A Seminar Report
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on

Emotionally Intelligent Machines & Sentiment Synthesis based on Ancient Vedic Astrology

College of Computing Sciences & Information Technology
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Moradabad

Submitted in partial fulfillment of the requirements for the degree of **Master of Technology** by

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under the guidance of
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Acceptance Certificate

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The project report entitled "Emotionally Intelligent Machines & Sentiment Synthesis based on Ancient Vedic Astrology" submitted by Mr. Mohit Singh (Enrollment No. TCA-2212005) may be accepted for being evaluated.

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-Mohit Singh
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Contents

Emotionally Intelligent Machines & Sentiment Synthesis based on Ancient Vedic Astrology

Abstract

After brain researchers have recognized that emotions are crucial for human and animal intelligence, Artificial Intelligence researchers have also started to acknowledge the importance of emotions in the design of intelligent machines. In this seminar, we will discuss about the Emotionally Intelligent Machines(EIM's) which is the new field of research in Artificial Intelligence but it has a great potential to do immense good, however the technology can be misused but it is up to the consumers of this technology who will decide whether it will be used for good or for evil. Also, Astrology has always been a controversial topic and is completely depends upto the personal faiths and beliefs of an individual. Apart from that, this paper describes that how Emotionally Intelligent Machines(EIM's) & Sentiment Synthesis Systems can be developed by using the concept of Ancient Vedic Astrology.

Keywords

Artificial Intelligence(AI), Emotional Intelligence(EI), Emotional Artificial Intelligence(EAI), Cognitive Psychology, Emotion Dynamics, Long-Short Term Memory(LSTM), Vedic Astrology.

1 Introduction

Going beyond sentiment analysis or developing such AI systems who have their own sentiments is currently not studied. However, several examples can be found where different methods are used to develop such systems that are capable of responding emotionally after analysing the sentiments from the input, such as the Emotional Speech Synthesis News Dialogue System, GAN Human Emotion Synthesis, and Emotional Chatting Machine which are discussed in this paper further, but working of all these EAI systems which are present currently is based on the logic not on the intution. If it may possible for us to make such an EAI system which works on the basis of the logic

as well as on the intution also, then the huge gaps and mismatches which are currently present in between interaction of the human and computers can be fulfilled. The AI researchers have focused on giving machines linguistic and mathematical-logical reasoning abilities, modelled after the classic linguistic and mathematical-logical intelligences. This paper describes new research that is giving machines skills of emotional intelligence. Machines have long been able to appear as if they have emotional feelings, but they are now being programmed to also learn when and how to display emotion in ways that enable them to appear empathetic or otherwise emotionally intelligent. They are now being given the ability to sense and recognize expressions of human emotion such as interest, distress, and pleasure, with the recognition that such communication is vital for helping them choose more helpful and less-aggravating behaviour. Emotionally Intelligent Machines are the systems that can recognize, interpret, process, and simulate human emotions which could be based on the concept of the ancient vedic astrology. They are the machines which can adapt different situations and knows how to handle these situations more intelligently and smartly. This paper also highlights different aspects of emotional behaviour of human beings.

2 Review of Literature

Ref. No.	Paper Title	Techniques	Findings	Year
[1]	A Concise History of Hindu Astrology and Indian Spirituality	-	Overview of Rashi, Nakshastras, Navagrahas and Dashas in Vedic Astrology	2023
[2]	The Unconscious Mind and Planetary Influences on the Human Unconscious Mind and Personality	-	Planetary Influences on Human Physiology and Psychology	2023
[3]	Predictability and Predictions	Nonlinear, Baroclinic, 3D Model of the Tropical Cyclone	Effects of Initial Conditions on Numerical Instabilities	2022

Ref. No.	Paper Title	Techniques	Findings	Year
[4]	Three Kinds of Butterfly Effects within Lorenz Models	Classical Lorenz Model	Sensitive Dependence of the Solutions of Non-Linear Differential Equations on Initial Conditions	2022
[5]	Reinforcement Learning for Emotional Text-to-Speech Synthesis with Improved Emotion Discriminability	Interactive training paradigm for Emotional Text-to-Speech Synthesis (i-ETTS)	Use of Reinforcement Learning in Sentiment Synthesis	2021
[6]	Sentiment Analysis for Emotional Speech Synthesis in a News Dialogue System	Combination of BERT and BiLSTM-CRF Models	Need and Real World Application of Sentiment Systhesis	2020

