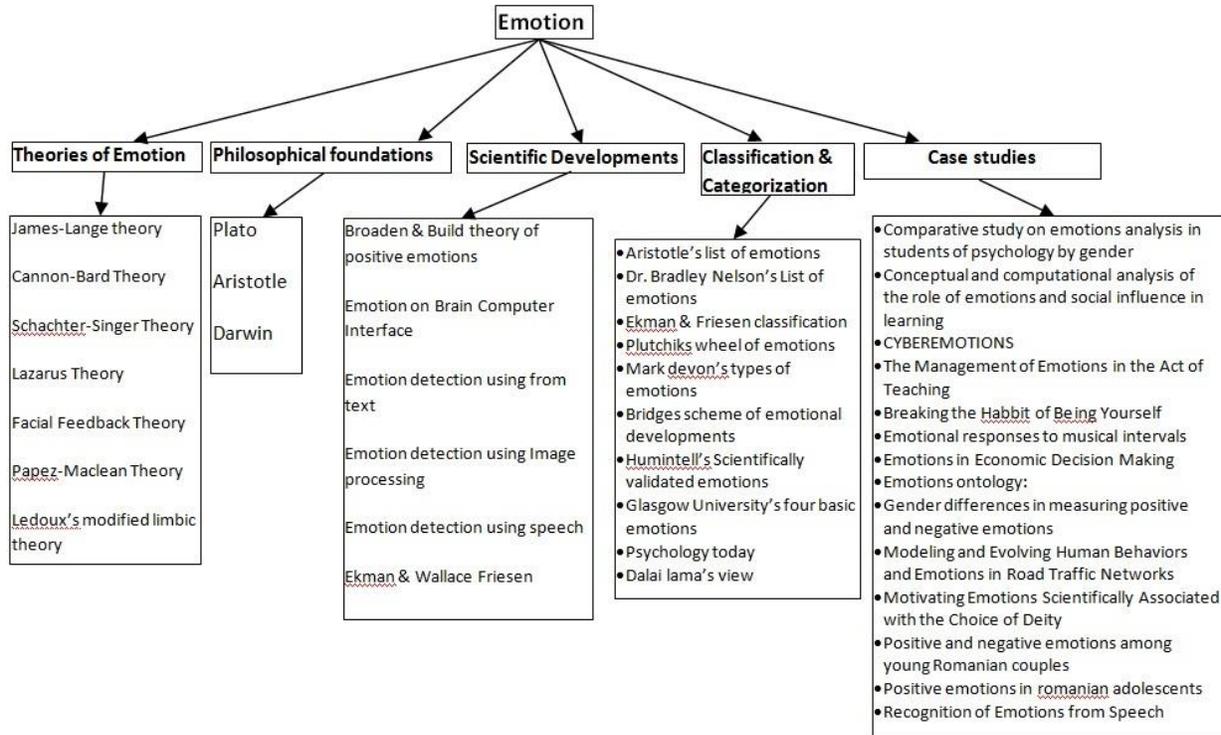


Figure1: Layout of the paper to deal with emotions at various domains and case studies

This paper is mainly emphasizing on the developments of emotion at various domains such as Philosophical, Psychological and Scientific. Also it highlights the number of emotion classification by number of researchers at various domains. Number of applicable case studies have been discussed at the end of the paper

before conclusion. Figure1 shows the layout of the study of the emotion in this paper.

III. THEORIES OF EMOTION

Theories discussed are devised based on the relation between emotion, cognition and physiological changes.

William James and C G Lange propose an emotion theory during the year 1922 called as **James-Lange theory of emotion** [90] and it argues that “*An event causes physiological arousal first and then we interpret this arousal. Only after our interpretation of the arousal we experience emotion. If the arousal is not noticed or is not given any thought, then we will not experience any emotion based on this event*”. For example, when you are sitting alone at home late night and when air makes a noise near window behind you and you begin tremble, your heart beats faster and sometimes your breathing deepens. You observe these physiological changes and keep your body ready for fearful situation and then feel fear.

