

Bibliography

- [1] Benedek, M., & Kaernbach, C. (2010). A continuous measure of phasic electrodermal activity. *Journal of neuroscience methods*, 190(1), 80–91.
- [2] Matu, S., Cristea, I., Coteș, C., Valenza, G., Gentili, C., Scilingo, E., et al. (2012). Are socially anxious individuals less empathic? a psychophysiological investigation of facial mimicry for emotional expressions. *International Journal of Psychophysiology*, 85(3), 375–376.
- [3] Cristea, I., Valenza, G., Gentili, C., Tatar, A., Scilingo, E., & David, D. (2012). Cognitive reappraisal and acceptance distinctively impact heart rate variability in socially anxious individuals. *International Journal of Psychophysiology*, 85(3), 339.
- [4] Zajonc, R. (1984). On the primacy of affect. *American Psychologist*, 39(2), 117–123.
- [5] Gross, J., & Muñoz, R. (1995). Emotion regulation and mental health. *Clinical Psychology: Science and Practice*, 2(2), 151–164.
- [6] Lazarus, R., & Averill, J. (1972). Emotion and cognition: With special reference to anxiety. *Anxiety: Current Trends in Theory and Research*, 2, 242–284.
- [7] Damasio, A. (2000). *Descartes' error: Emotion, reason, and the human brain*. New York: Quill.
- [8] Valenza, G., Gentili, C., Lanata, A., & Scilingo, E. (2013). Mood recognition in bipolar patients through the psyche platform: preliminary evaluations and perspectives. *Artificial Intelligence In Medicine*, 57(1), 49–58.
- [9] Greco, A., Lanata, A., Valenza, G., Rota, G., Vanello, N., & Scilingo, E. (2012). On the deconvolution analysis of electrodermal activity in bipolar patients. In *2012 Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC)* (pp. 6691–6694). IEEE.
- [10] Vanello, N., Guidi, A., Gentili, C., Werner, S., Bertschy, G., Valenza, G., et al. (2012). Speech analysis for mood state characterization in bipolar patients. In *2012 Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC)* (pp. 2104–2107). IEEE.
- [11] Greco, A., Valenza, G., Lanata, A., Rota, G., & Scilingo, E. P. (2014). Electrodermal activity in bipolar patients during affective elicitation. *IEEE Journal of Biomedical and Health Informatics*, 18(6), 1865–1873.
- [12] Fowles, D., Christie, M., Edelberg, R., Grings, W., Lykken, D., & Venables, P. (1981). Publication recommendations for electrodermal measurements, *Psychophysiology*, 18(3), 232–239.
- [13] Edelberg, R. (1972). Electrical activity of the skin: Its measurement and uses in psychophysiology. *Handbook of psychophysiology* (Vol. 12, p. 1011). New York: Holt.

- [14] Edelberg, R. (1993). Electrodermal mechanisms: A critique of the two-effector hypothesis and a proposed replacement. In *Progress in electrodermal research* (pp. 7–29). Berlin: Springer.
- [15] Boucsein, W. (2012). *Electrodermal activity* (2nd ed). New York: Springer Science & Business Media.
- [16] Benedek, M., & Kaernbach, C. (2010). Decomposition of skin conductance data by means of nonnegative deconvolution. *Psychophysiology*, 47(4), 647–658.
- [17] Dawson, M. E., Schell, A. M., & Filion, D. L. (2007). The electrodermal system. In J. T. Cacioppo, L. G. Tassinary, & G. G. Berntson (Eds.), *Handbook of psychophysiology* (Chap. 7). Cambridge: Cambridge University Press.
- [18] Schmidt, S., & Walach, H. (2000). Electrodermal activity (EDA)—state-of-the-art measurements and techniques for parapsychological purposes. *The Journal of Parapsychology*, 64(2), 139.
- [19] Roth, W. T., Dawson, M. E., & Filion, D. L. (2012). Publication recommendations for electrodermal measurements. *Psychophysiology*, 49, 1017–1034.
- [20] Greco, A., Lanata, A., Valenza, G., Rota, G., Vanello, N., & Scilingo, E. P. (2012). On the deconvolution analysis of electrodermal activity in bipolar patients. *Proceedings of the 34th IEEE EMBS Conference* (Vol. 2012, pp. 6691–6694).
- [21] Greco, A., Valenza, G., Lanata, A., Rota, G., & Scilingo, E. P. (2014). Electrodermal activity in bipolar patients during affective elicitation. *IEEE Journal of Biomedical and Health Informatics*, 18(6), 1865–1873.
- [22] Venables, P. H., & Christie, M. J. (1980). Electrodermal activity. *Techniques in Psychophysiology*, 54(3), 3–67.
- [23] Boucsein, W. (1992). *Electrodermal activity* (2nd ed.). New York: Springer Science & Business Media.
- [24] Millington, P. F., & Wilkinson, R. (1983). Skin. In R. J. Harrison, & R. M. McMinn (Series Eds.) *Biological structure and function* (Vol. 9, pp. 83–98). Cambridge (Great Britain): Cambridge University Press.
- [25] Tregear, R. T. (1966). *Physical functions of skin* (Vol. 5). London: Academic Press.
- [26] Walters, K. A., & Roberts, M. S. (2002). The structure and function of skin. *Drugs and the Pharmaceutical Sciences*, 119, 1–40.
- [27] Quay, W. (1977). Structure and function of skin glands. In *Chemical signals in vertebrates* (pp. 1–16). Berlin: Springer.
- [28] Kuno, Y. (1956). *Human perspiration* (no. 285). Illinois: Thomas.
- [29] Pinkus, H. (1952). Examination of the epidermis by the strip method. *Journal of Investigative Dermatology*, 19(6), 431–447.
- [30] Herrmann, F., & Ippen, H. (1973). *Biochemie der Haut:: 71 Tab.* Thieme. Stuttgart.
- [31] Montagna, W. (2012). *The structure and function of skin 3E*. New York: Academic.
- [32] Sato, K. (1983). The physiology and pharmacology of the eccrine sweat gland. *Biochemistry and Physiology of the Skin*, 1, 569–595.
- [33] Martin, I. (1980). *Techniques in psychophysiology* (Vol. 6). New York: Wiley.
- [34] Fowles, D. C. (1986). The eccrine system and electrodermal activity. *Psychophysiology: Systems, Processes, and Applications*, 1, 51–96.
- [35] Bagshaw, M. H., Kimble, D. P., & Pribram, K. H. (1965). The gsr of monkeys during orienting and habituation and after ablation of the amygdala, hippocampus and inferotemporal cortex. *Neuropsychologia*, 3(2), 111–119.
- [36] Montagu, J., & Coles, E. (1966). Mechanism and measurement of the galvanic skin response. *Psychological Bulletin*, 65(5), 261.
- [37] Edelberg, R. (1983). The effects of initial levels of sweat duct filling and skin hydration on electrodermal response amplitude. *Psychophysiology*, 20(5), 550–557.
- [38] Boucsein, W., Schaefer, F., & Neijenhuisen, H. (1989). Continuous recordings of impedance and phase angle during electrodermal reactions and the locus of impedance change. *Psychophysiology*, 26(3), 369–376.

