

Chapter 2

Social Emotions. A Challenge for Sentiment Analysis and User Models

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Abstract The work overviews the theoretical models of emotions mainly used by computer scientists in the area of user modeling and sentiment analysis. Central in this regard are the dimensional models in which the body side is crucial, and the cognitive ones in which the evaluation processes give rise to emotions. Special attention is devoted to a socio-cognitive model of emotions in terms of goals and beliefs, focusing on social emotions, both related to image (admiration, bitterness, enthusiasm) and to self-image (pride, shame). Nature, function, and typical body signals of these emotions are overviewed.

2.1 Introduction

In recent years, we have witnessed a fruitful dialog between psychosocial and computer sciences, within the field of artificial intelligence, passing from the planning of “systems that act like humans” to “systems that think like humans” [88].

The reason is clearly due to progress in both fields and to the integration of theoretical psychological models with technologies, increasingly able to apply these models to their programming languages. One more merit of this is the reciprocal feedback: theoretical models risk to remain abstract when not considered from a computational point of view, while computational ones are not sufficiently grounded if only tailored on the machine. Further, the computational point of view forces psychologists to test models of emotions in a temporal dynamics; this methodological constraint enriches models of emotions with “virtual ecology”, i.e., a retry in time and space of things that would not be ethically provable in the laboratory [37]. Gratch and

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Marsella (2010; [37]) have highlighted the crucial role of the theoretical modeling of emotions within computer science, mostly for two main areas: human–computer interaction and artificial intelligence.

As for AI and robotics, the adaptive nature of goals and selection of emotions allows to design systems more intelligent and skillful [56, 60] but also able to understand which alternatives are more relevant for the system in relation to the context. Emotions are qualified as “control choices” that direct the appraisals of what is dangerous or pleasant toward greater awareness of the relevance of certain problems [59]. Hence, we deduce how essential cognitive models of emotions are for the improvement of AI and robotics.

As for HCI instead the expressive aspects of emotions seem especially relevant, since the “emotional displays” [29] have a decisive role in the detection and modeling of the Users’ intentions and behaviors. Given that they may elicit particular responses to “social imperatives” [33], they may be used in HCI to induce social responsibility or reduce conflict [26], through emotional contagion and consequent persuasive effects [79]. More generally, in HCI the expression of emotions is essential in improving the relationship with the user, for example in the case of virtual empathetic [67] and reliable agents [18] and their use, for example, in education to increase intrinsic motivation [44], as well as in e-commerce, tutoring, entertainment, and decision supporting training [27].

Such research areas have over time launched a body of research on user modeling, thanks to which systems try to improve their response to users by means of a progressive adaptation to their needs, as in the case of intelligent tutoring systems, expert systems in the domain of decision-making, recommender systems, and the “affective user adaptive interfaces” where a system can conduct a more socially acceptable dialog by means of a right speech tone and content, and predict affective reactions [41].

To go in depth in some affective states and their expression, this chapter, after providing an overview of some models of emotion (Sects. 2.2 and 2.3) and some cases of their application by computer science, presents a socio-cognitive approach to emotions and focuses on a particular subset of them: some social emotions in the realm of the individual’s image and social identity—enthusiasm, pride, shame, admiration, bitterness—and a particular way of communicating, induced by bitterness and a sense of injustice, that we call “acid communication” (Sect. 2.4). It concludes by highlighting how a detailed knowledge of the cognitive structure of these and of their expression can contribute to research in Affective Computing and Sentiment Analysis.

2.2 Dimensional Theories of Emotions

At the origin of the contrasts between theoretical models of Affect is the historical controversy between Zajonc and Lazarus on the origin of emotions and the primacy of emotion on cognition [105, 106]. The priority of arousal—as defined by Zajonc—is

opposed to the assumption that considers the primacy of cognitive processes of significance and relevance evaluation over physiological activation ([28], Bellelli 2013). The dimensions considered during the evaluation process of appraisal, like pleasantness, novelty confirmation or disconfirmation of initial expectations, according to supporters of the appraisal lead to a differentiation among emotions based solely on processes of interpretation and labeling of positivity/negativity of the event.

Beyond Zajonc, other authors have overestimated physiological reactions giving rise to the “dimensional theories” that consider cognitive processes simply as the attribution of a cause to some perceived body reaction; see [58, 88] neurophysiological construct of *core affect* “that underlies simply feeling good or bad, or drowsy energised” and that can be changed by evaluation processes (appraisal) but also by altering substances.

Such theories start from Osgood et al. [66], who emphasize the dimensions of *pleasantness* and *activation* in the elicitation of emotions, while adding the dimension of *dominance*. This tripartite division, beside highlighting the difference between emotions such as anger and anxiety—has created the “pad” model that describes emotions in a simple but precise way by marking their difference in a space where those dimensions “are both necessary and sufficient to adequately define emotional states” (Russell and Mehrabian 1977, p. 273). Each emotion is defined by its position on the dimensions of *dominance*, *arousal* and *pleasantness*. These studies are the basis for physiological and neuropsychological emotion research [94], but also, the dimensional theories exploited in the study of body expressions [97] become central in research on emotion expression. Here, Ekman identifies the facial communication of basic emotions—fear, happiness, anger, surprise, disgust, and sadness—and represents them through Action Units [30], muscle movements of the face that he demonstrates to be culturally shared. But since emotion expression is multimodal [77], gaze too ([1], Kendon 1992, [77]), posture (Bertouze 2015), gestures ([57], Kendon 2004), head movements [16, 84], voice [42, 95, 96] have also been investigated, and such research has been used by scholars in human–computer interaction, multimodal users interfaces, and virtual agents [27, 43, 47, 72].