The **Cannon-Bard theory** argues that “*we experience physiological arousal and emotional at the same time, but gives no attention to the role of thoughts or outward behavior*” [29]. The theory asserts that “*the thalamic region in the brain area responsible for emotional responses to experienced stimuli*” [16]. For example, when you are sitting alone at home late at night and when air makes a noise near window behind you and you begin tremble, your heart beats faster and sometimes your breathing deepens. Here physiological changes and fear experience occurs parallel.

“Cognitive revolution” held during 1962 in the field of psychology, the researchers Schachter and Singer devised a new theory of emotion based on cognitive factors called as Schachter-Singer Theory [78]. According to this theory “an event causes physiological arousal first. You must then identify a reason for this arousal and then you are able to experience and label the emotion.” For example, when you are sitting alone at home late night and when air makes a noise near window behind you and you begin tremble, your heart beats faster and sometimes your breathing deepens. Upon noticing this arousal and you may realize that noise may be by air or any other. This behavior is dangerous and therefore you feel the fear. So this theory depicts the emotion fear based on cognition.

Lazarus Theory [69] states that “*a thought must come before any emotion or physiological arousal. In other*

words, you must first think about your situation before you can experience an emotion”. For example, when you are sitting alone at home late at night and when air makes a noise near window behind you and you may think that it is by black energy and you begin tremble, your heart beats faster and sometimes your breathing deepens at the same time you experience fear.

Facial Action Coding System (FACS) is a systematic classification of facial movements by their appearance on the face it is originally developed by a Carl-Herman Hjortsjo [36]. It was later adopted by Paul Ekman and Wallace V. Friesen, and published in 1978 [60]. Ekman, Friesen, and Joseph C. Hager published a significant update to FACS in 2002 [64]. FACS encodes the movements of the each and individual facial muscles by observing even minor difference from the facial appearance [32]. It is commonly used standard classification tool by psychologists and animators while categorizing the emotions based on facial expressions. Basically FACS does the detection of faces in videos, extracts the geometrical features and producing the profiles of each facial movement. For example, when you are sitting alone at home late at night and when air makes a noise near window behind you and you begin tremble, your heart beats faster and sometimes your breathing deepens and you may clench your teeth or open your eyes bigger then suddenly your brain may interpret these as the emotion of fear.

Papez-Maclean theory devised by Papez-Maclean mainly focus on the structure of the brain while dealing with two important emotions such as rage and fear [10] and this theory is based on the functioning of hippocampus, amygdala in limbic system of the brain. This theory says that “the limbic system and hypothalamus stimulate the production of adrenaline, which provokes ANS (Automatic Nervous System), which creates a physiological response (e.g. increased heart rate) and a behavioral response (e.g. increased attention) in readiness to deal with the stimulus”. **LeDoux’s modified limbic theory** is one of the improvised version of Papez-Maclean theory, This theory proposes that “two separate brain circuits involved in emotion: rapid emotional response (thalamus – amygdala) and slower emotional response (thalamus – cortex, thereby affected by higher mental processes)”[45].

IV. PHILOSOPHICAL FOUNDATIONS

The essence of philosophical foundation is most required bough for the proper justification of growing leaves of approaches like psychology, biology, neurology, neurophysiology, ontology of emotions and so on. Many philosophers of mind and psychology had proposed most of the recognizable theories of emotion. These theories and thoughts had triggered certain sort of concern to a subject, motivating characteristics behavior and encouraging the social behavior to sort out the meaningful aspect of civilization. This section deals with the contribution by the ancient philosophers – Plato, Aristotle, Spinoza, Descartes, Hobbes and Hume to the world of emotions.