- [39] Martínez-Rodrigo, A., Zangróniz, R., Pastor, J. M., & Fernández-Caballero, A. (2015). Arousal level classification in the ageing adult by measuring electrodermal skin conductivity. In *Ambient intelligence for health* (pp. 213–223). New York: Springer.
- [40] Martinsen, Ø., Grimnes, S., & Sveen, O. (1997). Dielectric properties of some keratinised tissues. part 1: Stratum corneum and nail in situ. *Medical and Biological Engineering and Computing*, 35(3), 172–176.
- [41] Hanson, M. A., Powell, Jr. H. C., Barth, A. T., Ringgenberg, K., Calhoun, B. H., Aylor, J. H., et al. (2009). Body area sensor networks: Challenges and opportunities. *Computer*, 42(1), 58.
- [42] Carbonaro, N., Greco, A., Anania, G., Dalle Mura, G., Tognetti, A., Scilingo, E., et al. (2012). Unobtrusive physiological and gesture wearable acquisition system: A preliminary study on behavioral and emotional correlations. *Global Health*, 1, 88–92.
- [43] Lee, Y., Lee, B., & Lee, M. (2010). Wearable sensor glove based on conducting fabric using electrodermal activity and pulse-wave sensors for e-health application. *Telemedicine and e-Health*, 16(2), 209–217.
- [44] Patel, S., Park, H., Bonato, P., Chan, L., & Rodgers, M. (2012). A review of wearable sensors and systems with application in rehabilitation. *Journal of Neuroengineering and Rehabilitation*, 9(1), 1.
- [45] Garbarino, M., Lai, M., Bender, D., Picard, R. W., & Tognetti, S. (2014). Empatica e3— a wearable wireless multi-sensor device for real-time computerized biofeedback and data acquisition. In *2014 EAI 4th International Conference on Wireless Mobile Communication and Healthcare (Mobihealth)* (pp. 39–42). IEEE.
- [46] Martinsen, O., & Grimnes, S. (1998). On using single frequency electrical measurements for skin hydration assessment. *Innovation et Technologie en Biologie et Médecine*, 19, 395–400.
- [47] Martinsen, Ø. G., & Grimnes, S. (2001). Facts and myths about electrical measurement of stratum corneum hydration state. *Dermatology*, 202(2), 87–89.
- [48] Martinsen, Ø. G., Grimnes, S., Nilsen, J. K., Tronstad, C., Jang, W., Kim, H. et al. (2008). Gravimetric method for in vitro calibration of skin hydration measurements. *IEEE Transactions on Biomedical Engineering*, 55(2), 728–732.
- [49] Picard, R. (2010). Emotion research by the people, for the people. *Emotion Review*, 2(3), 250.
- [50] Marieke van Doorena, J.J.G. (Gert-Jan) de Vriesa, & Janssena, J. H. (2012). Emotional sweating across the body: Comparing 16 different skin conductance measurement locations. *Physiology & Behavior*, 106(2), 298–304.
- [51] Poh, M.-Z., Swenson, N. C., & Picard, R. W. (2010). A wearable sensor for unobtrusive, long-term assessment of electrodermal activity. *IEEE Transactions on Biomedical Engineering*, 57(5), 1243–1252.
- [52] Strauss, M., Reynolds, C., Hughes, S., Park, K., McDarby, G., & Picard, R. W. (2005). The handwave bluetooth skin conductance sensor. In *International Conference on Affective Computing and Intelligent Interaction* (pp. 699–706). Springer.
- [53] Thought Technology Ltd: ProComp Infinity Encoder and amplifiers. <http://thoughttechnology.com/index.php/hardware/flexcomp-system-with-biograph-infinity-software-t7555m.html> (2016).
- [54] Biopac Systems, Inc. <http://www.biopac.com/> (2016).
- [55] BioSemi Instrumentation. <http://www.biosemi.com/> (2016).
- [56] Scheirer, J., & Picard, R. (2001). The Galvactivator: A glove that senses and communicates skin conductivity. In *Proceedings of the 9th International Conference on Human-Computer Interaction*.
- [57] Lanata, A., Valenza, G., & Scilingo, E. (2012). A novel EDA glove based on textile-integrated electrodes for affective computing. *Medical and Biological Engineering and Computing*, 50, 1163–1172.
- [58] Brainquiry, B. V. (2005) PET-GSR Wireless. <http://www.brainquiry.com/>.
- [59] Analog Device: AD9833 Low Power, Programmable Waveform Generator. <http://www.analog.com/en/products/rf-microwave/direct-digital-synthesis-modulators/ad9833.html> (2016).

- [60] Texas Instrument: MSP430 ultra-low-power Microcontrollers, http://www.ti.com/lscds/ti/microcontrollers_16-bit_32-bit/msp/overview.page (2016).
- [61] Breska, A., Maoz, K., & Ben-Shakhar, G. (2011). Interstimulus intervals for skin conductance response measurement. *Psychophysiology*, 48(4), 437–440.
- [62] Barry, R. J., Feldmann, S., Gordon, E., Cocker, K. I., & Rennie, C. (1993). Elicitation and habituation of the electrodermal orienting response in a short interstimulus interval paradigm. *International Journal of Psychophysiology*, 15(3), 247–253.
- [63] Lim, C. L., Rennie, C., Barry, R. J., Bahramali, H., Lazzaro, I., Manor, B., et al. (1997). Decomposing skin conductance into tonic and phasic components. *International Journal of Psychophysiology*, 25(2), 97–109.
- [64] Bach, D. R., & Friston, K. J. (2013). Model-based analysis of skin conductance responses: Towards causal models in psychophysiology. *Psychophysiology*, 50(1), 15–22.
- [65] Alexander, D., Trengove, C., Johnston, P., Cooper, T., August, J., & Gordon, E. (2005). Separating individual skin conductance responses in a short interstimulus-interval paradigm. *Journal of Neuroscience Methods*, 146(1), 116–123.
- [66] Bach, D. R. (2014). A head-to-head comparison of SCRalyze and Ledalab, two model-based methods for skin conductance analysis. *Biological Psychology*, 103, 63–68.
- [67] Chaspari, T., Tsiartas, A., Stein, L., Cermak, S., & Narayanan, S. (2015). Sparse representation of electrodermal activity with knowledge-driven dictionaries. *IEEE Transactions on Biomedical Engineering*, 62(3), 960–971.
- [68] Boyd, S. P., & Vandenberghe, L. (2004) *Convex optimization*. Cambridge: Cambridge University Press.
- [69] Greco, A., Valenza, G., Lanata, A., Scilingo, E., & Citi, L. (2016). cvxEDA: A convex optimization approach to electrodermal activity processing. *IEEE Transactions on Biomedical Engineering*, 63(4), 797–804.
- [70] Karenbach, C. (2005). Ledalab—a software package for the analysis of phasic electrodermal activity. Technical Report, Allgemeiner Psychologie, Institut für Psychologie.
- [71] Gustafsson, F. (1996). Determining the initial states in forward-backward filtering. *IEEE Transactions on Signal Processing*, 44(4), 988–992.
- [72] Mitra, S. (2001). *Digital signal processing. a computer-based approach*. New York: McGraw-Hill
- [73] Schneider, R. (1987). A mathematical model of human skin conductance. *Psychophysiology*, 24(5), 610.
- [74] Garrett, E. (1994). The Bateman function revisited: A critical reevaluation of the quantitative expressions to characterize concentrations in the one compartment body model as a function of time with first-order invasion and first-order elimination. *Journal of Pharmacokinetics and Pharmacodynamics*, 22(2), 103–128.
- [75] Macefield, V., & Wallin, B. (1996). The discharge behaviour of single sympathetic neurones supplying human sweat glands. *Journal of the Autonomic Nervous System*, 61(3), 277–286.
- [76] Nishiyama, T., Sugeno, J., Matsumoto, T., Iwase, S., & Mano, T. (2001). Irregular activation of individual sweat glands in human sole observed by a videomicroscopy. *Autonomic Neuroscience*, 88(1), 117–126.
- [77] Bach, D. R., Flandin, G., Friston, K. J., & Dolan, R. J. (2010). Modelling event-related skin conductance responses. *International Journal of Psychophysiology*, 75(3), 349–356.
- [78] Bach, D. R., Friston, K. J., & Dolan, R. J. (2013). An improved algorithm for model-based analysis of evoked skin conductance responses. *Biological Psychology*, 94(3), 490–497.
- [79] Vogelstein, J. T., Packer, A. M., Machado, T. A., Sippy, T., Babadi, B., Yuste, R. et al. (2010). Fast nonnegative deconvolution for spike train inference from population calcium imaging. *Journal of Neurophysiology*, 104(6), 3691–3704.
- [80] O'Brien, M. S., Sinclair, A. N., & Kramer, S. M. (1994). Recovery of a sparse spike time series by L1 norm deconvolution. *IEEE Transactions on Signal Processing*, 42(12), 3353–3365.
- [81] Tibshirani, R. (1996). Regression shrinkage and selection via the LASSO. *Journal of the Royal Statistical Society. Series B (Methodological)*, 58, 267–288.