Other related contributions on emotion are those that consider it as composed of arousal plus cognitive interpretation of the situation; these cognitive processes and their contents operate through labeling processes, judgment, and causal attribution to define the quality of emotional experience. An example is Schachter [92], whose subjects, placed in a state of arousal, if told they had received an injection of adrenaline attributed their state to this, not looking for other causes, while if not informed they labeled their state as an emotion [92].

Mandler [54] emphasizes the relationship between arousal, seen as perception of the activity of the sympathetic nervous system, and the intensity of the emotion in determining its value or control; but the definition and characteristics of the emotions are defined by comparing mental patterns with information brought by the event: if congruent, the emotion is positive, and new information is integrated in the scheme by a process of assimilation. Thus arousal, value judgments and familiarity are the determinants of emotional experience.

Computer science has often attempted to apply these theories, for instance exploiting the detection of physiological activation to recognize emotional behavior and “user affective state”, but their weak relationship with cognitive and evaluation processes makes such attempts rather weak and not very functional for advanced computational modeling [56].

At present Wasabi ([W]ASABI [A]ffect [S]imulation for [A]gents with [B]elievable [I]nteractivity; Becker-Asano and Wachsmuth 2008)—a system for humanoid expressing primary emotions—has used one of these models, but it was necessary to integrate it with an “appraisal” approach. In fact, Wasabi separates the body side of emotion, based on the dimensional model of the core Affect [88], from cognitive appraisal ([93], see below), distinguishing a “low road”, in which an appraisal is directly determined by an impulse, from a “high road”, triggered by a conscious appraisal based on the evaluation of the event and its coherence with the agent's/system's goals.

Another approach is based on the mixed model called ALMA, which aims to improve the quality of calls between virtual characters (Gebhard 2004) so that the emotional state influences both the nonverbal and the verbal contribution. In this case, the mood is calculated based on Ortony and colleagues' model of emotions ([65], see below) and on the space of emotional meanings based on Russell and Mehrabian (1977), defined by pleasure, arousal, and dominance.

2.3 Cognitive Theories of Emotions

While dimensional models do not lead to advanced computational models, this is more directly allowed by the appraisal view of emotions, arising within the “information processing perspective” [37, 56]. These cognitive theories that include [33] “tendency to action”, are intended to identify the mental processes and contents that make certain events “emotional”, by composing distinguishable emotions. The important elements for the emotional experience are called “cognitive appraisals” and “action tendencies” that capture and condense the structure of meaning of an emotional event (D'Urso and Trentin, 2009), interpreting it as positive or negative on the basis of situational meaning and hence causing different emotions [33]. It is not the nature of the event to arouse the emotion, but its interpretation and evaluation in relation to a subject's goals [13]. In fact, the same stimulus can be interpreted differently and therefore elicit different emotions [33]: the appraisal is a part of the cognitive representation and a determinant of the emotion; e.g., if I believe I have been offended, what makes me angry [28] is this “knowledge”. Here, the term refers to the general aspects and contextual, concrete and abstract knowledge, organized in our mind in the form of attitudes, beliefs, naive theories; and “cognitive evaluations” (Appraisal) are “a form of personal significance” consisting of assessments made of the meaning that the knowledge has for the subject's well-being [50].

The emotional process is thus a sequence of relevance evaluation (appraisal), assessment of significance, action preparation, and action [33, 62] and it is based on the evaluation of the event as positive or negative not in itself, as posited by dimensional theories, but with respect to the subject's goals [12]. The motivational core of emotions becomes central [13]: emotional experiences are frequently motivations for behavior, every emotion is perceived as an action tendency to do something, and different action tendencies characterize different emotions [33]. The communicative theory [62] shows the control mechanisms aimed to evaluate plans and purposes in progress and to communicate these changes to other modules.

2.3.1 *The Cognitive Structure of Emotions: OCC*

Within the cognitive approach, some theoretical frameworks were fertile ground for the study of emotions by computer scientists. The so-called "OCC" model [64] provides a clear and convincing structure of the eliciting conditions of emotions and the variables that affect their intensities.

The primary concern of Ortony and colleagues is to precisely characterize "the range of psychological possibilities for emotions". Emotions are "valenced reactions to events, agents with their particular nature being determined by the way in which the eliciting situation is construed", and the construction is a cognitive process structured through *goals*, *standards*, and *attitudes* that are the basis to interpret events, people, and objects. OCC outlines the overall structure of emotion types, without forgetting their relationship with language, and using self-reports as the most profitable method to detect the "phenomenally infinitude of possible emotions" (p. 15). In this sense, the OCC model can be defined "lexical" [94], being focused mainly on the connotative lexicon of emotions, which is the semantic basis of its structural model. Ortony et al. [64] outline a taxonomy of emotions easily computable since the progression of a path includes some emotions and excludes others, making them understandable and replicable for a programming language.

The first distinction is if an event can have consequences for themselves or another agent, and if positive or negative. Within emotions concerning "fortune-of-others", positive events may cause jealousy or "happy for", negative events gloating or pity. Those related to "consequences for self", further split into "prospect relevant" like fear or hope, that if confirmed by positive event can be satisfaction or confirmation of fear, and if disconfirmed may cause relief and disappointment, and "prospect irrelevant", like joy or distress. These, combined with attribution processes, give rise to a cluster "wellness/attribution compound", focused on the attribution of responsibility, in which pride and shame regard the self, admiration, and reproach another agent; attribution to himself or others of positive or negative events results, respectively, in gratification, gratitude, guilt, and anger. Finally emotions toward objects, so-called "attraction".