Ref. No.	Paper Title	Techniques	Findings	Year
[7]	Sentiment Analysis Based on Deep Learning: A Comparative Study	DNN, CNN, RNN and TF-IDF	Application of different types of Deep Learning Techniques on Sentiment Analysis	2020
[8]	Astrology, modernity and the project of self-identity	-	Application of Astrology in getting Self-Knowledge, Self-Determination and Encouragement of Elective Biography and Self-Identity	2020
[9]	Generative Adversarial Networks in Human Emotion Synthesis:A Review	Generative Adversarial Networks(GANs)	Working of GAN Model and Sentiment Sythesis using it	2020

Ref. No.	Paper Title	Techniques	Findings	Year
[10]	Summarizing Emotions from Text Using Plutchik's Wheel of Emotions	Psychological Model of different Human Sentiments	Sentiment Analysis using Plutchik's Wheel of Emotions	2019
[11]	The Study of Emotional Intelligence in Artificial Intelligence	-	Role of Emotional Intelligence in Artificial Intelligence and its Potential Applications	2019
[12]	Consciousness and Uncon-sciousness of Artificial Intelligence	-	Problem of Multilevel Mind in Artificial Intelligence Systems	2019
[13]	Word-level sentiment analysis with reinforce-ment learning	LSTM(WS-LSTM) Model	Application of LSTMs in Sentiment Analysis	2019

Ref. No.	Paper Title	Techniques	Findings	Year
[14]	Sentiment Intensity Ranking among Adjectives Using Sentiment Bearing Word Embeddings	Semi-Supervised Technique	Sentiment Specific Word Embeddings (SSWE) are significantly better than word2vec and GloVe	2017
[15]	Emotional Chatting Machine: Emotional Conversation Generation with Internal and External Memory	Gated Recurrent Unit(GRU)	Model can Generate Emotions as Responses	2017
[16]	Long Short-term Memory	-	Introduction to LSTM-RNN	1997

Ref. No.	Paper Title	Techniques	Findings	Year
[17]	Surya Siddhanta of Mayasura by Prof. Ram Chandra Pandey	Ancient Mathematical Techniques for Calculations of Astronomical Phenomena	Timings, Dashas and Transits in Vedic Astrology	1999
[18]	Brihat Parashar Hora Shastra of Maharishi Parashar Vol.1	-	Guidelines and Principles for Analyzing a Person's Traits, Strengths, Weaknesses	1996
[19]	Brihat Parashar Hora Shastra of Maharishi Parashar Vol.2	-	Effects of Dashas and Transits on a Person's Traits, Strengths, Weaknesses	1996

Ref. No.	Paper Title	Techniques	Findings	Year
[20]	Surya Siddhanta - Wikisource	Ancient Mathematical Techniques for Calculations of Astronomical Phenomena	Timings, Dashas and Transits in Vedic Astrology	2018
[21]	Brihat Parashara Hora Shastra - Wikisource	-	Guidelines and Principles for Analyzing a Person's Traits, Strengths, Weaknesses	2023
[22]	Geometric Series — Wikipedia	Convergence	Relation of Convergence with Human Beliefs	2022
[23]	Ramanujan summation — Wikipedia	Divergence	Relation of Divergence with Human Beliefs	2023

Ref. No.	Paper Title	Techniques	Findings	Year
[24]	Robert Plutchik — Wikipedia	Modelling of Human Emotions on the Basis of Psychology	Relationship Between Different Kinds of Human Emotions	2023
[25]	Emotion Dynamics - Equations of Emotion	Modelling of Human Emotions on the Basis of Analogy	Analogy of Human Mind with an Electrical Dynamical System	2017

In 2023, Martins, Paulo in their paper "A Concise History of Hindu Astrology and Indian Spirituality" provides a concise history of Hindu astrology and its symbolism present in its spirituality which is transversal to all cultures. They also mentioned the foundations and main conceptions of Hindu astrology, namely Rasi, Nakshastra, Navagrahas, Bhava, Dashas [1].

In 2023, Bhardwaj, Rishi and Pareek, Aditya in their paper "The Unconscious Mind and Planetary Influences on the Human Unconscious Mind and Personality" discusses the concept of the unconscious mind and its importance in psychology. The authors argue that the unconscious mind is not separate from the rest of the universe and that there is a connection between the human unconscious and the universal unconscious. They also discuss the impact of planetary vibrations on the huma physiology as well as on human psychology [2].