- [82] de Rooi, J., & Eilers, P. (2011). Deconvolution of pulse trains with the L0 penalty. *Analytica Chimica Acta*, 705(1), 218–226.
- [83] Levinson, D., & Edelberg, R. (1985). Scoring criteria for response latency and habituation in electrodermal research: a critique. *Psychophysiology*, 22(4), 417–426.
- [84] Ishchenko, A., & Shev'ev, P. (1989). Automated complex for multiparameter analysis of the galvanic skin response signal. *Biomedical Engineering*, 23(3), 113–117.
- [85] Posada-Quintero, H. F., Florian, J. P., Orjuela-Cañón, A. D., Aljama-Corrales, T., Charleston-Villalobos, S., & Chon, K. H. (2016). Power spectral density analysis of electrodermal activity for sympathetic function assessment. *Annals of Biomedical Engineering*, 44, 1–12.
- [86] Grassi, G., & Esler, M. (1999). How to assess sympathetic activity in humans. *Journal of Hypertension*, 17(6), 719–734.
- [87] Bauer, A., Malik, M., Schmidt, G., Barthel, P., Bonnemeier, H., Cygankiewicz, I., et al. (2008). Heart rate turbulence: Standards of measurement, physiological interpretation, and clinical use: International society for Holter and noninvasive electrophysiology consensus. *Journal of the American College of Cardiology*, 52(17), 1353–1365.
- [88] Crider, A., & Lunn, R. (1971). Electrodermal lability as a personality dimension. *Journal of Experimental Research in Personality*, 5(2), 145–150.
- [89] Kira, Y., Ogura, T., Aramaki, S., Kubo, T., Hayasida, T., & Hirasawa, Y. (2001). Sympathetic skin response evoked by respiratory stimulation as a measure of sympathetic function. *Clinical Neurophysiology*, 112(5), 861–865.
- [90] Lang, P., Bradley, M., & Cuthbert, B. (2005). International affective picture system (IAPS): Digitized photographs, instruction manual and affective ratings. Technical Report A-6. University of Florida.
- [91] Cook, E. W., Hawk, L. W., Davis, T. L., & Stevenson, V. E. (1991). Affective individual differences and startle reflex modulation. *Journal of Abnormal Psychology*, 100(1), 5.
- [92] Lang, P., Greenwald, M., Bradley, M., & Hamm, A. (1993). Looking at pictures: Affective, facial, visceral, & behavioral reactions. *Psychophysiology*, 30(3), 261–273.
- [93] Hollander, M., Wolfe, D. A., & Chicken, E. (2014). *Nonparametric statistical methods*. New York: Wiley.
- [94] Frijda, N. (1986). *The emotions*. Cambridge: Cambridge University Press.
- [95] Ekman, P. E., & Davidson, R. J. (1994). *The nature of emotion: Fundamental questions*. Oxford: Oxford University Press.
- [96] Russell, J., & Carroll, J.M. (1999). On the bipolarity of positive and negative affect. *Psychological Bulletin*, 125(1), 3–30.
- [97] Watson, D., Wiese, D., Vaidya, J., & Tellegen, A. (1999). The two general activation systems of affect: Structural findings, evolutionary considerations, and psychobiological evidence. *Journal of Personality and Social Psychology*, 76(5), 820–838.
- [98] Watson, D., & Clark, L. (1992). On traits and temperament: General and specific factors of emotional experience and their relation to the five-factor model. *Journal of Personality*, 60(2), 441–476.
- [99] LeDoux, J. (1998). *The emotional brain: The mysterious underpinnings of emotional life*. New York: Simon and Schuster.
- [100] Pegna, A. J., Khateb, A., Lazeyras, F., & Seghier, M. L. (2005). Discriminating emotional faces without primary visual cortices involves the right amygdala. *Nature Neuroscience*, 8(1), 24–25.
- [101] Ekman, P. (1993). Facial expression and emotion. *American psychologist*, 48(4), 384.
- [102] Darwin, C. (1872). *The expression of the emotions in man and animals; with an introduction, afterword, and commentaries by Paul Ekman*. New York: Oxford University.
- [103] Ekman, P. (1974). 1. universal facial expressions of emotion. In R. A. LeVine (Ed.), *Culture and personality: Contemporary readings* (pp. 8–15). Chicago: Aldine.
- [104] Ekman, P. (1999). Basic emotions. In T. Dalgleish, & T. Power (Eds.), *The Handbook of cognition and emotion*, (pp. 45–60). Sussex: Wiley.

- [105] Tompkins, S. (1962). *Affect Imagery Consciousness: Volume I: The Positive Affects*. New York: Springer Publishing Company.
- [106] Izard, C. (1971). *The face of emotion* (Vol. 23). New York: Appleton-Century-Crofts.
- [107] Plutchik, R. (1984). Emotions: A general psychoevolutionary theory. *Approaches to Emotion*, 197–219.
- [108] Ekman, P. (1973). Cross-cultural studies of facial expression. In P. Ekman (Ed.), *Darwin and facial expression: A century of research in review*, (pp. 169–222). New York: Academic.
- [109] Watson, J. (1997) *Behaviorism*. New Brunswick: Transaction Publication.
- [110] Ortony, A., & Turner, T. (1990). What is basic about basic emotions. *Psychological Review*, 97(3), 315–331.
- [111] Wundt, W. (1905). *Grundriss der psychologie [Fundamentals of psychology]*. (7th rev. ed.). Leipzig: Engelman.
- [112] Schlosberg, H. (1954). Three dimensions of emotion. *Psychological Review*, 61(2), 81–88.
- [113] Osgood, C. (1975). *The measurement of meaning*. Champaign: University of Illinois Pr.
- [114] Davitz, J. (1969). *The language of emotion*. New York: Academic.
- [115] Lang, P., Bradley, M., & Cuthbert, B. (1998). Emotion, motivation, and anxiety: Brain mechanisms and psychophysiology. *Biological Psychiatry*, 44(12), 1248–1263.
- [116] Panskepp, J. (1998). *Affective neuroscience: The foundations of human and animal emotions*. Oxford: Oxford University Press.
- [117] Breazeal, C. (2003). Emotion and sociable humanoid robots. *International Journal of Human-Computer Studies*, 59(1–2), 119–155.
- [118] Russell, J. (1980). A circumplex model of affect. *Journal of Personality and Social Psychology*, 39(6), 1161–1178.
- [119] Russell, J., & Mehrabian, A. (1977). Evidence for a three-factor theory of emotions* 1. *Journal of Research in Personality*, 11(3), 273–294.
- [120] Arnold, M. B. (1950). An excitatory theory of emotion. In M. L. Reymert (Ed.), *Feelings and emotions* (pp. 11–33). New York: McGraw-Hill.
- [121] Ortony, A., Clore, G., & Collins, A. (1990). *The cognitive structure of emotions*. Cambridge: Cambridge University Press.
- [122] Scherer, K., & Ekman, P. (1984). *Approaches to emotions*. Londres et New Jersey: Lawrence Erlbaum Associates, Publication.
- [123] Lisetti, C., & Gmytrasiewicz, P. (2002). Can a rational agent afford to be affectless? A formal approach. *Applied Artificial Intelligence*, 16, 1–33.
- [124] Scherer, K., Schorr, A., & Johnstone, T. (2001). *Appraisal processes in emotion: Theory, methods, research*. Oxford: Oxford University Press.
- [125] Egges, A., Kshirsagar, S., & Magnenat-Thalmann, N. (2003). A model for personality and emotion simulation. In *Knowledge-based intelligent information and engineering systems* (pp. 453–461). Berlin: Springer.
- [126] Posner, J., Russell, J., & Peterson, B. (2005). The circumplex model of affect: An integrative approach to affective neuroscience, cognitive development, and psychopathology. *Development and Psychopathology*, 17(03), 715–734.
- [127] Nasoz, F., Alvarez, K., Lisetti, C., & Finkelstein, N. (2003). Emotion recognition from physiological signals using wireless sensors for presence technologies. *Cognition, Technology and Work*, 6, 4–14.
- [128] Janig, W. (1989). Autonomic nervous system. In R. F. Schmidt, & G. Thews (Eds.), *Human physiology*, (2nd ed.). Berlin: Springer.
- [129] Lewis, M., Haviland-Jones, J. M., & Barrett, L. F. (2010). *Handbook of emotions*. New York: Guilford Press.
- [130] Picard, R. (2000). *Affective computing*. Cambridge: MIT.
- [131] Picard, R., Vyzas, E., & Healey, J. (2001). Toward machine emotional intelligence: Analysis of affective physiological state. *IEEE Transactions on Pattern Analysis and Machine Intelligence*, 23(10), 1175–1191.