Plato

Plato's (428 BCE – 348 BCE) point of views on emotion are based on the analysis of three parts of the soul i.e., feeling–thinking–desiring linkages. According to Plato, Emotion is the base for any medieval, inhibitory and disruptive to the normal and optimal function of mind. Emotion must be under the control for the sake of normal behavior, thoughts and action [92]. In the other angle it can be defined as negative view of emotions, it says that, “emotions usually affect reasoning for the worse” [26]. Plato also designed a model with respect to metaphysics or spiritualism as “the degrading of feelings and emotions to a low status is not just a byproduct of metaphysics; it belongs to metaphysics’ essential constitution” [35]. J Macmurray in his book “Reason and Emotion” makes important standpoints on Plato and observes that the reason for rationality and irrationality is not the feelings it is primarily an affair of emotion and the rationality thinking is the derivative and secondary one [51]. Again, this is a general consideration but it does not qualify Plato's view in terms of the negativity of emotion. As for more recent authors the more focused point is: “In the tri-partite soul, each part has its own reason, emotion, and desire”[51].

Now, if one agrees that affectivity is various and inherently differentiated, one will welcome Plato's model as all the more useful. If, however, one is inclined to treat the whole of affectivity as one–dimensional, Plato's model will appear to him pretty useless [75].

Aristotle (385 BC - 322 BC)

Aristotle was a Greek philosopher and scientist born in the Macedonian city of Stagira, Chalkidice, on the

northern periphery of Classical Greece. Aristotle prefers to call emotion as pathos [pl. pathe], pathe are the responses found in the animals in the beginning to the outside world like a perceptions. Pathe are the origin for actions and Aristotle treated them as movements of sort. This declares that pathe is a component of a soul which informs a body for actions. Aristotle discuss the different ways and solutions to the control of pathe for the rational influence and voluntary action [6]. Aristotle ethical write-ups are regarded as Nichomachean Ethics. These ethics characterizes pathe as the “feelings accompanied by pleasure or pain, listing appetite, anger, fear, confidence, envy, joy, love, hatred, longing, emulation, and pity as examples” [7]. Also the pathe are the reason for appetite and provokes the actions in different faces. Aristotle brought a distinctive thought corresponding to fail to act well. Weak-willed individual recognizes well doing without actually doing it. “Aristotle, however, appears to have thought of them more as exercising a cognitive interference that disrupts our completion of the practical syllogism than as an external force overturning our otherwise smoothly operating reason” [79].

Darwin

Darwin strongly believed that the adaptation to new environment and circumstances may mould mind and instinct become influenced in originating new expression of emotions. His one of the book “The Expression of the Emotions in Man and Animals” during 1872 has grabbed the minds of entire science and technology researches and it emphasizes manly on how the emotions of man and animals are correlated or analogous as a supporting theory that the man and animals derived from the same ancestors [89]. “Certain complex actions are of direct or indirect service under certain states of the mind, in order to relieve or gratify certain sensations, desires, etc.; and whenever the same state of mind is induced, however feebly, there is a tendency through the force of habit and association for the same movements to be performed, though they may not then be of the least use[62]”. These action may be suppressed by willness or through constant use complex movements may be facilitated i.e., “the conducting power of the nervous fibres increases with the frequency of their excitement”[43]. Darwin called these movements as inherited and instinctive also he gave many examples like horrid sight, shaking of head or shutting of the eyes.”

Scientific Developments

Murdock [6] has created a list of common denominator of

cultures and human nature, which was expanded by Tiger and Fox (1971)[87], Hockett(1973), and D E Brown(1991). This list is later developed in anthropology, psychology and linguistics. These were held during the 20th century as a identification of universals.

Ralph B et. al. in the paper Universal Development of Emotion Categories in Natural Language says that “no matter whatever the language is and language never defines the type of emotion during communication” and the this study has been made “*to determine whether the need to communicate about emotion-eliciting events was sufficiently alike so that the encoding sequence progressed similarly across languages*” [72].