2.3.2 *The Component Process Model (CPM)*

Leventhal and Scherer (1984), focusing on the automatic/aware conditions of emotion processes, propose a dynamic model in which emotions are valued following three processing levels: sensorimotor, schematic, and conceptual. The first consists of innate modules and brain activation systems stimulated by internal and external inputs and represents more basic emotional responses than those processed by the schematic level, constituted by associations learned during experience that produce “prototypes” integrated with sensory motor responses (Bellelli 2013). The conceptual level is finally associated to propositional format and extends to a long-term perspective, including memories, expectations, goals, plans, and the conscious self. These three evaluative procedures of appraisal operate synchronously and provide support to the emotional event evaluation, determining *relevance*, *implications*, *potential coping*, and *normative significance* [93–95]. The emotional event activates the “stimulus evaluation checks”, concerning its novelty, intrinsic pleasantness and relevance for the individual’s goals, while for long-term implications attributional checks are activated of causality and likeliness of consequences.

The appraisal also has a key role both in detecting the coping potential (power to deal with the situation) and in assessing normative significance against internal and external standards; normative appraisal includes evaluation concerning the importance of implications, possibility to cope in relation to normative standard. In Leventhal and Scherer’s hypothesis, these checks are sequential, while in Rumelhart and McClelland’s [90] connectionist model they may act in parallel.

2.3.3 *EMotion Adaptation: Gratch and Marsella*

The computability of these theoretical works is made explicit, in their EMA model, by Gratch and Marsella (2010; [37]), who adopt Lazarus’ [48] pioneering and foundational model of appraisal, viewing emotion as a process of interpretation in relation to the environment, including behavioral consequences and coping strategies. Lazarus classifies the coping strategies of stressful situations, in relation to the type of appraisal, as “task oriented” or “emotion oriented”, i.e., oriented respectively to problem-solving or to emotion expression. In Gratch and Marsella’s architecture, the system encodes environmental inputs by making a causal interpretation of them in relation to the agent’s goals, the importance of the event, its desirability, expectation, controllability, and changeability. EMA is also a computational model of coping dynamic and is cyclical, based on the appraisal–coping–reappraisal sequence [31, 49]. It is designed to support multiagent simulations by implementing each agent’s states in specific contexts that allow to figure out and adapt to blackberry agents’ specific goals and beliefs, but recently [37] it has been reinterpreted to be social and focused on social emotions. As the authors point out, “to maintain an adaptive relationship in the social world, an intelligent organism must not only understand

how to shape the physical environment, but also learn to recognize, model and shape beliefs, desires, and intentions of other social actors (i.e. it needs to understand social causality)". Some "social" functions are computationally modeled: social reactivity, inference on relational meaning (a "reverse appraisal", appraisal of information about another's mental state from his appearance or behavior, Whiten 1991), forecasting how others respond to one's emotional reactions, making inference on others' goals and planning joint actions. Gratch and Marsella, to capture the social complexity of emotional interaction, incorporate "social signals" [83] in the social version of their computational model, thus also managing information on the user's goals, social status, social relationships, and social attitudes.

2.4 A Socio-Cognitive Account of Emotions

In this section, we briefly present a socio-cognitive model of mind, social interaction, and communication in terms of goals and beliefs, and based on it we provide an account of some social emotions.

According to this model [12, 17], emotions, in line with appraisal theories, are viewed as an adaptive device that monitors the state of achievement or thwarting of humans' goals: a multifaceted internal state, encompassing feelings and cognitive, physiological, expressive, motivational aspects, that is triggered whenever a very important goal of a person is, or is very likely to be, achieved or thwarted [59, 79].

Since emotions are strictly linked to goals, they can be grouped into types depending on the type of goals they monitor. A human is regulated at each moment of his life by his "contingent" goals but also by some "permanent" goals [79] that, though generally silent, become salient when thwarted, threatened, achieved, or anyway at stake due to contextual events. All humans have survival goals (to preserve one's own and offspring's life), epistemic goals (to acquire and elaborate knowledge), image (to elicit positive evaluations by other people), self-image (to evaluate oneself positively), and other's image goals (to evaluate others); goals of affiliation (being helped by others), but also goals of altruism (to help others) and equity (avoid too deep differences between others' and one's fortunes). These goals are innate and universal, although different cultures and personalities attribute them different weights: individualistic cultures credit higher value to goals of self-empowerment and autonomy, collectivistic ones to help and cooperation; a narcissistic person values his image most, an anti-conformist one, his self-image.

Emotions can then be clustered together according to the permanent goal they monitor: beside "survival emotions" like fear and disgust, we have "epistemic emotions" (e.g. surprise, curiosity, amusement, flow, boredom), "affiliation emotions" (tenderness, feeling of belonging or exclusion), "altruism emotions" (sympathy and compassion), "equity emotions" (gratitude, revenge, guilt), "image emotions" (pride, embarrassment, humiliation), "self-image emotions" (satisfaction, pride, shame), and "the other's image emotions" (trust, admiration, contempt, pity).

2.4.1 *Social Emotions*

We may distinguish “individual” versus “social” emotions, and within these, four types of them [79].

An “individual” emotion does not entail another person in its basic structure. I may be happy because it is sunny today, or disappointed if it is not, but it is not necessary that any other person be implied in my feeling. On the other hand, with envy, I necessarily must feel envious *of* someone else: another person is logically implied in this very feeling, as well as in other “social emotions” like love, hate, contempt, admiration, or pity.