In 2022, Anthes, Richard A. in their paper "Predictability and Predictions"

describes their experiences with predictability theory and weather predictions. The author classified the development of mesoscale weather systems into two types: those resulting from forcing by surface inhomogeneities and those resulting from internal modifications of large-scale flow patterns. The author also developed a nonlinear, baroclinic, three-dimensional model of the tropical cyclone and suffered through various forms of numerical and physical instabilities. The numerical instabilities could be controlled by suitable choices of finite difference schemes and various damping or smoothing mechanisms, but physical instabilities persisted and resulted in the evolution of somewhat realistic mesoscale features such as rainbands and eddies on the outflow layer that were not present in the initial conditions [3].

In 2022, Shen, Bo-Wen and Pielke, Roger A. and Zeng, Xubin and Cui, Jialin and Faghih-Naini, Sara and Paxson, Wei and Atlas, Robert in their paper "Three Kinds of Butterfly Effects within Lorenz Models" discussed about the three major kinds of butterfly effects within Lorenz models: (1) butterfly effects of the first kind (BE1) represent the sensitive dependence of solutions on initial conditions (SDIC); (2) butterfly effects of the second kind (BE2) represent the hypothetical role of initial tiny perturbations in producing an organized large-scale system at large distances; and (3) butterfly effects of the third kind (BE3), or the so-called real butterfly effect, represent the role of small scale processes in contributing to the finite predictability of large scale processes. The paper also provides a brief summary of the three kinds of butterfly effects and their differences. Additionally, the paper discusses the features of classical Lorenz models and a generalized Lorenz model [4].

In 2021, Rui Liu and Berrak Sisman and Haizhou Li in their paper "Reinforcement Learning for Emotional Text-to-Speech Synthesis with Improved Emotion Discriminability" proposes a new interactive training paradigm for Emotional Text-to-Speech Synthesis (ETTS) called i-ETTS, which aims to improve the emotion discriminability of the generated voice by interacting with a Speech Emotion Recognition (SER) model. The proposed i-ETTS outperforms the state-of-the-art baselines by rendering speech with more accurate emotion style. The authors formulate an iterative training strategy with reinforcement learning to ensure the quality of i-ETTS optimization. The proposed i-ETTS achieves remarkable performance by consistently outperforming the ETTS baseline systems in terms of voice quality and emotion discriminability [5].

In 2020, Takatsu, Hiroaki and Ando, Ryota and Matsuyama, Yoichi and Kobayashi, Tetsunori in their paper "Sentiment Analysis for Emotional Speech Synthesis in a News Dialogue System" proposes a method to control emotional parameters of speech synthesis in a news dialogue system by constructing a news dataset with emotion labels annotated for each sentence. They use a model combining BERT and BiLSTM-CRF to identify emotion labels and evaluate its effectiveness using the constructed dataset. The model performance can be improved by preferentially annotating articles with low confidence in the human-in-the-loop machine learning framework. The future work includes developing a speech synthesis system that can control emotional parameters using the emotion label estimated by the proposed model and confirming whether speaking with emotion promotes users' understanding in news delivery tasks [6].

In 2020, Dang, Nhan Cach and Moreno-García, María N. and De la Prieta, Fernando in their paper "Sentiment Analysis Based on Deep Learning: A Comparative Study" discusses the use of deep learning models for sentiment analysis on social network data. The authors review the latest studies that have employed deep learning to solve sentiment analysis problems, such as sentiment polarity. They used word embedding and TF-IDF to transform input data before feeding that data into deep learning models. The architectures of DNN, CNN, and RNN were analyzed and combined with word embedding and TF-IDF to perform sentiment analysis. The authors conducted experiments to evaluate DNN, CNN, and RNN models on datasets of different topics, including tweets and reviews. Finally, a comparative study has been conducted on the experimental results obtained for the different models and input features [7].

In 2020, Paul Clements in their paper "Astrology, modernity and the project of self-identity" discusses Western and UK astrology as a fluid divinatory practice that accommodates modern, linear, and literal symbolism while still retaining its pre-modern 'magical' roots. It offers a spiritual understanding, self-knowledge, and self-determination, and encourages elective biography and self-identity. The practice of astrology today is a permutation of esoteric, individual DIY, and sun-sign formats, which offers multiple levels of engagement, from everyday meanings to more personal and philosophical insights. The astrologer mediates psychic hunches embedded in learnt craft, and it grounded some of the ideas presented, including the difficult choices surrounding individual definition and responsibility. The paper concludes that astrology embeds a spiritual outlook that co-exists with profane individualism and materiality highlighting

dissonant modernity [8].