- [132] Kim, J., & André, E. (2008). Emotion recognition based on physiological changes in music listening. *IEEE Transactions on Pattern Analysis and Machine Intelligence*, 30(12), 2067–2083.
- [133] Katsis, C. D., Katertsidis, N. S., & Fotiadis, D. I. (2010). An integrated system based on physiological signals for the assessment of affective states in patients with anxiety disorders. *Biomedical Signal Processing and Control*, 6(3), 261–268.
- [134] Valenza, G., Greco, A., Citi, L., Bianchi, M., Barbieri, R., & Scilingo, E. (2016). Inhomogeneous point-processes to instantaneously assess affective haptic perception through heartbeat dynamics information. *Scientific Reports*, 6(28567), 1–14.
- [135] Valenza, G., Greco, A., Gentili, C., Lanata, A., Sebastiani, L., Menicucci, D., et al. (2016). Combining electroencephalographic activity and instantaneous heart rate for assessing brain–heart dynamics during visual emotional elicitation in healthy subjects. *Philosophical Transactions of the Royal Society A*, 374(2067), 20150176.
- [136] Valenza, G., Nardelli, M., Gentili, C., Bertschy, G., Kosel, M., Scilingo, E. P., et al. (2016). Predicting mood changes in bipolar disorder through heartbeat nonlinear dynamics. *Biomedical and Health Informatics*, 20(2), 1034–1043.
- [137] Valenza, G., Citi, L., Gentili, C., Lanata, A., Scilingo, E. P., & Barbieri, R. (2014). Point-process nonlinear autonomic assessment of depressive states in bipolar patients. *Methods of Information in Medicine*, 53(4), 296–302.
- [138] Valenza, G., Lanatà, A., Scilingo, E. P., & De Rossi, D. (2010). Towards a smart glove: Arousal recognition based on textile electrodermal response. In *2010 Annual International Conference of the IEEE Engineering in Medicine and Biology* (pp. 3598–3601). IEEE.
- [139] Mazzei, D., Greco, A., Lazzeri, N., Zarak, A., Lanatà, A., Iglizzio, R., et al. (2012). Robotic social therapy on children with autism: preliminary evaluation through multi-parametric analysis. In *2012 International Conference on and 2012 International Conference on Social Computing (SocialCom) Privacy, Security, Risk and Trust (PASSAT)* (pp. 955–960). IEEE.
- [140] Betella, A., Zucca, R., Cetnarski, R., Greco, A., Lanatà, A., Mazzei, D., et al. (2015). Inference of human affective states from psychophysiological measurements extracted under ecologically valid conditions. *Using Neurophysiological Signals that Reflect Cognitive or Affective State*, 8, 66.
- [141] Lanatà, A., Valenza, G., Mancuso, C., & Scilingo, E. (2011). Robust multiple cardiac arrhythmia detection through bispectrum analysis. *Expert Systems with Applications*, 38(6), 6798–6804.
- [142] Valenza, G., & Scilingo, E. P. (2014) *Autonomic nervous system dynamics for mood and emotional-state recognition*. Springer.
- [143] James, W. (1884). II.—what is an emotion? *Mind, os-IX* (34), 188–205. doi:10.1093/mind/os-IX.34.188.
- [144] Ellsworth, P. C. (1994). William James and emotion: is a century of fame worth a century of misunderstanding? *Psychological Review*, 101(2), 222.
- [145] Lang, P. J. (1994). The varieties of emotional experience: A meditation on james-lange theory. *Psychological Review*, 101(2), 211.
- [146] Scherer, K. R., & Wallbott, H. G. (1994). Evidence for universality and cultural variation of differential emotion response patterning. *Journal of Personality and Social Psychology*, 66(2), 310.
- [147] Stemmler, G., Heldmann, M., Pauls, C. A., & Scherer, T. (2001). Constraints for emotion specificity in fear and anger: The context counts. *Psychophysiology*, 38(2), 275–291.
- [148] Ekman, P., Levenson, R., & Friesen, W. (1983). Autonomic nervous system activity distinguishes among emotions. *Science*, 221(4616), 1208–1210.
- [149] Christie, I., & Friedman, B. (2004). Autonomic specificity of discrete emotion and dimensions of affective space: A multivariate approach. *International Journal of Psychophysiology*, 51(2), 143–153.
- [150] Cacioppo, J. T., Berntson, G. G., Larsen, J. T., Poehlmann, K. M., Ito, T. A., et al. (2000). The psychophysiology of emotion. *Handbook of Emotions*, 2, 173–191.
- [151] Arnold, M. B. (1960). *Emotion and personality*. New York: Columbia University.

- [152] Hillman, J. (1960). *Emotion: a comprehensive phenomenology of theories and their meaning for therapy*. Evanston: Northwestern University Press.
- [153] Campos, J. J., & Johnson, H. J. (1967). Affect, verbalization, and directional fractionation of autonomic responses. *Psychophysiology*, 3(3), 285–290.
- [154] Bradley, M. M., & Lang, P. J. (2000). Measuring emotion: Behavior, feeling, and physiology. *Cognitive Neuroscience of Emotion*, 25, 49–59.
- [155] Stemmler, G. (2004). Physiological processes during emotion. In P. Philippot & R. S. Feldman (Eds.), *The regulation of emotion* (pp. 33–70). Mahwah: Erlbaum.
- [156] Calvo, R., & D’Mello, S. (2010). Affect detection: An interdisciplinary review of models, methods, and their applications. *IEEE Transactions on Affective Computing*, 1(1), 18–37.
- [157] Greco, A., Valenza, G., Nardelli, M., Lanata, A., Bianchi, M., & Scilingo, E. P. (2015). Electrodermal activity analysis during affective haptic elicitation. In *2015 Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC)*. IEEE.
- [158] Swangnetr, M., & Kaber, D. B. (2012). Emotional state classification in patient–robot interaction using wavelet analysis and statistics-based feature selection. *IEEE Transactions on Systems, Man and Cybernetics*, 43(1), 63–75.
- [159] Katsis, C., Katertsidis, N., Ganiatsas, G., & Fotiadis, D. (2008). Toward emotion recognition in car-racing drivers: A biosignal processing approach. *IEEE Transactions on Systems, Man and Cybernetics, Part A: Systems and Humans*, 38(3), 502–512.
- [160] Lanatà, A., Valenza, G., Greco, A., Gentili, C., Bartolozzi, R., Bucchi, F., et al. (2015). How the autonomic nervous system and driving style change with incremental stressing conditions during simulated driving. *IEEE Transactions on Intelligent Transportation Systems*, 16(3), 1505–1517.
- [161] Chakraborty, A., Konar, A., Chakraborty, U., & Chatterjee, A. (2009). Emotion recognition from facial expressions and its control using fuzzy logic. *IEEE Transactions on Systems, Man and Cybernetics, Part A: Systems and Humans*, 39(4), 726–743.
- [162] Chanel, G., Rebetez, C., Bétrancourt, M., & Pun, T. (2011). Emotion assessment from physiological signals for adaptation of game difficulty. *IEEE Transactions on Systems, Man and Cybernetics, Part A: Systems and Humans*, 41(6), 1052–1063.
- [163] Lisetti, C., & Nasoz, F. (2004). Using noninvasive wearable computers to recognize human emotions from physiological signals. *EURASIP Journal on Applied Signal Processing*, 2004, 1672–1687.
- [164] Haag, A., Goronzy, S., Schaich, P., & Williams, J. (2004). Emotion recognition using biosensors: First steps towards an automatic system. In *Tutorial and research workshop on affective dialogue systems*. Lecture Notes in Computer Science (Vol. 3068, pp. 36–48). Berlin/Heidelberg: Springer.
- [165] Kim, K., Bang, S., & Kim, S. (2004). Emotion recognition system using short-term monitoring of physiological signals. *Medical and Biological Engineering and Computing*, 42(3), 419–427.
- [166] Yoo, S., Lee, C., Park, Y., Kim, N., Lee, B., & Jeong, K. (2005). Neural network based emotion estimation using heart rate variability and skin resistance. In *International conference on natural computation*. Lecture Notes in Computer Science (Vol. 3610, pp. 818–824). Berlin/Heidelberg: Springer.
- [167] Choi, A., & Woo, W. (2005). Physiological sensing and feature extraction for emotion recognition by exploiting acupuncture spots. In *International conference on affective computing and intelligent interaction*. Lecture Notes in Computer Science (Vol. 3784, pp. 590–597). Berlin/Heidelberg: Springer.
- [168] Healey, J., & Picard, R. (2005). Detecting stress during real-world driving tasks using physiological sensors. *IEEE Transactions on Intelligent Transportation Systems*, 6(2), 156–166.
- [169] Li, L., & Chen, J. (2006). Emotion recognition using physiological signals. In *Advances in artificial reality and tele-existence*. Lecture Notes in Computer Science (Vol. 4282, pp. 437–446). Berlin/Heidelberg: Springer.

