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**Dissertation Proposal Form**

**Date of Submission: 2024/06/03**

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| **Name** | Pawan Agrahari |
| **Student Id** | 230277162 |
| **Module Code** | COM7040M |
| **Project Title** | Emotion Detection System Using Python. |
| **Supervisor Name** | Dr. Soonleh Ling |
| **Supervisor Approval** | Yes |
| **Supervisor Signature** |  |

**Section 1: Academic**

*This section helps Academic staff assess the viability of your project. It also helps identify the most appropriate supervisor for your proposed research. This proposal will be referred to as a point of discussion by your supervisor in seminar sessions.*

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| **NAME:** Pawan Agrahari | **STUDENT NUMBER:** 230277162 | | | | |
| **PROPOSED TITLE OF PROJECT:**  Emotion Detection system using python | | | | | |
| **BRIEFLY DESCRIBE YOUR FIELD OF STUDY:**  Emotion identification, or emotion detection, is the process of determining human emotions from a variety of data sources, including text, audio, video, and physiological signs. This project will use Python to build an emotion detection system with an emphasis on text and facial expression analysis.    **1. Overview**  Systems for detecting emotions use input interpretation to classify a range of emotions, such as neutrality, fear, surprise, anger, sadness, and happy. These systems are very useful in many different areas, including social media analysis, customer service, mental health monitoring, and human-computer interaction.  The primary aim of an emotion detection system using Python is to accurately identify and classify human emotions from different data inputs, such as text, facial expressions to enhance human-computer interactions and provide valuable insights in various applications. The specific objectives can be outlined as follows:  Improving Human-Computer Interaction:  - Create systems that can react to users' emotions in a compassionate manner. - Improve user experience by developing apps that are more emotionally aware and intuitive.    Monitoring mental health:  - Assist in the early identification and observation of emotional and psychological disorders.  Provide consumers with emotional input in real-time; this is useful for tracking one's own mental health or in therapeutic situations.   Customer support and service:  - Give customer support bots the ability to identify and react to customers' emotions in a suitable manner.  - Enhance client happiness by personalizing responses in accordance with identified emotional states.   Social media and Marketing Analysis:  - Examine user opinions on social media sites to determine the general consensus.  - By learning about the feelings and preferences of your customers, you can enable tailored advertising.  Tools for Education:  - Create educational software that can adjust to students' emotional states to improve their learning experiences.  Entertainment Industry:  - Develop emotionally-responsive, adaptive gaming experiences. - Improve methods for suggesting content by taking into account the emotional responses of viewers.  **Data Science**  Data science is an interdisciplinary field that takes advantage of scientific systems, algorithms, and procedures to draw conclusions and knowledge out of both structured and unstructured data. To find patterns, forecast outcomes, and aid in decision-making, it combines knowledge from domain-specific fields with proficiency in computer science, machine learning, statistics, and artificial intelligence.  In the betting industry, data science models can analyse historical betting data to detect patterns and trends. Predictive analytics enables the industry to forecast outcomes, set odds, and make informed decisions about betting markets. Data-driven models consider historical data, current market conditions, and other relevant factors to optimize odds and payouts, ensuring that the betting platform offers competitive and accurate odds. Additionally, data science techniques such as anomaly detection and pattern recognition are used to identify fraudulent activities and enhance security. | | | | | |
| **WHAT QUESTION DOES YOUR PROJECT SEEK TO ANSWER?**  An emotion detection system can address a wide range of problems across various domains by identifying and interpreting human emotions from various data inputs. The facial emotion detection and recognition module is trained using a supervised learning approach in which it takes images of different facial expressions like anger, disgust, fear, happiness, neutral, sad, and surprise. The system includes the training and testing phase followed by image acquisition, face detection, image preprocessing, feature extraction, and emotion classification. Face detection and feature extraction are carried out from face images and classified into seven emotion classes. Some key problems that can be solved using such a system are:  **Enhancement of Customer Service** Issue: Poor replies from customer service that leave customers unhappy. Remedy: A real-time emotion detection technology enables customer care representatives to customize their interactions and offer compassionate assistance by assessing the customer's feelings. Customer satisfaction and retention may increase as a result.  **2. Mental Health Monitoring Issue:**  Difficulty in Identifying and Tracking Mental Health Problems Early. Solution: Emotion detection systems can detect indications of sadness, anxiety, or other mental health issues by evaluating speech patterns or text (such as social media posts), allowing for rapid intervention.  **3. Enhanced User Experience in Applications**  Issue: Applications can't adjust to the feelings of the user.  Remedy: By adjusting material or functionality according to the user's present emotional state, emotion detection systems can enhance user engagement by making apps more interactive and responsive. | | | | | |
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| **WHAT ARE THE PROBABLE PROJECT OUTCOMES?**  The project outcome of an emotion detection system using Python can be evaluated in a number of ways, depending on the precise objectives and application areas. It will distinguish the mood of any human being by expression expressed by him/her like angry, happy, neutral, sad, fear, surprise and disgust. Below are some expected outcomes for such a project:  **1. Technical Outcomes**  Emotion Classification Model:  A strong model that can recognize emotions from text, audio, and facial expressions with accuracy.  Evaluation criteria that show how well the model performs include accuracy, precision, recall, and F1-score.  Multimodal Emotion Detection:  Integration of several data sources (text, video, and audio, for example) to enable thorough emotion identification.  Increased robustness and accuracy by combining several data modalities.  Real-Time Processing Capability:  Able to process and categorize emotions in real time system; ideal for applications that need quick response. | | | | | |
| **PLEASE PROVIDE A BRIEF BIBLIOGRPAHY OF 2-4 KEY TEXTS FOR YOUR STUDY (USE HARVARD REFERENCE STYLE)**   1. Ekman, P., & Friesen, W. V. (1971). Constants across cultures in the face and emotion. 2. Kim, J., & Provost, E. M. (2013). Emotion recognition during speech using hidden Markov models. 3. Devlin, J., Chang, M. W., Lee, K., & Toutanova, K. (2018). BERT: Pre-training of Deep Bidirectional Transformers for Language Understanding. 4. ​​Dhavalikar, A. S. & Kulkarni, R. K., 2014. Face Detection and Facial Expression Recognition System. *International Conference on Electronics, Circuits and Systems,* 1(7). | | | | | |
| **PLEASE NAME ANY MEMBER OF THE ACADEMIC TEAM YOU HAVE DISCUSSED THIS POTENTIAL PROJECT:**  NA | | | | | |
| ***(staff use only) Project Approved by Academic Team?*** | | YES |  | NO |  |
| *Any other Academic Staff comments*  ***Student did not provide sufficient evidence that he understands the project scope, timeline, technical details, problems, deliverables, etc.***  ***Student did not book meeting to finalise RP. Student was not responsive and did not follow the instructions from supervisor.*** | | | | | |