The Broaden-and-Build Theory of Positive Emotions

Language learning has become supportive area for the studies of emotions, because it involves acquisition at first and second languages. The process of emotion embedding in the second language may or may not differ. Thus far, “*affect has been considered as a core component of individual differences having a close bearing on second language learning*” says Ellis [22]. Affect also claims the degree of motivation and values says Schumann [80]. This affect can also be regarded as emotion. Forgas [27] and Fredrickson [9] proved that the tendency of the multi-component response generated by the group of opinions which will have both positive and negative responses is a short-live one but have a definite cause. Fredrickson [9] says “*emotions begin with an individual’s situational appraisal of an antecedent event thereby a cascade of response tendencies are triggered in the form of expressive or display behaviors*” also he states that “*certainly, moments in people’s lives characterized by experiences of positive emotions – such as joy, interest, contentment, love, etc. – are moments in which they are not plagued by negative emotions, such as anxiety, sadness, anger and the like*”. The main component of emotion is the assessment and analysis of the current situation and connected them to earlier incidences as given by Solomon and Stone [73]. Negative emotions took major role in the studies of emotions during nineteen hundreds. The negative emotions such as fear, anxiety, sadness and anger received little attention in the study of emotions [9][53]. So the positive emotions effect more in the acquisition of second language [66]. Many studies have shown that the second language learning and its acquisition is emotionally driven task. The Broaden and build theory [9] on positive emotions was proposed by Fredrickson based on the findings done by Isen and he

says that “*broad, flexible cognitive organization and ability to integrate diverse material*” [4]. This theory is mainly emphasizes on positive psychology.

A Framework for Automatic Human Emotion Classification Using Emotion Profiles

Emotion profile is the highest level of confidence quantified based on utterance assigned to the emotion class. Here the classification of the utterance-level is composed of four binary Support Vector Machine (SVM) classifiers, one for each emotions sadness, happiness, anger and neutrality. Utterance is defined as one sentence for each speaker turn or the entire speaker turn. These Emotion Profiles are used at the intermediary level to implement emotion classification from vocal and motion capture activities [23]. Emotions contain varieties of multiple affective classes [15][58]. It is challenging task for any science and technological methods for estimation of emotions based on naturalistic expressions. For example, in [41], the author explains a scene in which evaluators view on a clip of woman learning that her father remain in jail. The four evaluators labels four different emotions by seeing this clip as sadness, despair, disappointment and anger [41]. Sometimes it is very difficult to recognize the type of emotion by seeing natural expression which has a lack of emotion purity. Hence this lack of emotion can be captured and considered while estimation and classification of emotions. SVM for the Emotion Profiles based classification can be replaced by KNN or LDA classification methods but the strengths of SVM is its relative insensitivity to the selection of the base classifier. The type of interaction can be declared based on the human current emotional state. Hence, its detection, recognition and classification has made more required for human computer applications [81]. The paper [12] highlights the different strategies followed by researchers to detect emotion from text and speech [2] along with its limitations and further enhancements. Ekman and Wallace Friesen devised a FACS i.e., Facial Action Coding System in 1978 it is like a atlas of the human face expressions represents the detailed description of facial movements. Later they used for studying thousands of emotions. [63]. Richard Lazarus a psychologist has introduced a concept called “*Themes Central Relational*” in order to analyze and study the emotions when communicating with others. [70].