- [170] Rani, P., Liu, C., Sarkar, N., & Vanman, E. (2006). An empirical study of machine learning techniques for affect recognition in human-robot interaction. *Pattern Analysis & Applications*, 9(1), 58–69.
- [171] Rainville, P., Bechara, A., Naqvi, N., & Damasio, A. (2006). Basic emotions are associated with distinct patterns of cardiorespiratory activity. *International Journal of Psychophysiology*, 61(1), 5–18.
- [172] Zhai, J., & Barreto, A. (2006). Stress detection in computer users based on digital signal processing of noninvasive physiological variables. In *28th Annual International Conference of the IEEE Engineering in Medicine and Biology Society* (pp. 1355–1358).
- [173] Leon, E., Clarke, G., Callaghan, V., & Sepulveda, F. (2007). A user-independent real-time emotion recognition system for software agents in domestic environments. *Engineering Applications of Artificial Intelligence*, 20(3), 337–345.
- [174] Liu, C., Conn, K., Sarkar, N., & Stone, W. (2008). Physiology-based affect recognition for computer-assisted intervention of children with Autism Spectrum Disorder. *International Journal of Human-Computer Studies*, 66(9), 662–677.
- [175] Yannakakis, G., & Hallam, J. (2008). Entertainment modeling through physiology in physical play. *International Journal of Human-Computer Studies*, 66(10), 741–755.
- [176] Gouizi, K., Bereksi Reguig, F., & Maaoui, C. (2011). Emotion recognition from physiological signals. *Journal of Medical Engineering & Technology*, 35(6–7), 300–307.
- [177] Valenza, G., Lanatà, A., & Scilingo, E. (2011). The role of nonlinear dynamics in affective valence and arousal recognition. *IEEE Transactions on Affective Computing*. doi:10.1109/TAFFC.2011.30.
- [178] Jang, E.-H., Park, B.-J., Kim, S.-H., & Sohn, J.-H. (2012). Emotion classification based on physiological signals induced by negative emotions: Discrimination of negative emotions by machine learning algorithm. In *2012 9th IEEE International Conference on Networking, Sensing and Control (ICNSC)* (pp. 283–288). IEEE.
- [179] Ren, P., Barreto, A., Gao, Y., & Adjouadi, M. (2011). Comparison of the use of pupil diameter and galvanic skin response signals for affective assessment of computer users. *Biomedical Sciences Instrumentation*, 48, 345–350.
- [180] Torres, C. A., Orozco, Á. A., & Alvarez, M. A. (2013). Feature selection for multimodal emotion recognition in the arousal-valence space. In *2013 35th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC)* (pp. 4330–4333). IEEE.
- [181] Zhaofang Y., & Guangyuan, L. (2013). Emotion recognition based on nonlinear features of skin conductance response. *Journal of Information & Computational Science*, 10(12), 3877–3887.
- [182] Maaoui, C., Abdat, F., & Pruski, A. (2014). Physio-visual data fusion for emotion recognition. *IRBM*, 35(3), 109–118.
- [183] Kukulja, D., Popović, S., Horvat, M., Kovač, B., & Čosić, K. (2014). Comparative analysis of emotion estimation methods based on physiological measurements for real-time applications. *International Journal of Human-Computer Studies*, 72(10), 717–727.
- [184] Hariharan, A., & Adam, M. T. P. (2015). Blended emotion detection for decision support. *IEEE Transactions on Human-Machine Systems*, 45(4), 510–517.
- [185] Khezri, M., Firoozabadi, M., & Sharafat, A. R. (2015). Reliable emotion recognition system based on dynamic adaptive fusion of forehead biopotentials and physiological signals. *Computer Methods and Programs in Biomedicine*, 122(2), 149–164.
- [186] Khan, A. M., & Lawo, M. (2016). *Recognizing emotion from blood volume pulse and skin conductance sensor using machine learning algorithms* (pp. 1291–1297). Cham: Springer International Publishing. Available: http://dx.doi.org/10.1007/978-3-319-32703-7_247 [Online].
- [187] Rukavina, S., Gruss, S., Hoffmann, H., Tan, J.-W., Walter, S., & Traue, H. C. (2016). Affective computing and the impact of gender and age. *PLoS One*, 11(3), e0150584.

- [188] Bialoskorski, L. S., Westerink, J. H., & Broek, E. L. (2009). Mood swings: An affective interactive art system. In *International conference on intelligent technologies for interactive entertainment*. Lecture Notes of the Institute for Computer Sciences, Social Informatics and Telecommunications Engineering (Vol. 9, pp. 181–186). Berlin/Heidelberg: Springer.
- [189] Lisetti, C. L., & Nasoz, F. (2004). Using noninvasive wearable computers to recognize human emotions from physiological signals. *EURASIP Journal on Advances in Signal Processing*, 2004(11), 1–16.
- [190] Nardelli, M., Valenza, G., Greco, A., Lanata, A., & Scilingo, E. (2015). Recognizing emotions induced by affective sounds through heart rate variability. *IEEE Transactions of Affective Computing*, 6(4), 385–394.
- [191] Janssen, J., Van den Broek, E., & Westerink, J. (2009). Personalized affective music player. In *3rd International Conference on Affective Computing and Intelligent Interaction and Workshops, 2009 (ACII 2009)* (pp. 1–6.). IEEE.
- [192] Lin, Y., Wang, C., Jung, T., Wu, T., Jeng, S., Duann, J., & Chen, J. (2010). Eeg-based emotion recognition in music listening. *IEEE Transactions on Biomedical Engineering*, 57(7), 1798–1806.
- [193] Wagner, J., Kim, J., & André, E. (2005). From physiological signals to emotions: Implementing and comparing selected methods for feature extraction and classification. In *2005 IEEE International Conference on Multimedia and Expo* (pp. 940–943). IEEE.
- [194] Van den Broek, E., Schut, M., Westerink, J., & Tuinenbreijer, K. (2009). Unobtrusive Sensing of Emotions (USE). *Journal of Ambient Intelligence and Smart Environments*, 1(3), 287–299.
- [195] Van den Broek, E., & Westerink, J. (2009). Considerations for emotion-aware consumer products. *Applied Ergonomics*, 40(6), 1055–1064.
- [196] Zeng, Z., Pantic, M., Roisman, G., & Huang, T. (2008). A survey of affect recognition methods: Audio, visual, and spontaneous expressions. *IEEE Transactions on Pattern Analysis and Machine Intelligence*, 31(1), 39–58.
- [197] Poels, K., & Dewitte, S. (2006). How to capture the heart? reviewing 20 years of emotion measurement in advertising. *Journal of Advertising Research-New York*, 46(1), 18.
- [198] Chanel, G., Kierkels, J., Soleymani, M., & Pun, T. (2009). Short-term emotion assessment in a recall paradigm. *International Journal of Human-Computer Studies*, 67(8), 607–627.
- [199] Healey, J. (2009). Affect detection in the real world: Recording and processing physiological signals. In *3rd International Conference on Affective Computing and Intelligent Interaction and Workshops, 2009 (ACII 2009)* (pp. 1–6). IEEE.
- [200] Lang, P., & Bradley, M. (1999). International affective digitized sounds (IADS): Stimuli, 802 instruction manual and affective ratings (Technical Report no. b-2) (Vol. 803). Gainesville.
- [201] Bensafi, M. (2001). *Le traitement affectif des odeurs: aspects implicites et explicites*. Ph.d Thesis in, Lyon 2 University.
- [202] Lang, P., Bradley, M., & Cuthbert, B. (1997). *International affective picture system (IAPS): Technical manual and affective ratings*. Gainesville: The Center for Research in Psychophysiology, University of Florida.
- [203] Lang, P., Greenwald, M., Bradley, M., & Hamm, A. (1993). Looking at pictures: Affective, facial, visceral, and behavioral reactions. *Psychophysiology*, 30(3), 261–273.
- [204] Lang, P. (1980). Behavioral treatment and bio-behavioral assessment: Computer applications. *Technology in Mental Health Care Delivery Systems*, 119–137.
- [205] Grimm, S., Schmidt, C., Bermpohl, F., Heinzel, A., Dahlem, Y., Wyss, M., et al. (2006). Segregated neural representation of distinct emotion dimensions in the prefrontal cortex—an fMRI study. *Neuroimage*, 30(1), 325–340.
- [206] Hariri, A., Mattay, V., Tessitore, A., Fera, F., & Weinberger, D. (2003). Neocortical modulation of the amygdala response to fearful stimuli. *Biological Psychiatry*, 53(6), 494–501.
- [207] Chatel-Goldman, J., Congedo, M., Jutten, C., & Schwartz, J.-L. (2014). Touch increases autonomic coupling between romantic partners. *Frontiers in Behavioral Neuroscience*, 8, 95. <http://doi.org/10.3389/fnbeh.2014.00095>.