An emotion can be considered “social” in four senses.

1. In its very argumental structure. Envy or hate are “social emotions in the strong sense”: another person is necessarily implied in their formal representation, they are two arguments predicates of the type FEEL TOWARD x, y. You cannot feel envy, hate, or compassion but toward someone.
2. a subset of “social emotions” are the so-called “self-conscious” emotions [51], like pride, shame, embarrassment, humiliation, that we feel when our image or self-image, an important part of our social identity, is at stake, crucially determining our relations with others.
3. partially overlapping with the emotions “towards” someone else (type 1) and with the “self-conscious” ones (type 2), being heavily involved in social interaction, norms, and values, are “moral” emotions [39, 100], like contempt, shame, guilt.
4. an emotion may be “social” because it is very easily “transmitted” from Agent x to Agent y through contagion: like enthusiasm, that can thus favor joint action.

In the following, we present a theoretical analysis of some social emotions that are not so frequently studied in psychological literature, nor often tackled in Virtual Agents and Sentiment Analysis, highlighting their underlying mental states and their bodily expression. We start from enthusiasm (Sect. 2.4.2), one typically transmitted across agents through contagion (type 4), but also a self-image emotion, entailing self-efficacy (type 2). Pride (Sect. 2.4.3), shame (4.4), and bitterness (4.6) are presented as emotions linked to the goals of image and self-image, power, and lack of power (type 2); whereas admiration (Sect. 2.4.7) is linked to the other’s image (type 3).

2.4.2 *Enthusiasm*

Enthusiasm was mainly studied by philosophers, like Plato [75] who saw it as a state of mystic inspiration, Bruno [9] who stressed it as a state of creative insanity, and Kant [45], who connected it to the aesthetical experience of sublime, but also acknowledged its function in revolutions and other innovative events. In the psychological domain, Greenson [38] distinguishes the trait of being an enthusiastic person from the transitory state of enthusiasm, a type of euphoria apparently similar

to mania, in which, though, the subject maintains a sense of reality. Csikszentmihaly [20] connects it to the state of flow, a state of complete immersion in some activity, that makes it become an “optimal experience”; and he stresses its importance in education as a way to enhance intrinsic motivation. As we feel enthusiasm we are in a state of exultance, fervour, elation: a state close to joy, exuberance, optimism. Our ideas take life thanks to enthusiasm, a peculiar type of joy that implies a complete transformation of personality, of the Self and of the way we perceive the world. In general, then, enthusiasm is a fire [9], charge, spur that helps to focus a person’s physical and mental efforts to reach high value goals.

The word “enthusiasm” derives from Greek *èn theòn* = God inside. This emotion belongs to the family of happiness, being an intensely positive emotion, felt for the achievement of a very important goal; but it differs from happiness, exultance, or elation for the goal at stake and the time it is felt [77]. We feel enthusiasm about goals that are noble, important, worth pursuing, activities entailing novelty and creativity (e.g., creating a new musical group or founding a new company), or equity and altruism (fighting for our ideas or defending noble causes, like in political revolutions). Enthusiasm is not felt after the achievement, but during goal pursuit, not at the end of the football game but at the first goal, that witnesses we do have the necessary skills to achieve the end goal. This first success during pursuit of a high value goal triggers proprioceptions of high activation: heart beat acceleration, a sense of energy, well-being, good mood, heat, excitement; we cannot stand still, we talk or shout, we hop up and down and make uncontrolled movements [77]. Such internal energy felt once achieved an intermediate goal of our action plan sustains goal pursuit, making us believe “we can”, enhancing our self-efficacy. Enthusiasm is thus a “self-image” emotion in its self-attribution of power; and its function is to be the “gasoline of motivation”: its great physiological activation fosters physical and mental resources inducing persistency and self-confidence, renewing motivation, providing new energy for action.

Enthusiasm is expressed by smile, wide open eyes, high eye humidity (bright eyes), general activation, a desire to move, jump, shout, speak aloud, and its display generally exerts emotional contagion [40]: a form of emotion transmission [78] in which Agent A feels an emotion E1 and expresses it through expressive signal s1, B perceives s1 and reproduces it, even automatically (i.e., not necessarily at a high level of awareness and intentionality), and this causes B to feel an emotion E2 similar or identical to A’s. Seeing or hearing others’ enthusiasm makes us feel so too, causing an amplification effect that triggers a loop of enthusiasm. Both A and B may not be aware that B’s enthusiasm has been transmitted by A, nor A must have transmitted it consciously or deliberately. But at times A (for example, a political leader) may consciously want to transmit his enthusiasm. That this highly activating emotion can be triggered in an automatic and irreflexive way, without checks by conscious rationality makes enthusiasm and its contagion a powerful but a double-edged weapon, since it may induce to fanaticism, and be exploited by people wanting others to act without thinking.

2.4.3 *Pride*

The emotion of pride has been an object of attention in ancient Greece (Herodotus' *hybris*), religion and moral philosophy (for Augustine and Aquinas, one of the worst sins, the root of all evil). In modern literature [22, 51] include it among the "complex", more specifically the "self-aware" emotions: ones that, like embarrassment, shame and guilt, can be felt only when the concept of self has been formed. Tracy and Robins [102] distinguish two types of pride, authentic and hubristic, the former associated with "extraversion, agreeableness, conscientiousness, and favoring altruistic action, the latter with self-aggrandizing narcissism and shame-proneness" (p. 149), often contributing to aggression, hostility and interpersonal problems. They propose that the adaptive function of pride is "to provide information about an individual's current level or social status and acceptance" (p. 149), and investigate the nonverbal expression of pride, demonstrating its universality and singling out its constituting elements: small smile, head slightly tilted back, arms raised, and expanded posture. Such expression may serve to "alerting one's social group that the proud individual merits increased status and acceptance" (pp. 149–150).