VI. CLASSIFICATION AND CATEGORIZATION OF EMOTIONS

The classification and categorization of emotions must be based on philosophical, psychological and scientific perspectives. Aristotle has defined [38] Anger, Mildness, Love, Enmity (hatred), Fear, Confidence, Shame, Shamelessness, Benevolence, Pity, Indignation, Envy, Emulation, Contempt. Dr. Bradley Nelson has made many shades of emotions [11] like Abandonment, Anger, Anxiety, Betrayal, Bitterness, Blaming, Conflict, Confusion, Creative Insecurity, Crying, Defensiveness, Depression, Despair, Discouragement, Disgust, Dread, Effort Undeceived, Failure, Fear, Forlorn, Frustration, Grief, Guilt, Hatred, Heartache, Helplessness, Hopelessness, Horror, Humiliation, indecisiveness, Insecurity, Jealousy, Lack of Control, Longing, Lost, Love Unreceived, Low Self-Esteem, Lust, Nervousness, Overjoy, overwhelm, Panic, Peeved, Pride, Rejection, Resentment, Sadness, Shame, Shock, sorrow, Stubbornness, Taken for Granted, Terror, Unsupported, Unworthy, Vulnerability, Wishy Washy, Worry, Worthless. One of the most popular classification of emotions is Ekman and Friesen classification. They have been proposed universal and standard emotional expressions, they are happiness, sadness, anger, disgust, surprise and fear [21, 28, 57, 31, 41] as shown in the following figure 2.



Figure 2: The six universal standard emotional expressions

Robert Plutchik is a well known psychologist and proposed a psycho-evolutionary theory of emotion. Also this theory establishes the relationship between emotions. Majorly he identifies eight basic or primary emotions i.e., Joy, Trust, Fear, Surprise, Sadness, Anticipation, Anger, and Disgust. This circumplex model is a result of gradual development in the area of Evolutionary Psychology. It is the work since 1921 when a social psychologist William McDougall proposes the similarity analysis between color and emotions and says "the color sensations present, like the emotions, an indefinitely great variety of qualities shading into one another by imperceptible gradients...".

The first circumplex model was designed by Harold Schlosberg in 1941 later it was improved by Robert Plutchik as shown in figure 3. Mark Devon proposes five types of emotions [52] i.e., conceptions, sensations, reflexes, involuntary expressions and voluntary expressions as shown in figure 4.

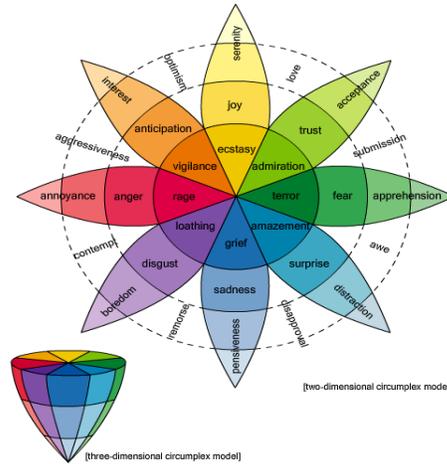


Figure 3 : Plutchik Model of Emotions Classification

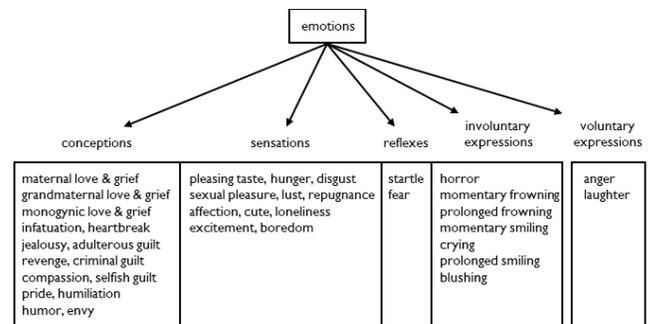


Figure 4: Mark Devon's five types of emotions

Conceptions, sensations, reflexes and involuntary expressions are biological adaptations. They are transmitted to the next generation through reproduction. They are universal to the species. Voluntary expressions are cultural adaptations. They are transmitted to the next generation through interaction. They vary by culture. Bridge during 1932 proposes the differentiation of emotions [47] during the first 24 months of any birth as shown in figure 5. Birth time the baby will have excitement emotion. Gradually branches to distress in the 1st month then to delight after 2 months and so on [47].

