Literature Survey

Hindawi. (2022) *Big Data analytics in mobile information systems for advanced computing.* [Online] *https://www.hindawi.com/journals/jece/2022/1566664/#abstract*

Athletes participate in competitive competitions, and the ultimate goal is to better display their personal competitive level in the competition so as to achieve the goal of defeating their opponents and winning the competition. In all types of competitions, most matches are instantaneous, and opportunities are fleeting. The instantaneous nature and fierce competition of sports competitions require athletes who participate in sports competitions to have a high psychological quality. It can be seen that the quality of the mental state directly determines the performance of the athletes in usual training and competition. In the process of sports, if athletes can obtain real-time changes in their mental states when they encounter various situations, they can formulate more targeted and effective training or competition strategies according to the athletes' states. For the opponent, by analysing the opponent's psychological state during exercise, the game strategy can be adjusted in real time in a targeted manner, and the probability of winning the game can be provided. Based on this background, the paper proposes to use support vector machine (SVM) to identify the mental state of athletes during exercise. It first collects the data of body movements and facial expressions of athletes during training or competition. Use multimodal data to train an SVM model. Output the emotional state of athletes at different stages based on test data. In order to verify the applicability of the method in this paper to the athlete subjects, several comparative models were used in the experiment to verify the performance of the used models. The experimental results show that the accuracy rate of emotion recognition obtained by this method is more than 80%. This shows that the research in this paper has certain application value.

SpringerLink. (2022) *Facial expression analysis in a wild sporting environment.* [Online] https://link.springer.com/article/10.1007/s11042-022-13654-w

The scientific community and mass media have already reported the use of nonverbal behaviour analysis in sports for athletes' performance. Their conclusions stated that certain emotional expressions are linked to athlete's performance, or even that psychological strategies serve to improve endurance performance. The paper examines the portrayal of well-known emotions and their relationship to the participants of an ultra-distance race in a high-stake environment. For this purpose, they analysed almost 600 runners captured when they passed through a set of locations placed along the race track. They observed a correlation between the runners' facial expressions and their performance along the track. Moreover, they have analysed Action Unit activations and aligned our findings with the state-of-the-art psychological baseline.

Frontiers. (2022) *How do emotions affect sport performance?.* [Online] https://kids.frontiersin.org/articles/10.3389/frym.2022.691706

Playing sports can be filled with emotions. Athletes might feel nervous about try-outs or before a big competition upset about losing or performing poorly, or excited and happy after a big win or a major accomplishment. To perform well in sport, athletes can learn to manage their emotions and cope with stress. However, some emotion regulation and coping strategies might be more useful than others. So, how can athletes learn to deal with their emotions and cope with stress in sport? In the paper, they review what emotions are and how they influence athletes' thoughts and behaviours in sport, as well as their impact on sport performance . They also review types of coping strategies that athletes can use to deal with stress and emotions in sport, and they explore ways that athletes can learn to develop better coping skills for sport performance.

RearchGate. (2012) *Emotions and Performance: Valuable insights from the sport domain.* [Online]
https://www.researchgate.net/publication/233739887_Emotions_and_Performance_Valuable_insights_from_the_sport_domain

The chapter is aimed to understand the influence of emotions on human performance. As a background, they chose to present research done in the sport domain, a real-world and highly complex environment. Indeed sport appears to be a perfect context to understand the link between emotions and performance: In competition, athletes almost always have to face high levels of pressure, which might trigger a full range of emotional experiences. They first review the theories helping to understand how emotions might influence performance, integrating them according to an original perspective, considering the trait and state levels. For the trait level, they present individual differences linked with emotions, such as trait emotional intelligence, the propensity for reinvestment… At the state level, they show how specific emotions (e.g., anxiety, anger, hope…) might influence performance, considering the cognitive and the motor parts of performance. In particular, they included very recent work on a specific aspect of cognitive performance, decision making; and innovative work on kinematics regarding motor performance. After this theoretical review, they address the methodological advances in the field, showing how to elicit and how to assess emotions. This part is aimed to be particularly helpful to researchers when designing their experiments concerning this topic. The last part is dedicated to the applied implications of the findings reviewed so far. This part stresses the applied benefits of knowing how to deal with one's emotions in order to improve one's performance. Topics like emotion regulation, stress management, appropriate 2 use of coping strategies, biofeedback… are presented here. Finally, they provide an illustration of how the findings presented in this chapter can be extended to performance in other domains, such as organizational, economic, artistic… thus being an inspiring source of ideas for researchers. Emotions are part of the life experience of each individual, thus understanding them and knowing how to deal with them can be a smart and definitive advantage for the one who aims at reaching a better performance