According to a socio-cognitive account [82], we feel pride when due to an *action* (e.g., I run faster than others), a *property* (I am stubborn, I have long blond hair), an *event* (my party has won the elections), our goal of having a positive image and/or self-image is achieved, that is, we evaluate ourselves, or believe to be evaluated by others, very positively with respect to some goals that are an important *part of our identity*. I can be proud of my son because I see what he is or what he does as something stemming from me; proud of the good climate of my country because I feel it as *my country*.

Four types of pride can be distinguished: a *self-image* pride, plus three types stemming from achievement of the goal of image: *superiority*, *arrogance*, and *dignity* pride.

In *superiority pride*, the proud person feels superior to another person, for instance because he won over him in a single event, or because (he thinks) he has an acknowledged status that puts him over other people: e.g., an athlete who has just won a race, or the king's son.

Arrogance pride is felt (and displayed) by one who is presently on the "down" side of the power comparison, who has less power than another, but wants to challenge the other and his power, while communicating that actually he has more power than he seems to, that he has the intention to climb the pyramid, to win over the other, and finally become superior to him.

Dignity pride is felt by a person that sees his image of a human, with its most typical feature, the right to freedom and self-regulation, challenged by other people who want to humiliate, submit him, remark his inferiority and dependence. One who feels dignity pride does not claim to be superior to other, but only to be at the same level, not inferior to him.

Pride may be also triggered when only the goal of self-image is achieved. A nurse, after working hard with patients, may feel proud not because anyone has publicly

acknowledged her outcomes, but simply because she has lived up to her values, thus feeling *self-image pride*.

For both pride and shame, as we shall see later, the achievement of the goal of self-image is a necessary condition, whether or not the goal of image before others is fulfilled. Only if the standard one is evaluated against by others makes part not only of one's goal of image before them but also of the image one wants to have of oneself, can one feel real pride (as well as real shame). Suppose a boy values making room for kindness and tenderness as important for his own image, even if others evaluate him against some value he does not share (say, to be an aggressive macho man) he will not feel proud of showing aggressive and dominant, nor will he feel shame of not looking very macho to others.

Beside being an emotion, pride can also be viewed as a personality trait. A "proud" person is one who attributes a high value to his goal of self-image, mainly to his self-image of an autonomous person, not dependent on anyone else. This is why a proud person typically does not ask or accept help from anyone, and he does not apologize since this would imply submitting to others, being dependent, indebted, not autonomous.

Pride (as already found by Tracy and Robins [102]) is expressed by a multimodal pattern of body signals: small smile, expanded posture, head tilted backward, arms extended out from the body, possibly hands on hips. Within this multimodal display [82], *smile* conveys a positive feeling due to the achievement of the goal of image or self-image; the *expanded posture*, enlarging the body, conveys dominance, superiority, and enhances visibility: when proud of something you want to exhibit your qualities. *Expanding chest* implies reference to oneself, to one's own *identity*. *Head tilted back* is a way to look taller, symbolically communicating superiority, and induces to *look down on the other*, remarking his inferiority. But even more specifically, different combinations of these signals distinguish the three types of *image pride*. Among pride expressions in political debates [82] **dignity** pride is characterized by *head tilted upward* and signals of worry and anger, like *frown* or *vertical wrinkles on the forehead*, *rapid and nervous gestures*, *loud voice*, *eyes fixed to interlocutor*, and *no smile*; all conveying seriousness of the proud person's request to have one's dignity acknowledged. In **superiority** pride, *low voice rhythm and intensity* signal absence of worry (if you are superior you have nothing to fear from others), and sometimes by *gaze away from Interlocutor* conveys he is so inferior he does not deserve attention. **Arrogance** pride is displayed by *large smile*, almost a *scornful laughter*, *expanded chest*, *head tilted back*, *gaze fixed to interlocutor*, that convey challenge and defiance, and *provocative*, possibly *insulting words*. The whole pattern conveys that the proud person does not fear the interlocutor, even if he is presently superior to himself.

An experimental study [82] showed that *asymmetrical eyebrows without smile* convey either superiority or dignity pride, while *frown with smile* mainly dignity, but also other meanings like "I am resolute", "I want to humiliate you," and "I won". *Frown* generally conveys dignity pride, *asymmetrical eyebrows*, superiority, *absence of frown*, and arrogance. *Smile*, mainly if viewed as ironic, is typical of arrogance; *absence of smile*, of dignity and superiority pride.

The intense gratification provided by the emotion of pride makes it a very effective incentive to take care of one's image and self-image, by striving to live up to one's standards and values. Succeeding in goals where others fail makes us feel superior, and repeated achievements increase the sense of our value: thus pride is a symptom of our having more power than others, but at the same time displaying this emotion, by telling our superiority, may be exploited to gain further power: the exhibition of superiority, intimidating the other, can make him refrain from competition or aggression. Therefore, pride and superiority may be pretended, and their display become a bluff deliberately aimed at preventing another's reaction.