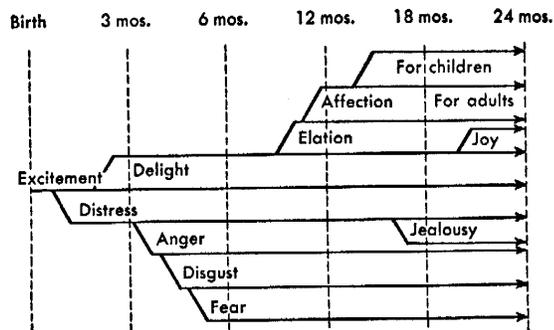


Figure 5: Bridges scheme of emotional developments

Humintell's scientifically validated, emotion recognition training tools features images of individuals portraying the 7 basic emotions: Anger, Contempt, Fear, Disgust, Happiness, Sadness and Surprise. Basic emotions are emotions that have been scientifically proven to have a certain facial expression associated with it [39].

VII. CASE STUDIES

Understanding and Comparing study on emotions analysis in students of psychology by gender is tried to examine any gender differences in analysis and emotion recognition. The results showed that two of emotions, fear and contempt, have significant differences in their recognition which can lead to possible directions of research on these two and the reasons these differences between males and females, studying psychology. This study is made based on Paul Ekman theory, there are seven basic emotions [21] which are universal: happiness, sadness, anger, fear, surprise, contempt, disappointment. So, emotional spectrum analysis should not be viewed as one by itself, but simply as an expression of emotional experiences and their individual transformations. In conclusion, analysis of the data in the paper supports the idea that emotions play an important role in social interactions, mediating the relationship of the individual. The future psychologists who are preparing to become professional persons must know how well they can use recognition of emotions in their work and how well they can rely on it. The clients of psychologists can be sometimes insincere, so being a good psychologist suppose having this skill. An early training assure better skills in time [31].

Another study Conceptual and computational analysis of the role of emotions and social influence in learning [42] investigate more on learning process which may be active or reflective by the analysis of emotions of own and social

environment. This work has been done in two phases as conceptual and computational phases. Conceptual phase includes the analysis of cognitive, affective and social neuroscience on the roles of emotions where as computational phase includes computation of learning process. Neural mechanisms of both the person's own emotions and emotions of others are observed to study the learning process. This study has observed the strengthening of learning process by considering effects of emotions and social interactions. Also this study uses the insights for learning and teaching done by Immordino-Yang & Fischer in Cognitive, Affective and Social Neuroscience. Junghyun Ahn et. al. introduces "Cyberemotions – Collective emotions in cyberspace" is an emerging phenomena to detect and analyze the emotional elements in the ICT (Information Communication Technologies) services. This study has proven that "the data on the cyberspace not only includes factual also contains the emotional elements" by developing state-of-the-art sentiment analysis algorithms. This project works in three different layers i.e., data, theory and ICT output [46].

The paper "The Management of Emotions in the Act of Teaching" [50] mainly focus on embedding the emotion in process of teaching and observation of outcome at different systems irrespective of country and culture. The performance is analyzed versus the traditional teaching process. Hascher Tina explores that "the students' feelings and frames of mind may be influenced by simple teaching methods, at least in the short run" [33]. Dispenza and Joe proves that emotion is the element or the action source for further thoughts and it becomes action. For this they conducted a classroom experiments between teacher and student's. They prove that "Any final stage of a communication process (OUTPUT) is a part of the INPUT of the next stage". This research reveals that positive emotion generated ensures the learners understanding. Also the negative emotions are useful to ensure the learners attention and capacities [19]. The paper [67] tried to replicate some of the earlier studies as follows a) "musical pieces in a major mode with fast tempo will be perceived as happy and slow pieces in a minor mode will be perceived as sad" [84], b) "250 ms of musical stimulation will be sufficient for the distinction between happy and sad music" [40], and c) "consonance represents a measure of pleasantness" [85] [77].