- [208] Liljencrantz, J., & Olausson, H. (2014). Tactile c fibers and their contributions to pleasant sensations and to tactile allodynia. *Frontiers in Behavioral Neuroscience*, 8, 37. <http://doi.org/10.3389/fnbeh.2014.00037>.
- [209] Zotterman, Y. (1939). Touch, pain and tickling: An electro-physiological investigation on cutaneous sensory nerves. *Journal of Physiology*, 95(1), 1–28.
- [210] Rolls, E. T. (2010). The affective and cognitive processing of touch, oral texture, and temperature in the brain. *Neuroscience & Biobehavioral Reviews*, 34(2), 237–245.
- [211] Triscoli, C., Olausson, H., Sailer, U., Ignell, H., & Croy, I. (2013). CT-optimized skin stroking delivered by hand or robot is comparable. *Frontiers in Behavioral Neuroscience*, 7, 208.
- [212] Löken, L. S., Wessberg, J., McGlone, F., & Olausson, H. (2009). Coding of pleasant touch by unmyelinated afferents in humans. *Nature Neuroscience*, 12(5), 547–548.
- [213] Kessler, R., McGonagle, K., Zhao, S., Nelson, C., Hughes, M., Eshleman, S., et al. (1994). Lifetime and 12-month prevalence of dsm-iii-r psychiatric disorders in the united states: Results from the national comorbidity survey. *Archives of General Psychiatry*, 51(1), 8.
- [214] Kauer-Sant'Anna, M., Kapczinski, F., & Vieta, E. (2009). Epidemiology and management of anxiety in patients with bipolar disorder. *CNS Drugs*, 23(11), 953–964.
- [215] Young, R., Biggs, J., Ziegler, V., & Meyer, D. (1978). A rating scale for mania: Reliability, validity and sensitivity. *The British Journal of Psychiatry*, 133(5), 429–435.
- [216] Vieta, E., Reinares, M., & Rosa, A. (2011). Staging bipolar disorder. *Neurotoxicity Research*, 19(2), 279–285.
- [217] Andreazza, A., Kauer-Sant'Anna, M., Frey, B., Bond, D., Kapczinski, F., Young, L., et al. (2008). Oxidative stress markers in bipolar disorder: A meta-analysis. *Journal of Affective Disorders*, 111(2), 135–144.
- [218] Phillips, M., & Vieta, E. (2007). Identifying functional neuroimaging biomarkers of bipolar disorder: Toward dsm-v. *Schizophrenia Bulletin*, 33(4), 893–904.
- [219] Cohen, H., Kaplan, Z., Kotler, M., Mittelman, I., Osher, Y., & Bersudsky, Y. (2003). Impaired heart rate variability in euthymic bipolar patients. *Bipolar Disorders*, 5(2), 138–143.
- [220] Henry, B. L., Minassian, A., Paulus, M. P., Geyer, M. A., & Perry, W. (2010). Heart rate variability in bipolar mania and schizophrenia. *Journal of Psychiatric Research*, 44(3), 168–176.
- [221] Levy, B. (2013). Autonomic nervous system arousal and cognitive functioning in bipolar disorder. *Bipolar Disorders*, 15(1), 70–79.
- [222] Valenza, G., Nardelli, M., Lanata, A., Gentili, C., Bertschy, G., Paradiso, R., et al., Wearable monitoring for mood recognition in bipolar disorder based on history-dependent long-term heart rate variability analysis. *IEEE Journal of Biomedical and Health Informatics*, 18(5), 1625–1635.
- [223] Iverson, G., Gaetz, M., Rzemoluck, E., McLean, P., Linden, W., & Remick, R. (2005). A new potential marker for abnormal cardiac physiology in depression. *Journal of Behavioral Medicine*, 28(6), 507–511.
- [224] Taillard, J., Lemoine, P., Boule, P., Drogue, M., & Mouret, J. (1993). Sleep and heart rate circadian rhythm in depression: The necessity to separate. *Chronobiology International*, 10(1), 63–72.
- [225] Taillard, J., Sanchez, P., Lemoine, P., & Mouret, J. (1990). Heart rate orcadian rhythm as a biological marker of desynchronization in major depression: A methodological and preliminary report. *Chronobiology International*, 7(4), 305–316.
- [226] Iacono, W. G., & Tuason, V. B. (1983). Bilateral electrodermal asymmetry in euthymic patients with unipolar and bipolar affective disorders. *Biological Psychiatry*, 18(3), 303–315.
- [227] Iacono, W. G., Lykken, D. T., Peloquin, L. J., Lumry, A. E., Valentine, R. H., & Tuason, V. B. (1983). Electrodermal activity in euthymic unipolar and bipolar affective disorders: A possible marker for depression. *Archives of General Psychiatry*, 40(5), 557.

- [228] Sponheim, S., Allen, J., & Iacono, W. (1995). Selected psychophysiological measures in depression: The significance of electrodermal activity, electroencephalographic asymmetries, and contingent negative variation to behavioral and neurobiological aspects of depression. *The behavioral high risk paradigm in psychopathology* (pp. 222–249). New York: Springer.
- [229] Damasio, A. R. (1998). Emotion in the perspective of an integrated nervous system. *Brain Research Reviews*, 26(2), 83–86.
- [230] Coan, J. A., & Allen, J. J. (2007). *Handbook of emotion elicitation and assessment*. Oxford: Oxford university press.
- [231] Ruiz-Padial, E., Vila, J., & Thayer, J. (2011). The effect of conscious and non-conscious presentation of biologically relevant emotion pictures on emotion modulated startle and phasic heart rate. *International Journal of Psychophysiology*, 79(3), 341–346.
- [232] Beissner, F., Meissner, K., Bär, K.-J., & Napadow, V. (2013). The autonomic brain: An activation likelihood estimation meta-analysis for central processing of autonomic function. *The Journal of Neuroscience*, 33(25), 10,503–10,511.
- [233] Heller, A., Johnstone, T., Shackman, A., Light, S., Peterson, M., Kolden, G., et al. (2009). Reduced capacity to sustain positive emotion in major depression reflects diminished maintenance of fronto-striatal brain activation. *Proceedings of the National Academy of Sciences*, 106(52), 22,445–22,450.
- [234] Picard, R. W. (2003). Affective computing: Challenges. *International Journal of Human-Computer Studies*, 59(1), 55–64.
- [235] Rottenberg, J., Ray, R. R., & Gross, J. J. (in press). Emotion elicitation using films. In J. A. Coan & J. J. B. Allen (Eds.), *The handbook of emotion elicitation and assessment*. New York: Oxford University Press.
- [236] Nasoz, F., Alvarez, K., Lisetti, C. L., & Finkelstein, N. (2004). Emotion recognition from physiological signals using wireless sensors for presence technologies. *Cognition, Technology & Work*, 6(1), 4–14.
- [237] Pecchinenda, A. (1996). The affective significance of skin conductance activity during a difficult problem-solving task. *Cognition & Emotion*, 10(5), 481–504.
- [238] Scheirer, J., Fernandez, R., Klein, J., & Picard, R. W. (2002). Frustrating the user on purpose: A step toward building an affective computer. *Interacting with Computers*, 14(2), 93–118.
- [239] Ilves, M., & Surakka, V. (2012). Heart rate responses to synthesized affective spoken words. *Advances in Human-Computer Interaction*, 2012, 14.
- [240] Yang, Y.-H., & Chen, H. H. (2011). *Music emotion recognition*. Milton Park/Abingdon-on-Thames/Oxfordshire: Taylor & Francis Group.
- [241] Yang, Y.-H., Lin, Y.-C., Su, Y.-F., & Chen, H. H. (2008). A regression approach to music emotion recognition. *IEEE Transactions on Audio, Speech, and Language Processing*, 16(2), 448–457.
- [242] Kim, J., & Andre, E. (2008). Emotion recognition based on physiological changes in music listening. *IEEE Transactions on Pattern Analysis and Machine Intelligence*, 30(12), 2067–2083.
- [243] Ramakrishnan, S. (2012). Recognition of emotion from speech: A review. In S. Ramakrishnan (Ed.), *Speech enhancement, modeling and recognition—algorithms and applications* (p. 121). ISBN: 978-953-51-0291-5, 2012. InTech, Available from: <http://www.intechopen.com/books/speech-enhancementmodeling-and-recognition-algorithmsandapplications/recognition-of-emotion-from-speech-areview>.
- [244] Levenson, R. W. (1988). Emotion and the autonomic nervous system: A prospectus for research on autonomic specificity. *Social psychophysiology and emotion: Theory and clinical applications* (pp. 17–42). Oxford: Wiley.
- [245] Andreassi, J. L. (2000). *Psychophysiology: Human behavior and physiological response*. New York: Psychology Press.