National library of medicine. (2018) *The influence of emotional intelligence on performance in competitive sports: a meta-analytical investigation*. [Online] https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6316207/

In order to summarise the available evidence, they conducted a meta-analysis examining the relationship between emotional intelligence (EI) and sports performance in competitive sports. A systematic literature search was conducted. They calculated correlation (r) to estimate the effect of the relationship. A random effects model was used to interpret findings. The meta-analysis of 22 effect sizes on the response of 3.431 participants found a small but significant relationship between EI and sports performance ($r = 0.16$).

Extraction of Data Initially, the first author extracted data with to the following key features: reference information, aim of the study, type of study design, participants and sample characteristics, type of sport, EI theory or rather conceptualisation, dependent variables and how they were measured

Extraction of Effect Sizes Correlation (r) was used as the effect size because the majority of the research reported r, as it is easily calculated from chi-square, t, f, and d values, and it is readily understood and interpreted

Meta-Analytic Procedure and Assessment of Publication Bias Comprehensive Meta-Analysis software. A random effects model was used to interpret findings. Analyses completed using a random effects model adjusts effect sizes by the inverse weight of the variance in order to consider both the sampling and between-study error [43]. Interpretation of the effect size calculations were based on Cohen's [70] determination of small ($r \leq 0.10$), medium ($r \leq 0.30$), and large ($r \geq 0.50$) effect sizes.

There were a number of limitations to the current study. First, because of the limited number of study sizes, we were not able to examine all moderators, leaving several research questions we had raised unanswered. Second, the present quantitative analysis was dominated by studies using a cross-sectional design. Future studies should use longitudinal designs and conduct advanced analyses, such as multilevel analysis. Third, the current study relies on a linear model to determine the relationship between EI and sports performance. It is possible that such a relationship depends on multiple factors in a non-linear fashion and that this changes over time.

The results of this meta-analysis suggest that EI is a weak determinant of sports performance. Overall, the results seem encouraging regarding the value of EI as a possible sports performance predictor. Knowledge and analysis of emotional intelligence benefited the sport psychologists, coaching staff, athletes, and sport administrators to analyse and improve the performance of the athletes. Practitioners should promote the implementation of EI screening and EI-development programs as an integral part of the training process.

ResearchGate. (2022) *Feature extraction of athlete's post-match psychological and emotional changes based on deep learning*. [Online] https://www.researchgate.net/publication/361472485_Feature_Extraction_of_Athlete%27s_Post-Match_Psychological_and_Emotional_Changes_Based_on_Deep_Learning

In this research work, information on nearly 11,000 competitors representing 47 sports and 743 teams competing in the Tokyo Olympics in 2021 (2020) is considered. The dataset includes information on the athletes, coaches, and teams who competed, as well as gender-specific entries.It includes their names, the countries they represent, the discipline they compete in, the gender of the athletes, and the identifiers of the coaches.

The only definition of artificial intelligence is software package systems that perform intelligently despite not being explicitly programmed. ese systems learn to recognize and categorize input patterns, develop and act on probabilistic forecasts, and operate in the absence of explicit rules or supervision. The study deployed a behavior recognition algorithm-based deep learning technique for evaluating the post-psychological characteristics of athletes. It also evaluates the mental health and emotional balance experienced by the athletes. E study results proved that the proposed model has provided an accuracy of 89%. For future research, it is highly recommended to determine the impact of deep learning toward pre -and post-psychological situations of athletes.