**Section 2: Technical**

*This section is designed to help the technical team ensure the appropriate equipment to support each project has been ordered. It also exists to help you fully ascertain the technical requirements of your proposed project. In filling out this section please note that we do not ‘buy’ major items of equipment for student projects. However, if a piece of equipment has a use to the department beyond the scope of a single project, we will consider purchasing it. Though purchasing equipment through the university is often a slow process.*

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| **PLEASE DESCRIBE YOUR PROJECT IN TECHNICAL TERMS:**  In order to classify human emotions from text, speech inputs, and face expressions, the Emotion Detection System project combines natural language processing (NLP), computer vision, and audio signal processing techniques. Utilizing pre-trained transformers from the Hugging Face library, the system performs text-based sentiment analysis, detects facial landmarks using OpenCV and dlib, and recognizes emotions in images using convolutional neural networks (CNNs). Recurrent neural networks (RNNs) like LSTMs are used by the system to analyze speech patterns and extract audio features for voice-based emotion identification. With the use of cutting-edge machine learning algorithms, the research unifies several multimodal data sources into a single framework and achieves high classification accuracy for emotions. Model evaluation measures are used to measure performance, including accuracy, recall, F1-score, and confusion matrices.  **System Architecture**    Figure 1: Block diagram of Emotion detection system.  **System Diagram**      Figure 2: System Diagram.  **System Flowchart**    Figure 3: Model Training Flowchart    Figure 4: Model Testing Flowchart.  There are two categories for the input photographs here: o Training images. o Examining pictures. For classifier training, training photos are utilized. Verification of the algorithm is done by testing photos, which are used to forecast various facial emotions. Emotion detection mostly involves expression analysis, which is used to categorize various emotions using a schematic approach.  **The following tools are used in the emotion detection system using python project:**  1. NLTK (Natural Language Toolkit): A comprehensive library for natural language processing tasks.  Tokenization, stemming, lemmatization  Sentiment analysis  Example: nltk.sentiment.vader  2. spaCy: An advanced library for NLP tasks, known for its speed and accuracy.  Tokenization, part-of-speech tagging, named entity recognition  Example: spacy.load('en\_core\_web\_sm')  3. TextBlob: Simplified text processing, providing a consistent API for diving into common NLP tasks.  Sentiment analysis, noun phrase extraction, translation  Example: TextBlob("Your text").sentiment  Machine Learning Libraries  4. scikit-learn: A versatile library for machine learning.  Preprocessing, model selection, evaluation  Example: from sklearn.feature\_extraction.text import CountVectorizer  5. TensorFlow and Keras: Libraries for building and training deep learning models.  Example: from tensorflow.keras.models import Sequential  6. PyTorch: An alternative to TensorFlow, preferred for dynamic computation graphs.  Example: import torch.nn as nn  Data Processing and Visualization  7. Pandas: Essential for data manipulation and analysis.  Example: import pandas as pd  8. NumPy: Core library for numerical computations.  Example: import numpy as np  9. Matplotlib/Seaborn: Libraries for data visualization.  Example: import matplotlib.pyplot as plt  10. Pre-trained Models and APIs  Transformers by Hugging Face: A library providing state-of-the-art pre-trained models for NLP.  Example: from transformers import pipeline  Pre-trained models like BERT, GPT, RoBERTa can be used for emotion detection.  **PROJECT TIMELINE**   |  |  |  |  | | --- | --- | --- | --- | | **Task** | **Start Date** | **End Date** | **Duration (weeks)** | | Project Planning and Setup | 2024-05-15 | 2024/05/29 | 2 | | Data Collection | 2024/05/30 | 2024/06/15 | 3 | | Data Preprocessing | 2024/06/16 | 2024/07/05 | 3 | | Feature Extraction | 2024/07/06 | 2024/08/04 | 4 | | Model Selection and Training | 2024/08/05 | 2024/09/28 | 7 | | Model Evaluation | 2024/09/29 | 2024/10/20 | 3 | | Model Optimization | 2024/10/21 | 2024/11/01 | 2 | | Testing and Validation | 2024/11/02 | 2024/11/17 | 2 | | Documentation and Reporting | 2024/11/18 | 2024/12/10 | 3 | | Final Review and Adjustments | 2024/12/11 | 2024/12/19 | 1 | | | | | |
| **WHAT EXISTING LAB EQUIPMENT DO YOU NEED ACCESS TO UNDERTAKE YOUR PROPOSED PROJECT:**  Computer systems, Virtual machines. | | | | |
| **PLEASE LIST ANY MINOR EQUIPMENT YOU MUST PURCHASE TO COMPLETE YOUR RESEARCH PROJECT: (computer with camera)**  NA | | | | |
| **PLEASE LIST ANY MAJOR EQUIPMENT YOU REQUIRE TO COMPLETE YOUR RESEARCH PROJECT ALONG WITH LINKS TO WHERE IT MAY BE PURCHASED (eg a Drone, mobile phone etc).**  NA | | | | |
| **HAVE YOU DISCUSSED THE FEESIBILITY OF YOUR PROJECT WITH A MEMBER OF THE TECHNICAL TEAM? IF SO, WHO?**  NO | | | | |
| ***(staff use only) Project Approved by Technical Team?*** | YES |  | NO |  |
| Please comment on the Feasibility of the project:  ***Student did not provide sufficient evidence that he understands the project scope, timeline, technical details, problems, deliverables, etc.***  ***Student did not book meeting to finalise RP. Student was not responsive and did not follow the instructions from supervisor.*** | | | | |

