Artificial Intelligence and Computer Vision In Nonverbal Communication

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Abstract: Elation and impact of Artificial Intelligence in nonverbal communication has become more intimate now a days. But still the application of AI in communication is not well understood. Integration of Computer Vision with Artificial Intelligence can provide efficient learning strategies in the domain of Nonverbal Communication. For effective learning of different aspects of nonverbal communication such as: facial expressions; body language; gestures; eye contact etc. different types of AI & ML modules can be utilized. Body Language is the key part of any communication. In different scenarios human must act different and without proper feedback and suggestions it is difficult to build a positive attitude. By tracking body movements and gestures during real-time conversation, AI models can give real time feedback to improve communication skills. In case of group presentation or multi person communication, an installed computing device consisting of AI & ML modules, can listen the audio and detect the movements and with those data module can provide instantaneous suggestions and feedback to improve presentation/communication. Computer Vision models can track each and every movement of human bodies and determine the interaction level. So appropriate use of AI can lead to progressive learning of nonverbal communication and interactive communication skill.

Keywords: AI in Nonverbal Communication; Computer Vision for body language learning; Machine-learning models to improve communication.

I.   INTRODUCTION

In order to build relationships on a personal and professional level, strong communication skills are crucial. Non-verbal and verbal communication are the two basic categories. The majority of people are proficient in using verbal communication in daily life, yet nonverbal communication is sometimes inadvert and offers sufficient details about individuals and events. In this paper our aim is to utilize Artificial Intelligence (AI) in domains of nonverbal communication learning.

Nonverbal Communication

Sending and receiving communications devoid of spoken or written words is known as nonverbal communication, commonly referred to as manual language. Nonverbal conduct may highlight specific verbal messages, just like italicising draws attention to certain words in written text. In the book "Nonverbal Communication: Notes on the Visual Perception of Human Relations," written by Weldon Kees and psychiatrist Jurgen Ruesch, the phrase "nonverbal communication" was first used.

7-38-55 Rule of Communication

The 7-38-55 rule, developed by Albert Mehrabian, aims to measure the amount of meaning that is conveyed orally and nonverbally. According to the rule, spoken words only convey 7% of meaning, whereas voice tones account for 38% and body language for 55% respectively. Professor of psychology Albert Mehrabian of the University of California, Los Angeles, created it and described it in his 1971 book Silent Messages (1971).
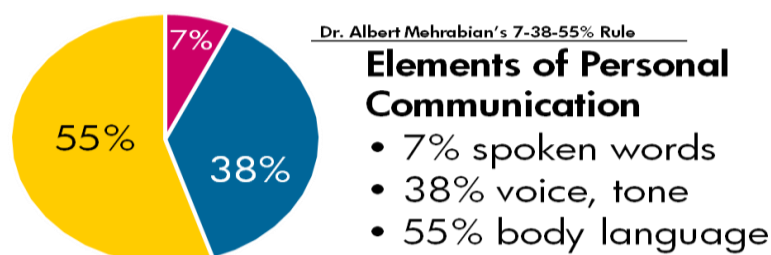

Fig. 1 Dr. Albert Mehrabian's 7-38-55 Rule

Body Language

The silent component of communication that we employ to express our actual emotions and give our messages greater weight is body language. There is a lot more to communication than just words. Nonverbal cues including posture, gestures, and voice inflection all have an impact. Understanding and interpreting a person's body language helps us interpret their words. That is why body language is so important. We can better understand the feelings and moods of people because to it. Additionally, it improves our awareness of how other people respond to the things we say and the way we express them.

II. CATEGORIES OF NONVERBAL COMMUNICATIONS

Nonverbal communication may be divided into many categories in addition to its various uses. These categories consist of

- Haptics (Touch)
- Vocalics (Voice)
- Paralinguistics (Paralanguage)
- Kinesics (Body movement and gestures)
- Proxemics (Personal space)
- Oculesics (Facial and eye expression)

Artificial Intelligence in Nonverbal Communication Learning

Effective communication is greatly influenced by appropriate nonverbal communication. To become knowledgeable about and skilled in the various forms of nonverbal communication Artificial Intelligence can be used. To improve communication skill, trained AI can give real time feedback, suggest ways to improve.

Fundamental Data

There are four fundamental elements that need to be recognised to assess an interaction. Those are Facial recognition, Voice recognition, Gesture recognition and Posture recognition.

Getting Input

To obtain the fundamental dataset, array of input devices such and video and audio capturing devices are required.

Pre-Processing Data: Obtained image and audio feed is pre-processed before sending to trained AI model. With the help of computer vision, gesture, posture, facial expressions are recognised; using voice recognition, incoming audio feed is converted into text. In this step unwanted audio and video noise filtration is done.

Analysis: All the pre-processed data is passed through neural networks, where it analyses about various parameters; such as the communication scenario, whether speaker is maintaining the rules of communication or not, any wrong gesture is performed or not etc. Based on these data AI generates feedback and suggestions.

Output: Result of processed output is given either as real time feedback or as in form.

III. CATEGORISED NONVERBAL DATA

Haptics

A study of nonverbal communication through touch is called haptics. In our daily lives, touch is utilised for a variety of purposes, including expressing greetings, comfort, affection, completing tasks, and exercising control. In case of work place communication or professional communication adequate use of haptic is necessary. As touch is made using hand movements, so haptic data can be obtained with the help of Computer Vision.