MDPI. (2022) *M1M2: Deep learning based realtime emotion recognition from neural activity.* [Online] https://www.mdpi.com/1424-8220/22/21/8467/htm

The paper proposes two convolutional neural network (CNN) models (M1: heavily parameterized CNN model and M2: lightly parameterized CNN model) coupled with elegant feature extraction methods for effective recognition. In this study, the most popular EEG benchmark dataset, the DEAP, is utilized with two of its labels, valence, and arousal, for binary classification. We use Fast Fourier Transformation to extract the frequency domain features, convolutional layers for deep features, and complementary features to represent the dataset. The M1 and M2 CNN models achieve nearly perfect accuracy of 99.89% and 99.22%, respectively, which outperform every previous state-of-the-art model. We empirically demonstrate that the M2 model requires only 2 seconds of EEG signal for 99.22% accuracy, and it can achieve over 96% accuracy with only 125 milliseconds of EEG data for valence classification. Moreover, the proposed M2 model achieves 96.8% accuracy on valence using only 10% of the training dataset, demonstrating our proposed system's effectiveness. Documented implementation codes for every experiment are published for reproducibility.

SpringerLink. (2021) *Human facial emotion detection using deep learning.* [Online] https://link.springer.com/chapter/10.1007/978-981-16-3690-5_136

Deep learning techniques are rapidly growing in this era and help in tackling real world problems. In this work, deep neural networks or convolutional neural networks are used to detect human facial emotions. We have proposed a network with the help of ResNet50 to classify the human facial emotions using static images. To train the network FER2013 dataset is used and the proposed model produced significant results compared to existing models.

Taylor&Francis online. (2022) *Psychological skills training and perfectionism: A single-subject multiple baseline study.* [Online] https://www.tandfonline.com/doi/full/10.1080/10413200.2022.2137597

Psychological skills training (PST) is a common and effective form of support provided by sports psychologists. Nevertheless, its use in helping support athletes with perfectionism and some of the problematic issues they can face is unknown. The purpose of the present study was to assess the effectiveness of PST in reducing perfectionistic cognitions and improving emotional experiences in athletes. Using a single-subject multiple baseline research design, we recruited five national-level basketball players ($M = 21.8$ years) based on their concerns over mistakes (a key dimension of perfectionistic concerns). All participants received eight, one-to-one PST sessions over a four-week period. Participants completed self-report measures of perfectionistic cognitions, cognitive appraisals, pre-competition emotions, and performance satisfaction on a weekly basis, before, during, and after the intervention, as well as 3-months later. Results suggested that PST improved at least some of the cognitive appraisals, pre-competition emotions, and performance satisfaction in most participants. Minimal changes were observed for perfectionistic cognitions. The findings support the general use of PST but other interventions may be required to reduce perfectionistic cognitions.

To maximize the ability to perform at their best consistently, athletes need to develop their psychological skills. Psychological skills training (PST) does so through the formalized practice of key skills (e.g., imagery, goal-setting, self-talk, and physical relaxation) that enhance confidence, attentional focus, and regulation of emotions. PST is a routine part of the practice of many applied sports psychologists and something they would commonly use with the athletes they work with. Although research attests to the general use of PST in supporting athletes, it may be less effective for some athletes, and even ineffective for those that may need it most. Here, we are interested in the use of PST when working with athletes who exhibit more problematic aspects of perfectionism—a personality characteristic that can pose a number of performance, motivation, and well-being difficulties. These difficulties include the experience of frequent and disruptive thoughts about perfection as well as more negative emotional experiences. The study is intended to better inform sports psychologists of the effectiveness of PST for these athletes and whether PST is useful for addressing common issues they experience.