**Section 3: Ethics Approval**

*This section of the form will help ascertain if you need to complete and undergo the universities research ethics approval process. Please answer all questions honestly.*

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| **Question** | **Yes** | **No** |
| **Does your Research involve any of the following?**  **Human participants / subjects, Human tissue, Documents** |  | **Badge Tick1 outline** |
| **Will the research require the collection of primary source material that might be considered offensive or illegal to access or hold on a computer? (e.g. studies related to state security, pornography, abuse, illegal behaviour, or terrorism).** |  | **Badge Tick1 outline** |
| **Does your research concern group which may be construed as terrorist or extremist?** |  | **Badge Tick1 outline** |
| **Will the research involve visual/vocal methods where participants may be identified?** |  | **Badge Tick1 outline** |
| **Will the research involve the use of genetic data (inherited/acquired genetic characteristics resulting from the analysis of a biological sample)?** |  | **Badge Tick1 outline** |
| **Will the study require the co-operation of a gatekeeper to give access to, or to help recruit, participants? (eg, headteacher or group leaders publicising your work)** |  | **Badge Tick1 outline** |
| **Will it be necessary for participants to take part in the study without their knowledge or consent at the time?** |  | **Badge Tick1 outline** |
| **Will the study involve recruitment of patients through the NHS?** |  | **Badge Tick1 outline** |
| **Will inducements be offered to participants? (eg the offer of being entered into a prize draw)** |  | **Badge Tick1 outline** |
| **Does the study involve participants who are particularly vulnerable or unable to give informed consent? (e.g. participants under 18. Adults with learning disabilities, the frail elderly, or anyone who may be easily coerced due to lack of capacity)** |  | **Badge Tick1 outline** |
| **Is there a possibility that the safety of the researcher may be in question?** |  | **Badge Tick1 outline** |
| **Will the study require participants to commit extensive time to the study?** |  | **Badge Tick1 outline** |
| **Are drugs, placebos, or any other substances to be administered to participants, or will the study involve invasive, intrusive, or potentially harmful procedures of any kind?** |  | **Badge Tick1 outline** |
| **If there are experimental and control groups, will being in one group disadvantage participants?** |  | **Badge Tick1 outline** |
| **Is an extensive degree of exercise or physical exertion involved?** |  | **Badge Tick1 outline** |
| **Will blood or tissue samples be obtained from participants?** |  | **Badge Tick1 outline** |
| **Could the study induce psychological stress or anxiety or cause harm or negative consequences beyond the risks encountered in normal life?** |  | **Badge Tick1 outline** |

*This part of Section 3 requires you to thoroughly* ***identify*** *and* ***mitigate*** *the ethical challenges of your research project. This is required to enable the computer Science ethics panel to properly consider if your proposed project requires you to submit a formal proposal to the university ethics panel.*

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| **With your answers to the previous questions in mind, please describe the main ethical challenges of your research project and how you propose to mitigate them. Your discussion may include material not covered in the above questions. Please be as through as possible:**  N/A |