2.4.4 Shame and the Multimodal Discourse of Blush

Research on the emotion of shame has long been dominated by the attempt to find its differences and similarities with respect to guilt feelings. In the long tradition of "shame and guilt" research, Benedict [6] first stressed the "outward" aspects of shame of being mainly aimed at maintaining a good reputation from people, and triggered by transgression of a social, more than a moral kind, with guilt instead viewed as a more internal feeling punishing the individual from inside, even without public acknowledgment of his faults. This led to a quite ethnocentric distinction between guilt cultures and shame cultures, fortunately overcome by Piers and Singers [74] who acknowledged the depth of shame feelings, that may grip the individual even when no other knows of his transgression, thus reestablishing their ethical potential. Beside the distinctions public versus private and community- versus individual-oriented, other studies (see [100], for an overview) viewed guilt as more typically induced by a specific event or action in the moral realm, and shame as an overall negative self-evaluation of the subject, due to either moral or nonmoral transgressions. An appraisal and attributional account of the two emotions [103] showed correlations of shame with internal, stable, uncontrollable attributions for failure, as opposed to the internal, unstable, controllable attributions linked to guilt.

In terms of the socio-cognitive model above, shame may be defined as a regret or fear of thwarting one's goal of esteem and/or self-esteem: the negative emotion we feel when our goal of eliciting positive evaluations from others or ourselves is certainly or probably thwarted [14]. We are ashamed when we feel we have fallen short of some norm or value that we share with our group, or one we want to live up to: so we can feel shame both before others and before ourselves. If I want to be a good pianist, and I make a mistake while playing before my friends, I may be ashamed before them if I think they realized my fault, but also shame only before myself because, though they do not realize my subtle fault, I did, and I want to be perfect for and before myself.

Like for pride, the necessary condition to feel shame is that we think that not only our image before others, but also our image before ourselves is thwarted. As some standard makes part of my self-image, I am sincerely sorry when I fall short of it; but if I share it with my group, my fault might lead the group to reject me and close

social relations with me, so I feel shame also before others, and my display of shame is an apology, conveying: “I violated this norm, but I still share it with you; do not aggress or reject me, accept me in the group again”.

The feeling of shame is an internal self-punishment, while its external expression asks forgiveness from the group, by three signals: (1) *head lowering*, (2) *eyes lowering*, (3) *blush*, the reddening of the face. While head and eyes lowering (the posture of shame) may be deliberate actions, blushing is a morphological feature, not subject to conscious will Darwin [22], that cannot be feigned or pretended. They work together as a multimodal signal of submission and apology, that while acknowledging one’s faults or shortcomings implies acceptance of the violated standards, to block the group’s aggression and prevent rejection. Its unavoidable sincerity is a guarantee of true repentance, allowing to distinguish loyal versus unreliable group members.

Pride and shame are thus specular emotions in feeling and function, but also in their expression: the display of pride conveys dominance, that of shame submission.

2.4.5 *Admiration*

Admiration, according to Darwin [22], is “surprise joined with feelings of pleasure and approval”. Freud [32] considers it as a way of putting another person in the place of one’s ideal ego. Klein [46], in talking of envy and gratitude and the way they stem from the child’s relation to his mother, observes that “sometimes we feel grateful for the other has a unique capacity to produce some good, and this gratitude is a part of admiration”. Again within a psychoanalytical framework, for Sandell (1993) admiration, like envy, comes from a sense of “relative deprivation”, since the other has something you do not have. But in admiration you divide the object in two different objects, the whole and a part (trait object), so the entire object becomes irrelevant while the trait object becomes distinguished and comes to be admired. Sandell also observes that the pathological narcissist is incapable of admiration, while in normal narcissism the relative deprivation leads to identification with the other: thus one can feel joy from the good of the other, and admiration becomes a narcissistic gratification. In the Cognitive Science domain, Ortony et al. [64] consider admiration an appreciation emotion stemming from attributing the responsibility of a praiseworthy action to another agent. Its intensity is mainly determined by deviation from role-based expectations: we admire more a weak, old lady than a baywatch for saving a drowning child.

In our terms, admiration belongs to the “other’s image emotions”. For an agent it is relevant to make up an image of other agents, i.e., to have a set of (mainly evaluative) beliefs about them, to choose who to have positive relationships with, and emotions like trust, esteem, contempt, are triggered by (and are a symptom of) our evaluation of others.

Admiration is a positive social emotion felt by an Agent A toward an Agent B, that encompasses a positive evaluation of either B as a person, or of a quality or skill Q of B, that A considers desirable or definitely would like to have; so A eventually

may want to imitate B to learn or acquire quality Q; and due to the positive evaluation of B and/or of his quality Q, A may want to interact and have social relationships with B.

Given this highly positive evaluation, A believes that B is superior to A; but different from envy, where A feels inferior to B, admiration is not a negative emotion because the acknowledgment of a positive quality in B is not accompanied by the feeling of A's powerlessness: here A believes that he is in some way similar to B (he belongs to the same category), that the very fact that B has Q is evidence that having Q, though rare, difficult, and unexpected, is not impossible, and that A can achieve it too. This induces A to interact with B to have the chance of imitating him and learning from him.

The qualities admired in people range from tenacity, strength, courage, to beauty, self-confidence, skill, passion, as well any difficult behavior or rare property [79]: what is most frequently admired is a positive attitude of a person *notwithstanding* a difficult situation.

Generally the emotions linked to image and self-image, like shame, guilt, embarrassment, respect, are counted among "moral" emotions [100]; but one might contend that admiration is an "a-moral" emotion, in that while some people definitely cannot admire the other's quality without taking into account the goals to which it is devoted, for others admiration is more of an aesthetical feeling, where you like the quality in itself, even when aimed at goals you disprove of: like when a detective admires the smart thief he is chasing. Actually, Poggi and Zuccaro [79] found out that the majority of people (72 vs. 26 %), when they admire someone do not suspend their moral judgement: as a person admires another, he generally also feels trust and esteem for him, considering him a good person.