Also recent investigations have shown that musical elements may cause arousal of specific emotional responses [13]. Creation of specific acoustics for a particular musical stimuli is a major part of this [67] work by observing and analyzing the acoustic properties. As it has been stated by Rabin (1998) [54], the study of human behavior has to be integrated into economics, and the tractable and parsimonious psychological findings should not be ignored by the economic research. Kahneman (2003) [17] says that incorporating psychological aspects of the intuitive agent into economic theory might be challenging, but this challenge seems to be quite successful. According to Peterson (2009) [55], behavioral economics studies judgments and decision making focusing on psychological aspects. Elster (1998) [44] claims that economic theory is mostly interested in the interaction between emotions and other motivations, like self-interest [3]. EmotionsOnto is a ontology of emotion, emotion description and its detection and it is introduced by Rosa Gil et. al. in the year 2015 [76] to understand basic and fundamental components required to design and develop emotion-aware applications to reduce learners' or students' drop outs in Massive Online Open Courses (MOOCs) or proliferating the collection of emotion related data in social networking sentiment analysis. Studies have observed around 90% of drop outs in the MOOCs [20]. Hence the sentiment analysis is more required tool to decrease the drop outs in MOOCs environment [55]. The paper [57] brings the experimental analysis of the gender differences in the self perception of Romanian high school students with respect to positive and negative emotions. This study has proved that the positive emotion self-perception in school girls aged 16 to 18 is more significant than the school boys ($7.43 > 6.25; p=0.05$). Negative emotion self-perception is also significant higher than the school boys ($5.40 > 4.41; p < 0.05$). Earlier research on positive and negative emotions with gender difference has shown that "*Gender differences were also found for negative deactivating emotions suggesting that girls reported less hopelessness and boredom than boys*" [8]. "*Related pursuit of pride is related with aspiration of normative goals*" [88].

The paper [30] studies the behavioral modeling and its decision making by the analysis of artificially generated multi-agent environment and demonstrates that "models of steady state that do not account for behavioral modeling under-estimate risk and the differences are

significant". Mainly this model is used for understanding the behaviors of an agent in dynamically changing environment and its decision making, then these understandings are compared and tested using the collision-avoidance physics-based model and a rational cognitive model. In the other angle of the study strongly agrees that the choice of the deity plays major role in the motivating the emotions in human being rather than genetics, traditions, cultural and geographical environments. This study mainly focuses on the finding out the scientific ism in reason, emotion and its belief aspects [86]. The paper [83] says that "confirmed and enforced alexithymia mainly upon men" while exploring the positive and negative emotions of young Romanian couples in terms of their method of expressiveness. The observations have shown that the Romanian specific tradition and heritage is very popular and unique hence young Romanian couples face difficulties in expressing and recognizing the emotions even though knowing its benefits. "*The positivity ratio predicts only the global evaluation of personal values, but not the other dimensions of irrational thinking*" says the paper [5] while studying the hypothesis "whether or not positivity ratio (the ratio between positive and negative emotions) can predict irrational thinking" and "*the influence of positive emotions on creative thinking and adolescents' attitudes concerning change*".

Findings in this study also suggest fostering change in psychotherapy [5]. The paper [82] conducts an experiment to capture the emotion specific detail by the analysis of the speech. Here author has used GEU-SNESC (GEU Semi Natural Emotion Speech Corpus) database and it is collected by recording the bollywood actors / actresses. Mainly they have tried to capture the emotions like sad, anger, happy and neutral. Linear Prediction Analysis is used to estimate LP residual, which gives rise to the characteristics of emotional elements in the speech. Also Gaussian Mixture Model (GMM) is used for LP residual analysis. Performance of the emotion recognition in speech has given up to 50-60%.

CONCLUSION

Since emotion is one the most tedious and unpredictable component of human being, its studies and developments of the tools will be more cumbersome and challenging. Hence knowing the developments of emotion and its related issues in the research and developments since

from the centuries till today is very much required for the further developments. Hence this paper has tried to highlight the importance, developments at various fields like psychology, scientific, music and so on of the emotion.

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