In 2020, Hajarolasvadi, Noushin and Arjona Ramírez, Miguel and Demirel, Hasan in their paper "Generative Adversarial Networks in Human Emotion Synthesis:A Review" reviews recent advances in human emotion synthesis using generative adversarial network (GAN) models. GAN models consist of a generator and a discriminator, which are trained iteratively in an adversarial learning manner, approaching Nash equilibrium. The core idea of GANs is based on a zero-sum game in game theory. Instead of estimating the distribution of real data samples, GANs learn to synthesize samples that adapt to the distribution of real data samples. The paper discusses facial expression synthesis, speech emotion synthesis, and audio-visual (cross-modal) emotion synthesis under different application scenarios. The authors also highlight open research problems to push the boundaries of this research area for future works [9].

In 2019, Abbasi, Mohsin and Beltiukov, Anatoly in their paper "Summarizing Emotions from Text Using Plutchik's Wheel of Emotions" discusses the analysis of emotions expressed by people on the internet using Plutchik's wheel of emotions. The wheel is used as a tool to identify and summarize emotions to their primary classes. The methodology involves allocating a weight to each emotion depending on the class it belongs to and its distance from the center of the wheel. These weights are then multiplied by the frequencies of emotions in text to identify their intensity level. The intensity of each emotion is summed up with the intensity of its primary emotion while summarizing it. The paper concludes that the methodology effectively summarizes emotions in the text, but neutral emotions and feelings described in Plutchik's wheel of emotion complicate the process of summarization. In future, the authors plan to propose a mechanism to avoid complications while summarizing neutral emotions [10].

In 2019, Sahiti S. Magapu, Sashank Vaddiparty in their paper "The Study of Emotional Intelligence in Artificial Intelligence" discusses the role of Emotional Intelligence in Artificial Intelligence and its potential applications in various fields such as healthcare, education, consultation, and construction. The use of Emotional Artificial Intelligence can help machines to better understand and respond to human emotions, which can lead to more advanced solutions to complicated problems. It can also help to close the barriers between humans and machines, providing new opportunities for equal treatment. The conclusion of the paper is that the use of Emotional Artificial Intelligence gives a

much more profound view on how machines can help humans compared to traditional AI today [11].

In 2019, Piletsky, Eugene in their paper "Consciousness and Unconsciousness of Artificial Intelligence" discusses the need to understand the problem of multilevel mind in artificial intelligence systems. It proposes that consciousness and the unconscious are not equal in natural mental processes and that the alleged mental activity of Artificial Intelligence may be devoid of the evolutionary characteristics of the human mind. The paper presents several scenarios for the possible development of a 'strong' AI through the prism of creation (or evolution) of the machine unconscious. It also proposes two opposite approaches regarding the relationship between the unconscious and the conscious. The conclusion raises interesting questions about whether a machine can have a phenomenal experience or something remotely resembling it, and whether there is a fundamental difference between the imitation of rational behavior and the rational behavior itself [12].

In 2019, Chen, Ruiqi and Zhou, Yanquan and Zhang, Liujie and Duan, Xiuyu in their paper "Word-level sentiment analysis with reinforcement learning" proposes a new framework named Word-level Sentiment LSTM (WS-LSTM) that uses reinforcement learning to realize text sentiment analysis. The framework uses three different LSTM tunnels for each action (Positive, Neutral, and Negative) to get sentiment tendency for each word in a sentence. The model can get word-level sentiment sequence with a relatively good result through reinforcement learning. The conclusion of the paper is that the proposed method can successfully combine text sentiment analysis with reinforcement learning and can get sentiment for each word in a specific task [13].

In 2017, Sharma, Raksha and Somani, Arpan and Kumar, Lakshya and Bhattacharyya, Pushpak in their paper "Sentiment Intensity Ranking among Adjectives Using Sentiment Bearing Word Embeddings" proposes a semi-supervised technique that uses sentiment bearing word embeddings to produce a continuous ranking among adjectives that share common semantics. The system demonstrates a strong Spearman's rank correlation of 0.83 with the gold standard ranking. The use of sentiment embeddings reduces the need for sentiment lexicon for identification of polarity orientation of words. Results show that Sentiment Specific Word Embeddings (SSWE) are significantly better than word2vec and GloVe, which do not capture sentiment information of words for intensity ranking task. The sentiment intensity information of words can be

used in various NLP applications, for example, star-rating prediction, normalization of over-expressed or under-expressed texts, etc [14].