To prepare athletes for psychological pressure of competition, pressure training (PT) systematically applies pressure on athletes during training. The study explored how to create pressure for PT and how PT improves performance in competition. Specifically, it aimed to explore the views of sport psychologists and athletes on: (a) common properties of effective pressure manipulations, and (b) PT's mechanisms for improving performance under pressure. Eight sport psychologists and eight international-level athletes participated in semi-structured interviews. Thematic analysis identified three properties of effective pressure manipulations: (a) extending the reach of consequences, (b) simulating psychological demands of competition, and (c) approximating, but not replicating, intensity of competition pressure. Analysis also produced three themes that described how PT benefits performance: (a) learn and practice coping skills, (b) "change the relationship" with pressure, and (c) increase the quality of training. Understanding these benefits can help communicate to athletes why they should participate in PT.

This study explored the creation of pressure in training and PT's mechanisms for improving performance. Because themes reflected participants' experiences in actual training and competition, they demonstrate how applied practice can inform understanding of how an

intervention works. Although they do not necessarily represent the only common properties of effective pressure manipulations, the findings illustrate how practitioners can look beyond the severity of consequences or difficulty of a task when considering how to create pressure. Findings on performance benefits suggested that PT enhances performance by providing athletes a chance to practice coping skills and to realize that pressure does not have to hurt performance. Practitioners can explain these benefits to help athletes and coaches understand the value and purpose of PT.

ScienceDirect. (2020) *Facial emotion recognition using deep learning: review and insights.* [Online] https://www.sciencedirect.com/science/article/pii/S1877050920318019

 Automatic emotion recognition based on facial expression is an interesting research field, which has presented and applied in several areas such as safety, health and in human machine interfaces. Researchers in this field are interested in developing techniques to interpret, code facial expressions and extract these features in order to have a better prediction by computer. With the remarkable success of deep learning, the different types of architectures of this technique are exploited to achieve a better performance. The purpose of this paper is to make a study on recent works on automatic facial emotion recognition FER via deep learning. We underline on these contributions treated, the architecture and the databases used and we present the progress made by comparing the proposed methods and the results obtained. The interest of this paper is to serve and guide researchers by review recent works and providing insights to make improvements to this field.

Frontiers. (2022) *Emotion analysis based on Deep learning with application to research on development of western culture.* [Online] https://www.frontiersin.org/articles/10.3389/fpsyg.2022.911686/full

Cultural development is often reflected in the emotional expression of various cultural carriers, such as literary works, movies, etc. Therefore, the cultural development can be analyzed through emotion analysis of the text, so as to sort out its context and obtain its development dynamics. This paper proposes a text emotion analysis method based on deep learning. The traditional neural network model mainly deals with the classification task of short texts in the form of word vectors, which causes the model to rely too much on the accuracy of word segmentation. In addition, the short texts have the characteristics of short corpus and divergent features. A text emotion classification model combing the Bidirectional Encoder Representations from Transformers (BERT) and Bi-directional Long Short-Term Memory (BiLSTM) is developed in this work. First, the BERT model is used to convert the trained text into a word-based vector representation. Then, the generated word vector is employed as the input of the BiLSTM to obtain the semantic representation of the context of the relevant word. By adding random dropout, the mechanism prevents the model from overfitting. Finally, the extracted feature vector is input to the fully connected layer, and the emotion category to which the text belongs is calculated through the Softmax function. Experiments show that in processing short texts, the proposed model based on BERT-BiLSTM is more accurate and reliable than the traditional neural network model using word vectors. The proposed method has a better analysis effect on the development of western culture.