- [246] Lanata, A., Greco, A., Valenza, G., & Scilingo, E. P. (2014). A pattern recognition approach based on electrodermal response for pathological mood identification in bipolar disorders. In *2014 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)* (pp. 3601–3605). IEEE.
- [247] Bianchi, M., Valenza, G., Serio, A., Lanata, A., Greco, A., Nardelli, M., et al. (2014). Design and preliminary affective characterization of a novel fabric-based tactile display. In *2014 IEEE Haptics Symposium (HAPTICS)* (pp. 591–596). IEEE.
- [248] Valenza, G., Lanata, A., & Scilingo, E. (2012). The role of nonlinear dynamics in affective valence and arousal recognition. *IEEE Transactions on Affective Computing*, 3(2), 237–249.
- [249] Bradley, M., & Lang, P. J. (1999). *The International affective digitized sounds (IADS) stimuli, instruction manual and affective ratings*. NIMH Center for the Study of Emotion and Attention. Gainesville: University of Florida.
- [250] Bensafi, M., Rouby, C., Farget, V., Bertrand, B., Vigouroux, M., & Holley, A. (2002). Autonomic nervous system responses to odours: The role of pleasantness and arousal. *Chemical Senses*, 27(8), 703–709.
- [251] Gibbons, J. D., & Chakraborti, S. (2011). *Nonparametric statistical inference*. Berlin: Springer.
- [252] Jain, A., & Zongker, D. (1997). Feature selection: Evaluation, application, and small sample performance. *IEEE Transactions on Pattern Analysis and Machine Intelligence*, 19(2), 153–158.
- [253] Wang, J.-C., Wang, J.-F., He, K. W., & Hsu, C.-S. (2006). Environmental sound classification using hybrid svm/knn classifier and MPEG-7 audio low-level descriptor. In *International Joint Conference on Neural Networks, 2006 (IJCNN06)* (pp. 1731–1735). IEEE.
- [254] Kearns, M., & Ron, D. (1999). Algorithmic stability and sanity-check bounds for leave-one-out cross-validation. *Neural Computation*, 11(6), 1427–1453.
- [255] Duda, R. O., Hart, P. E., & Stork, D. G. (2012). *Pattern classification*. New York: Wiley.
- [256] Kohavi, R., & Provost, F. (1988). Glossary of terms. *Machine Learning*, 30, 271–274.
- [257] Lemke, M. R., Fischer, C. J., Wendorff, T., Fritzer, G., Rupp, Z., & Tetzlaff, S. (2005). Modulation of involuntary and voluntary behavior following emotional stimuli in healthy subjects. *Progress in Neuro-Psychopharmacology and Biological Psychiatry*, 29(1), 69–76.
- [258] Schaaff, K., & Schultz, T. (2009). Towards emotion recognition from electroencephalographic signals. In *3rd International Conference on Affective Computing and Intelligent Interaction and Workshops, 2009 (ACII 2009)* (pp. 1–6). IEEE.
- [259] Frantzidis, C. A., Bratsas, C., Papadelis, C. L., Konstantinidis, E., Pappas, C., & Bamidis, P. D. (2010). Toward emotion aware computing: an integrated approach using multichannel neurophysiological recordings and affective visual stimuli. *IEEE Transactions on Information Technology in Biomedicine*, 14(3), 589–597.
- [260] Palomba, D., Angrilli, A., & Mini, A. (1997). Visual evoked potentials, heart rate responses and memory to emotional pictorial stimuli. *International Journal of Psychophysiology*, 27(1), 55–67.
- [261] Junghöfer, M., Schupp, H. T., Stark, R., & Vaitl, D. (2005). Neuroimaging of emotion: Empirical effects of proportional global signal scaling in fMRI data analysis. *NeuroImage*, 25(2), 520–526.
- [262] Jackson Davis, W., Rahman, M. A., Smith, L. J., Burns, A., Senecal, L., McArthur, D., et al. (1995). Properties of human affect induced by static color slides (IAPS): Dimensional, categorical and electromyographic analysis. *Biological Psychology*, 41(3), 229–253.
- [263] Sloan, D. M., Bradley, M. M., Dimoulas, E., & Lang, P. J. (2002). Looking at facial expressions: Dysphoria and facial EMG. *Biological Psychology*, 60(2), 79–90.
- [264] Gavazzeni, J., Wiens, S., & Fischer, H. (2008). Age effects to negative arousal differ for self-report and electrodermal activity. *Psychophysiology*, 45(1), 148–151.
- [265] Norris, C. J., Larsen, J. T., & Cacioppo, J. T. (2007). Neuroticism is associated with larger and more prolonged electrodermal responses to emotionally evocative pictures. *Psychophysiology*, 44(5), 823–826.

- [266] Greco, A., Lanata, A., Valenza, G., Scilingo, E. P., & Citi, L. (2014). Electrodermal activity processing: A convex optimization approach. In *2014 36th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC)* (pp. 2290–2293). IEEE.
- [267] Pollatos, O., Herbert, B. M., Matthias, E., & Schandry, R. (2007). Heart rate response after emotional picture presentation is modulated by interoceptive awareness. *International Journal of Psychophysiology*, *63*(1), 117–124.
- [268] Lang, P. (1995). The emotion probe. Studies of motivation and attention. *The American Psychologist*, *50*(5), 372.
- [269] McCurdy, H. G. (1950). Consciousness and the galvanometer. *Psychological Review*, *57*(6), 322.
- [270] Bradley, M. M., & Lang, P. J. (2007). The international affective digitized sounds (iads): Affective ratings of sounds and instruction manual. Technical Report B-3, University of Florida, Gainesville.
- [271] Lang, P. J., Bradley, M. M., & Cuthbert, B. N. (2005). *International affective picture system (IAPS): Affective ratings of pictures and instruction manual*. Cuthbert: NIMH, Center for the Study of Emotion & Attention.
- [272] Gobl, C., & Ni, A. (2003). The role of voice quality in communicating emotion, mood and attitude. *Speech Communication*, *40*(1), 189–212.
- [273] Goldstein, A. (1980). Thrills in response to music and other stimuli. *Physiological Psychology*, *8*(1), 126–129.
- [274] Johna, S. (1991). Music structure and emotional response: Some empirical findings. *Psychology of Music*, *991*(9), L120.
- [275] Marcell, M., Malatanos, M., Leahy, C., & Comeaux, C. (2007). Identifying, rating, and remembering environmental sound events. *Behavior Research Methods*, *39*(3), 561–569.
- [276] Gaver, W. W. (1993). What in the world do we hear? An ecological approach to auditory event perception. *Ecological Psychology*, *5*(1), 1–29.
- [277] Blood, A. J., & Zatorre, R. J. (2001) Intensely pleasurable responses to music correlate with activity in brain regions implicated in reward and emotion. *Proceedings of the National Academy of Sciences*, *98*(20), 11,818–11,823.
- [278] Koelsch, S., Fritz, T., Müller, K., Friederici, A. D., et al. (2006). Investigating emotion with music: An fMRI study. *Human Brain Mapping*, *27*(3), 239–250.
- [279] Anders, S., Eippert, F., Weiskopf, N., & Veit, R. (2008). The human amygdala is sensitive to the valence of pictures and sounds irrespective of arousal: An fMRI study. *Social Cognitive and Affective Neuroscience*, *3*(3), 233–243.
- [280] Roque, A. L., Valenti, V. E., Guida, H. L., Campos, M. F., Knap, A., Vanderlei, L. C. M., et al. (2013). The effects of auditory stimulation with music on heart rate variability in healthy women. *Clinics*, *68*(7), 960–967.
- [281] Orini, M., Bailon, R., Enk, R., Koelsch, S., Mainardi, L., & Laguna, P. (2010). A method for continuously assessing the autonomic response to music-induced emotions through HRV analysis. *Medical & Biological Engineering & Computing*, *48*(5), 423–433.
- [282] Anttonen, J., & Surakka, V. (2005). Emotions and heart rate while sitting on a chair. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (pp. 491–499). ACM.
- [283] Ivonin, L., Chang, H.-M., Chen, W., & Rauterberg, M. (2013). Unconscious emotions: Quantifying and logging something we are not aware of. *Personal and Ubiquitous Computing*, *17*(4), 663–673.
- [284] Verona, E., Patrick, C. J., Curtin, J. J., Bradley, M. M., & Lang, P. J. (2004). Psychopathy and physiological response to emotionally evocative sounds. *Journal of Abnormal Psychology*, *113*(1), 99.
- [285] Hariharan, A., & Adam, M. T. P. (2015). Blended emotion detection for decision support. *IEEE Transactions on Human-Machine Systems*, *45*(4), 510–517.
- [286] Storm, H. (2008). Changes in skin conductance as a tool to monitor nociceptive stimulation and pain. *Current Opinion in Anesthesiology*, *21*(6), 796–804.