In an adaptive view, admiration has (1) a social function of enhancing effective cooperation, leading us to interact with persons we like and with whom conflicts are minimized, since we consider them better than us and worth respect; (2) a cognitive function of learning from people who are better than we are, to become better ourselves.

2.4.6 Bitterness

McFall [55] defines bitterness as "a refusal to forgive and forget", a tendency "to maintain a vivid sense of the wrongs one has been done, to recite one's angry litany of loss long past the time others may care to listen or sympathize"; while Campbell [11] sees it as "a rational response to the frustration of important and legitimate hopes". Starting from these definitions, Campbell observes that bitterness differs from anger for its failure of uptake, since the one who is recounting his injury here fails to be listened to.

According to Poggi and D'Errico [80], bitterness is an emotion that shares aspects of anger and sadness: a kind of restrained anger that we feel when we sense we have been subject to some injustice, but we cannot, or we believe it pointless, to struggle against it, because we do not have the power to overcome the one who did us wrong.

A feels bitterness when his goal *G* is thwarted in an irreversible way causing injustice to A, and when A believes that the responsible for this thwarting is another person B, where B is someone with whom A is affectively involved, and who A expected would allow or cause the fulfillment of *G*; A believes that B was committed to fulfill it, but B disconfirmed A's expectation.

In some cases, a true injustice has not occurred, and B is A himself: for example [80], if A in an examination does not perform as she wants, the one A believes was committed to fulfill *G* is A herself, and the ingredient of *injustice* is not present: at most, A feels she *betrayed* herself, she is *responsible* for an *irreversible harm* she inflicted to herself. Thus, a common ingredient of bitterness, either caused by others or by oneself, is *responsibility* for a *nonachieved goal*. Bitterness due to *disconfirmed expectation* and *inequity* may be also caused by the disproportion between personal investment and actual results, e.g., if after years studying and *striving* one still cannot find a work. In other cases, the salient ingredient is *injustice* only, due to *non-motivated harm*, e.g., for a relative's death that causes pain *without an acceptable motivation*.

While *goal thwarting*, *violated expectation*, *involvement*, *responsibility*, *injustice*, are common to anger, another ingredient of bitterness is shared with sadness: *impotence to react*, to recover the damage undergone, because those who caused the injustice are stronger than we are. We feel bitterness as we struggle with powerful agencies, like mafia, or an unjust and iniquitous judiciary system: we feel them too strong and powerful and conclude we have no chance to win. From this restrained anger bitterness comes, that entails both impotence to react and impotence to express one's anger, thus becoming a kind of restrained disappointment that lasts in time, just because restrained, which may have a relevant impact on people's quality of life in affective relations and in the workplace.

2.4.7 Acid Communication

A form of emotional display of anger, annoyance, and bitterness, not so infrequent in everyday life and easily recognized by laypeople [25], is "acid communication": the way of communicating of a person who feels she has been an object of injustice and feels emotions like anger, envy, bitterness, grudge, or rancor, but feels she does not have the power to revenge or even to express her anger freely. So she comes out with a restrained and half-inhibited way of attacking other people.

Acid communication is a type of communicative verbal and nonverbal acts in which a sender expresses aggressiveness toward a target by attacking his image, not in an explicit way but in a covert, yet possibly ostentatious manner, because she feels she has been subject to injustice, but having less power than the target she cannot attack him safely. The typical communicative acts of acid communication aim at criticizing and accusing the other, making him feel guilty, making specification and pinpointing, but mainly through indirect communication, including a frequent use of rhetorical figures (irony, sarcasm, euphemism, litotes, oxymoron, allusion, insin-

uation). This aims at projecting the image of the acid communicator as a smart and brilliant person, who did not deserve the attack or abasement undergone. This counts as both a revenge over the target who somehow humiliated her, and a demonstration to him, and possibly to an Audience, that S is worth respect or even admiration.

The field of acid communication—a topic never tackled before by research in the expression of emotions—was explored in three studies [25].

First, a questionnaire investigating the commonsense description of acid communication asked 148 female university students (age 19–25, mean 21) (1) to tell an episode of acidity, (2) to describe the behavior of an acid person and its typical verbal and bodily cues, (3) to define the notion of acidity, and (4) to guess its general and specific causes, by focusing on (4a) another person's and possibly on (4b) one's own acidity.

Acidity is seen as an inner feeling, a permanent trait, or a single behavior: a way to behave, a stance taken while interacting with others, described as *sgarbato* (rude), *scontroso* (grumpy), lacking politeness and kindness, unpleasant, disagreeable. The acid person is considered selfish, pessimistic, and negative, not altruistic, her behavior as ugly, unpleasant, characterized by a sort of “social meanness”, a desire not to mix up with others, expressed by behaviors aimed at keeping distance, at showing superior, cold, detached, arrogant, haughty, but actually masking a deep lack of self-confidence, also cued by a total lack of sense of humor, notwithstanding her irony that is, in fact, always sarcastic.

Contingent causes of acidity are believed to be frustration, due for instance to physiological states like tiredness, a quarrel or disappointment from a friend, and negative feelings (anger, stress, dissatisfaction, annoyance, boredom, bad mood, jealousy, grudge, feeling wounded, sense of injustice, revenge, and impotence). Acidity results from an impulse to aggression that cannot be acted out but leaks in an indirect way both as to manner (e.g., the numerous rhetorical figures mask aggression under a brilliant form) and as to target (being acid toward C when you are angry at B).