Frontiers. (2021) *Facial expression emotion recognition model integrating philosophy and machine learning theory.* [Online]
https://www.frontiersin.org/articles/10.3389/fpsyg.2021.759485/full

Facial expression emotion recognition is an intuitive reflection of a person's mental state, which contains rich emotional information, and is one of the most important forms of interpersonal communication. It can be used in various fields, including psychology. As a celebrity in ancient China, Zeng Guofan's wisdom involves facial emotion recognition techniques. His book Bing Jian summarizes eight methods on how to identify people, especially how to choose the right one, which means "look at the eyes and nose for evil and righteousness, the lips for truth and falsehood; the temperament for success and fame, the spirit for wealth and fortune; the fingers and claws for ideas, the hamstrings for setback; if you want to know his consecution, you can focus on what he has said." It is said that a person's personality, mind, goodness, and badness can be showed by his face. However, due to the complexity and variability of human facial expression emotion features, traditional facial expression emotion recognition technology has the disadvantages of insufficient feature extraction and susceptibility to external environmental influences. Therefore, this article proposes a novel feature fusion dual-channel expression recognition algorithm based on machine learning theory and philosophical thinking. Specifically, the feature extracted using convolutional neural network (CNN) ignores the problem of subtle changes in facial expressions. The first path of the proposed algorithm takes the Gabor feature of the ROI area as input. In order to make full use of the detailed features of the active facial expression emotion area, first segment the active facial expression emotion area from the original face image, and use the Gabor transform to extract the emotion features of the area. Focus on the detailed description of the local area. The second path proposes an efficient channel attention network based on depth separable convolution to improve linear bottleneck structure, reduce network complexity, and prevent overfitting by designing an efficient attention module that combines the depth of the feature map with spatial information. It focuses more on extracting important features, improves emotion recognition accuracy, and outperforms the competition on the FER2013 dataset.

Hindawi. (2022) *Optimal facial feature based emotional recognition using deep learning algorithm.* [Online] https://www.hindawi.com/journals/cin/2022/8379202/

Humans have traditionally found it simple to identify emotions from facial expressions, but it is far more difficult for a computer system to do the same. The social signal processing subfield of emotion recognition from facial expression is used in a wide range of contexts, particularly for human-computer interaction. Automatic emotion recognition has been the subject of numerous studies, most of which use a machine learning methodology. The recognition of simple emotions like anger, happiness, contempt, fear, sadness, and surprise, however, continues to be a difficult topic in computer vision. Deep learning has recently drawn increased attention as a solution to a variety of practical issues, including emotion recognition. In this study, we improved the convolutional neural network technique to identify 7 fundamental emotions and evaluated several preprocessing techniques to demonstrate how they affected the CNN performance. This research focuses on improving facial features and expressions based on emotional recognition. By identifying or recognising facial expressions that elicit human responses, it is possible for computers to make more accurate predictions about a person's mental state and to provide more tailored responses. As a result, we examine how a deep learning technique that employs a convolutional neural

network might improve the detection of emotions based on facial features (CNN). Multiple facial expressions are included in our dataset, which consists of about 32,298 photos for testing and training. The preprocessing system aids in removing noise from the input image, and the pretraining phase aids in revealing face detection after noise removal, including feature extraction. As a result, the existing paper generates the classification of multiple facial reactions like the seven emotions of the facial acting coding system (FACS) without using the optimization technique, but our proposed paper reveals the same seven emotions of the facial acting coding system.

ResearchGate. (2022) *Facial emotion detection and recognition.* [Online] https://www.researchgate.net/publication/361108119_FACIAL_EMOTION_DETECTION_AND_RECOGNITION

Facial emotional expression is a part of face recognition, it has always been an easy task for humans, but achieving the same with a computer algorithm is challenging. With the recent and continuous advancements in computer vision and machine learning, it is possible to detect emotions in images, videos, etc. A face expression recognition method based on the Deep Neural Networks especially the convolutional neural network (CNN) and an image edge detection is proposed. The edge of each layer of the image is retrieved in the convolution process after the facial expression image is normalized. To maintain the texture picture's edge structure information, the retrieved edge information is placed on each feature image. In this research, several datasets are investigated and explored for training expression recognition models. The purpose of this paper is to make a study on face emotion detection and recognition via Machine learning algorithms and deep learning. The research work will present deeper insights into Face emotion detection and Recognition. It also highlights the variables that have an impact on its efficacy.