Vocalics

Vocalics, or vocal utterances that serve as a method of communication without the use of words. There are different vocal characteristics-

➢ **Timbre:** The characteristic that an overtone gives to a sound, such as the resonance that the ear uses to distinguish and identify a voiced speaking sound.

➢ **Pitch:** The frequency range between high and low is referred to as pitch. Pitch is not often given much consideration unless someone's pitch sticks out.

➢ **Tempo:** Tempo is the term for the speech tempo. Tempo changes can express emotions like enthusiasm or rage, as well as physical health or level of energy.

➢   **Rhythm:** The pattern utilised when speaking is referred to as rhythm. People frequently mimic unusual speech patterns.

➢   **Intensity:** An individual's speaking volume or softness is referred to as intensity. Emotion and intensity are often related. Loud speech can be used to express emotions like rage, pleasure, emotional discomfort, or enhanced enthusiasm. Lower voice volume may be an attempt to defuse an emotionally charged discourse when people talk.

Vocalics can be measured with the help of dedicated hardware such as Condenser Microphone.

Paralinguistics

Another name for vocalics is paralanguage, which describes "extra-linguistic" aspects of communication such the traits of speech previously outlined, pauses and silences, and nonverbal vocalisations.

Kinesics

Kinesics, a term Ray Birdwhistell originally used, is the study of communication through movements, facial expressions, and eye activity. In general, any movement of the body that is visible might be considered a gesture. Other people's thoughts are "stimulated" by these motions. Kinesics have a variety of uses in communication, including regulators, illustrators, affect displays, and symbols.

➢   **Emblems:** Kinesics that are clear and unambiguous and have a verbal equivalent in a given culture.

➢   **Illustrators:** While emblems can be used to replace words directly, illustrators can assist to accentuate or clarify a word.

➢   **Regulators:** Kinesics that help coordinate the flow of conversation, such as shrugging shoulders or winking.

Fig. 2 AI based posture detection developed by Researchers at Carnegie Mellon University

Facial Expression

Another example of kinesics is facial expressions. According to Paul Eckman and Wallace V. Friesen, facial expressions frequently convey "affect" or like. Seven emotions that are well-known over the world are presented by Eckman and Freisen. Shock, anger, disgust, fear, interest, sorrow, and happiness are among these feelings, which are frequently referred to by the abbreviation S.A.D.F.I.S.H. Particularly effective in expressing emotion are facial expressions.
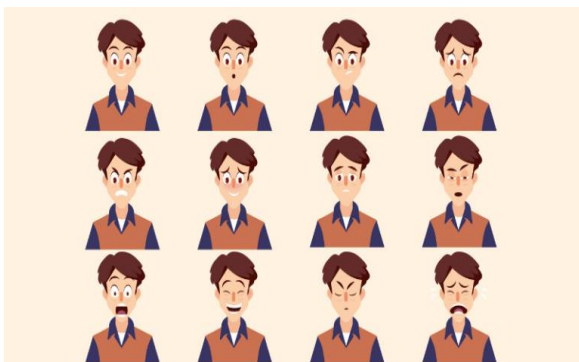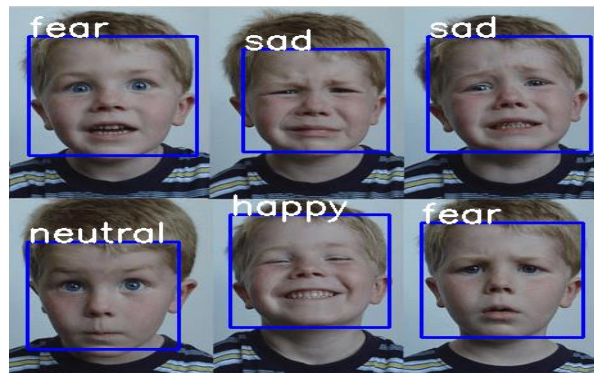

Fig. 3 Emotional expression   Fig. 4 OpenCV based expression detection

● **Oculesics:** Oculesics is the study of how people express themselves via their eye movements. In most interactions, making eye contact is the initial step in communicating.

● **Proxemics:** Proxemics is the study of communication through space and distance.

Fig. 5 Edward T. Hall's Four Spaces

● **Artifacts:** Artifacts are something we use to decorate ourselves or carry about. Glasses, jewellery, canes, shoes, clothes, and any other item connected to our body that conveys significance are examples of artefacts. Maintaining proper attires in case of professional communication is important.

● **Chronemics:** Chronemics, is the use of time to communicate.

IV.   EFFECTIVENESS OF AI IN NONVERBAL COMMUNICATION LEARNING

In case of professional communication, like meeting, interview or presentation nonverbal communication is prioritised over verbal communication. So, to make nonverbal presentation more effective, anyone can utilise trained computing device to constantly monitor their performance in real-time; and later or in real-time they can get the feedback and suggestions from the machine to improve their presentation skill. Integration of emotional intelligence with computer vision can enhance the feedback and suggestions as it can read emotional expression while communicating. AI-based communication learning may be made portable and utilised anywhere with the development of lightweight software, mobile applications, or any web-based application. Accessible recoding of earlier communications will aid in future self-evaluation and progress reporting.

Not only in case of 'learning' of nonverbal communication AI can be utilised, but also there are several sectors related with nonverbal communication where application of AI is possible. As trained computing devices can recognise all the key components of communication, so the application of Artificial Intelligence can be extended to a new level, where a trained computer can take interview reducing human effort and it would be almost impossible to influence or manipulate the judgement taken by AI. This kind of capabilities can be integrated with different robots, so robots can understand human behaviour better.

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