In 2017, Zhou, Hao and Huang, Minlie and Zhang, Tianyang and Zhu, Xiaoyan and Liu, Bing in their paper "Emotional Chatting Machine: Emotional Conversation Generation with Internal and External Memory" proposes Emotional Chatting Machine (ECM) that can generate appropriate responses not only in content but also in emotion. The model addresses the emotion factor using three new mechanisms that respectively (1) models the high-level abstraction of emotion expressions by embedding emotion categories, (2) captures the change of implicit internal emotion states, and (3) uses explicit emotion expressions with an external emotion vocabulary. The proposed model can generate responses appropriate not only in content but also in emotion, as shown by objective and manual evaluation [15].

In 1997, Hochreiter, Sepp and Schmidhuber, Jürgen showed in their paper "Long Short-term Memory" introduces a novel, efficient, gradient-based method called Long Short-Term Memory (LSTM) to solve long time lag problems. LSTM is local in space and time, its computational complexity per time step and weight is O(1). Each memory cell's internal architecture guarantees constant error flow within its constant error carrousel (CEC), provided that truncated backprop cuts off error flow trying to leak out of memory cells. Two gate units learn to open and close access to error flow within each memory cell's CEC. The multiplicative input gate affords protection of the CEC from perturbation by irrelevant inputs. Likewise, the multiplicative output gate protects other units from perturbation by currently irrelevant memory contents [16].

Surya Siddhanta is a significant ancient mathematical text in Vedic Astrology and Astronomy. It is believed to have been written around the 4th or 5th century CE, although some scholars date it as early as 200 BCE. The text contains detailed calculations of astronomical phenomena, such as the movements of the planets, eclipses, equinoxes, planetary positions, and timekeeping methods.It also contains formulas and algorithms for the Earth's axial tilt, the length of the solar year, and other astronomical parameters. It describes various instruments and techniques used for observing and predicting celestial events [17,20].

The Brihat Parashara Hora Shastra is one of the most important and comprehensive texts in Vedic astrology. It is considered one of the foundational

texts in Vedic astrology, also known as Jyotish. The word "Hora" refers to the branch of astrology that deals with the interpretation of planetary positions and their effects on individuals and events. The text provides detailed guidelines and principles for analyzing a person's horoscope to determine their personality traits, strengths, weaknesses, and future prospects. It explores topics such as the significance of the twelve houses, the nature and characteristics of the nine planets (including the Sun, Moon, Mars, Mercury, Jupiter, Venus, Saturn, Rahu, and Ketu), and the impact of planetary periods (dashas) on a person's life. The Brihat Parashara Hora Shastra is highly revered among astrologers and is studied and referenced extensively for astrological predictions and consultations. It is a comprehensive guide that offers insights into the principles and practices of Vedic astrology, helping practitioners gain a deeper understanding of the cosmic influences on human life [18, 19, 21].

An article on wikipedia gives an example of a geometric series that converges absolutely. This infinite series is related to some philosophical questions considered in antiquity, particularly to Zeno's paradoxes. It can be very useful in understanding the relationship between the belief systems of human mind and concept of convergence which is one the very important concept in the theories of dynamical systems, control systems and artificial neural networks. [22].

Ramanujan summation is an infinite divergent series which is a technique invented by the mathematician Srinivasa Ramanujan for assigning a value to divergent infinite series. Although the Ramanujan summation of a divergent series is not a sum in the traditional sense, it has properties that make it mathematically useful in the study of divergent infinite series, for which conventional summation is undefined [23].

In 1980, Robert Plutchik proposed a psychoevolutionary classification approach for general emotional responses. He considered there to be eight primary emotions—anger, fear, sadness, disgust, surprise, anticipation, trust, and joy and discussed about the bipolar relationship between them. He also created a wheel of emotions to illustrate different emotions which is known as the Plutchik's Wheel of Emotions [24].

In 2017, Jon Miles published a blog on his website. In this blog named emotion dynamics or equation of emotions, he discussed about the mathematical modelling of human sentiments and different states of human mind which

is based on the analogy of human mind with an electrical dynamical system. According to his blog, the three phenomenas of mind, craving, anger and attachment are related to each other as like the inductance, resistance and capacitance in an electrical network by a second order ordinary linear differential equation [25].

3 Conclusion & Outlook

The human mind is a very complex dynamical system that evolves over time in responses to the various inputs from the environment. The more we attempt to understand it deeply, the more we find ourselves entangled in questions. However, this pursuit provides us with new knowledge that leads to innovation and presents numerous challenges. The study of the human mind has been instrumental in the birth of artificial intelligence (AI), but there still exists a significant difference between AI and the human mind. To bridge this gap, psychology and Vedic astrology can play a crucial role, and by leveraging these theories, intuition-based AI systems could be developed in the future.

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