- [287] Hellerud, B., & Storm, H. (2002). Skin conductance and behaviour during sensory stimulation of preterm and term infants. *Early Human Development*, 70(1), 35–46.
- [288] Olausson, H., Cole, J., Rylander, K., McGlone, F., Lamarre, Y., Wallin, B. G., et al. (2008). Functional role of unmyelinated tactile afferents in human hairy skin: Sympathetic response and perceptual localization. *Experimental Brain Research*, 184(1), 135–140.
- [289] Löken, L. S., Evert, M., & Wessberg, J. (2011). Pleasantness of touch in human glabrous and hairy skin: Order effects on affective ratings. *Brain Research*, 1417, 9–15.
- [290] Klöcker, A., Oddo, C. M., Camboni, D., Penta, M., & Thonnard, J.-L. (2014). Physical factors influencing pleasant touch during passive fingertip stimulation. *PLoS One*, 9(7), e101361.
- [291] Bradley, M. M., & Lang, P. J. (1994). Measuring emotion: the self-assessment manikin and the semantic differential. *Journal of Behavior Therapy and Experimental Psychiatry*, 25(1), 49–59.
- [292] Posner, J., Russell, J. A., & Peterson, B. S. (2005). The circumplex model of affect: An integrative approach to affective neuroscience, cognitive development, and psychopathology. *Development and Psychopathology*, 17(03), 715–734.
- [293] Herz, R. S., & Engen, T. (1996). Odor memory: review and analysis. *Psychonomic Bulletin & Review*, 3(3), 300–313.
- [294] Van Toller, S. (1988). Emotion and the brain. In *Perfumery* (pp. 121–143). Berlin: Springer.
- [295] Alaoui-Ismaili, O., Robin, O., Rada, H., Dittmar, A., & Vernet-Maury, E. (1997). Basic emotions evoked by odorants: Comparison between autonomic responses and self-evaluation. *Physiology & Behavior*, 62(4), 713–720.
- [296] Lorig, T. S., Huffman, E., DeMartino, A., & DeMarco, J. (1991). The effects of low concentration odors on eeg activity and behavior. *Journal of Psychophysiology*, 5(1), 69–77.
- [297] Aggleton, J. P., & Mishkin, M. (1986). The amygdala: sensory gateway to the emotions. *Emotion: Theory, Research and Experience*, 3, 281–299.
- [298] Price, J. L. (1987). The central olfactory and accessory olfactory systems. In T. E. Finger, & W. L. Silver (Eds.), *Neurobiology of Taste and Smell* (pp. 179–203). New York: Wiley.
- [299] Greco, A., Valenza, G., Nardelli, M., Bianchi, M., Citi, L., & Scilingo, E. P. (2016). Force-velocity assessment of caress-like stimuli through the electrodermal activity processing: Advantages of a convex optimization approach. *IEEE Transactions on Human-Machine Systems*, PP(99), 1–10.
- [300] Van Toller, C., Kirk-Smith, M., Wood, N., Lombard, J., & Dodd, G. (1983). Skin conductance and subjective assessments associated with the odour of 5- α -androstan-3-one. *Biological Psychology*, 16(1), 85–107.
- [301] Robin, O., Alaoui-Ismaili, O., Dittmar, A., & Vernet-Maury, E. (1999). Basic emotions evoked by eugenol odor differ according to the dental experience. a neurovegetative analysis. *Chemical Senses*, 24(3), 327–335.
- [302] Brauchli, P., Rüegg, P. B., Etzweiler, F., & Zeier, H. (1995). Electrocutaneous and autonomic alteration by administration of a pleasant and an unpleasant odor. *Chemical Senses*, 20(5), 505–515.
- [303] Uryvaev, Y., Golubeva, N., & Nechaev, A. (1986). Differences in human involuntary reactions to perceptible and imperceptible odors. In *Doklady Akademii Nauk SSSR*, 290, 501–504.
- [304] Henion, K. E. (1971). Odor pleasantness and intensity: A single dimension? *Journal of Experimental Psychology*, 90(2), 275.
- [305] Moskowitz, H. R., Dravnieks, A., & Gerbers, C. (1974). Odor intensity and pleasantness of butanol. *Journal of Experimental Psychology*, 103(2), 216.
- [306] Moskowitz, H. R., Dravnieks, A., & Klarman, L. A. (1976). Odor intensity and pleasantness for a diverse set of odorants. *Attention, Perception, & Psychophysics*, 19(2), 122–128.
- [307] Doty, R. L. (1975). An examination of relationships between the pleasantness, intensity, and concentration of 10 odorous stimuli. *Perception & Psychophysics*, 17(5), 492–496.

- [308] Alaoui-Ismaili, O., Vernet-Maury, E., Dittmar, A., Delhomme, G., & Chanel, J. (1997). Odor hedonics: Connection with emotional response estimated by autonomic parameters. *Chemical Senses*, 22(3), 237–248.
- [309] Kring, A. M., & Gordon, A. H. (1998). Sex differences in emotion: Expression, experience, and physiology. *Journal of Personality and Social Psychology*, 74(3), 686.
- [310] Bradley, M. M., Codispoti, M., Sabatinelli, D., & Lang, P. J. (2001). Emotion and motivation ii: Sex differences in picture processing. *Emotion*, 1(3), 300.
- [311] Nardelli, M., Valenza, G., Bianchi, M., Greco, A., Lanata, A., Bicchi, A., et al. (2015). Gender-specific velocity recognition of caress-like stimuli through nonlinear analysis of heart rate variability. In *2015 37th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC)* (pp. 298–301). IEEE.
- [312] Grossman, M., & Wood, W. (1993). Sex differences in intensity of emotional experience: A social role interpretation. *Journal of Personality and Social Psychology*, 65(5), 1010.
- [313] Robin, O., Rousmans, S., Dittmar, A., & Vernet-Maury, E. (2003). Gender influence on emotional responses to primary tastes. *Physiology & Behavior*, 78(3), 385–393.
- [314] Wrase, J., Klein, S., Gruesser, S. M., Hermann, D., Flor, H., Mann, K., et al. (2003). Gender differences in the processing of standardized emotional visual stimuli in humans: a functional magnetic resonance imaging study. *Neuroscience Letters*, 348(1), 41–45.
- [315] Soussignan, R., & Schall, B. (1996). Children's facial responsiveness to odors: Influences of hedonic valence of odor, gender, age, & social presence. *Developmental Psychology*, 32(2), 367.
- [316] Yousem, D. M., Maldjian, J. A., Siddiqi, F., Hummel, T., Alsop, D. C., Geckle, R. J., et al. (1999). Gender effects on odor-stimulated functional magnetic resonance imaging. *Brain Research*, 818(2), 480–487.
- [317] Naudin, M., El-Hage, W., Gomes, M., Gaillard, P., Belzung, C., & Atanasova, B. (2012). State and trait olfactory markers of major depression. *PLoS One*, 7(10), e46938.
- [318] Kroenke, K., Spitzer, R., & Williams, J. (2001). The PHQ-9. *Journal of General Internal Medicine*, 16(9), 606–613.
- [319] Wilcoxon, F. (1945). Individual comparisons by ranking methods. *Biometrics Bulletin*, 1(6), 80–83.
- [320] Siegel, S. (1956). The Mann-Whitney U test. *Nonparametric statistics for the behavioral sciences* (pp. 116–127). New York: McGraw-Hill.
- [321] Meli, L., Scheggi, S., Pacchierotti, C., & Prattichizzo, D. (2014). Wearable haptics and hand tracking via an RGB-d camera for immersive tactile experiences. In *ACM SIGGRAPH 2014 Posters* (p. 56). ACM.
- [322] Mørkrid, L., & Qiao, Z.-G. (1988). Continuous estimation of parameters in skin electrical admittance from simultaneous measurements at two different frequencies. *Medical and Biological Engineering and Computing*, 26(6), 633–640.
- [323] Sawan, M., Laaziri, Y., Mounaim, F., Elzayat, E., Corcos, J., & Elhilali, M. (2007). Electrode–tissues interface: Modeling and experimental validation. *Biomedical Materials*, 2(1), S7.
- [324] Pavšelj, N., Prémat, V., & Miklavčič, D. (2007). A numerical model of skin electropermeabilization based on in vivo experiments. *Annals of Biomedical Engineering*, 35(12), 2138–2144.
- [325] Empatica: Human data in real time. <https://www.empatica.com/> (2016).
- [326] Fernandez, R., & Picard, R. W. (2003). Modeling drivers' speech under stress. *Speech Communication*, 40(1), 145–159.