The type of speech acts mentioned by participants in the study are challenge, defiance, and bad, impolite, biting, cutting, “dry” answers (abrupt, not argued, nor accompanied by polite formulas), offensive sentences, and display of contempt and superiority.

Another study, concerning the verbal expression of acidity in sms and email [81] found out a frequent use of particular speech acts.

Criticism. The acid sender often remarks some fault or blameworthy action of the target.

Specification. The acid person tends to make things precise, not to let them vague, possibly to correct others' inaccurate statements. Beside correcting the opponent's imprecision, specification also implies his being ignorant and inaccurate, thus spoiling his image, discrediting him [23], and at the same time aims at giving an image of the Acid one as a smart person, one not easy to dupe by vague statements.

Indirectness. Due to one's lack of power, the acid person must refrain from direct attack and resort to more subtle ways of criticizing and discrediting the target, not to risk retaliation and to keep a formal image of politeness. Thus, typical acid speech acts are **insinuation**, an indirect, partially covert accusation, and **allusion**, referring to some (generally negative) thing while not mentioning it in an explicit way, or doing so only incidentally.

Beside particular types of speech acts, acid communication is characterized by a polished, brilliant, creative language, exploiting a literary and refined lexicon, sometimes stuffed with rhetorical figures like metaphor, oxymoron, euphemism, and irony. **Irony**, in which the sender uses positive statements to imply negative evaluations of the target, is the perfect candidate for acid communication since it puts the sender on a level superiority both discrediting the target by making fun of him, and displaying his originality, divergence, creativity, thus taking revenge of the supposed injustice or abasement undergone.

In a third study on the multimodal expression of acidity, [25] simulated scenarios in which the social relationship between the acid communicator and the target differed in two variables: affective versus instrumental, and peer versus hierarchical.

104 female University students were asked to describe a real episode of acid communication as a narrative and as a script of a scene, specifying aspects of voice, gesture, posture, facial expression. Eight episodes were selected and rephrased: peer instrumental, peer affective, hierarchic instrumental, and hierarchic affective, each in a "dry" version (explicit expression of an acid criticism) and in an "ironic" version (criticism expressed ironically); participants had to act these versions as if on a stage.

Multimodal acid communication in the *instrumental* condition is mainly expressed through signals as the *nod of revenge* [81], *eyebrows raised*, *high tone and rhythm of voice*, interjections (*ahhh* of surprise or *eh?* of request for confirmation at the end of an interrogative sentence). In the *peer relationship*, participants report more negative social emotions like *contempt*, and perform distancing signals: *backward posture*, *shoulder shake*, *head turned away*, *gaze avoidance*, *partial closure of eyelids*, *looking from down up*, and *wrinkled mouth with raised upper lip* communicating disgust [30].

A frequent activation signal during acid communication is *head position* and *head movement*: irritated participants tend to affirm their position by *nodding once or repeatedly and quickly* (with gaze to Interlocutor) but also by *head canting* (Costa et al. 2001), in the ironic case with a *small smile*.

In the *instrumental low status* relationship, the acid communicator uses *jerky gestures* usually *repeated with high muscular tension*, *gestures toward the opponent* like the "accusing finger", and closure gestures; in *high status*, *slow and fluid gestures* like *moving one hand from down upward repeatedly*, indicating how vain is any effort to improve the low status situation.

A peculiar way to communicate acidity, in the same line as irony, is to make a parody, that is, an exaggerated and distorted imitation of the target, aimed at diminishing him by making fun of him.

2.5 Conclusion. User Modeling, Sentiment Analysis and Social Emotions

Since its first rising, affective computing, the research area aimed at the recognition, processing, and simulation of affect [69, 73, 101] has investigated the recognition of primary emotions from face [107], voice [2, 19], and written text [10, 15, 70, 99]. So did the field of sentiment analysis, aimed at capturing the people's attitudes that is, their personal evaluations in favor or against entities like individuals, organizations, topics ([53]; Saif et al. this volume), composed by *subjectivity, polarity and emotion detection*. In both Affective Computing and Sentiment analysis, the emotion detection side has generally focussed on the six basic emotions: anger, disgust, fear, joy, sadness, and surprise [98], while the "social" emotions have been often almost totally neglected. Yet, there are other emotions that people frequently feel in everyday life—at home and in the workplace, in affective and service relationships—for instance social emotions like envy or admiration, bitterness or pride. An accurate description of these emotions is then called for, both as to their vocal, facial, postural, and written verbal displays and as to their internal cognitive structure, the underlying feelings, the actions they typically induce, and their effects on people's life.

This work has attempted to outline the mental ingredients of some social emotions that are linked to people's image and self-image, then essential for their social identity. We tackled pride and shame, that signal the achievement or thwarting of a person's striving for success or complying with social norms; admiration, that corresponds to a need for affiliation and learning from good models; enthusiasm that enhancing our self-efficacy incentives our striving; bitterness and acidity, that highlight received injustice.

Taking into account these emotions might enrich user models in human-computer interaction, by improving Affective Computing and Sentiment Analysis techniques, but also be of use in monitoring the quality of life in organizations and the quality of social relationships between people. Tools for facial expression detection might tell us if a person is particularly proud hence particularly keen to get offended. A sophisticated sentiment analysis that finds a high frequency of rhetorical figures—a typical feature of acid communication—in emails between faculty members might be a cue to a high sense of injustice in that context. Our work is but a first attempt to go in deep in these emotions, so frequently felt in our life, but so rarely studied by emotion research.

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