**Research Review and Project Proposal Worksheet**

**Team Name:** CDS09

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**Research Topic:** Detecting Mental Health Through Screenings and Chatbot Interventions

**Section 1: Research Summary**

**1. Research Summary**

Provide a concise summary of your research topic, including the main objectives and scope.

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| **Research Summary**  We live in a world where many people struggle with their feelings and thoughts, causing mental health issues like anxiety, sadness, or stress. It's crucial to find ways to help them feel better. We're working on a special computer system that can help with this. It asks people questions to understand how they're feeling and offers advice that fits them. It also has a friendly computer friend you can chat with, called a chatbot. This friend talks to people and tries to make them feel better.  **Objectives**   * **Make a Helpful Questionnaire:**   Create a simple set of questions on a website to understand how someone is feeling emotionally.  Ask different questions based on how old someone is and what they like, like their favorite music or food.   * **Use Clever Computers to Understand:**   Use smart computer programs to understand if someone might be going through a tough time mentally.  Give scores based on the answers to figure out how someone is doing emotionally.   * **Create a Friendly Chatbot:**   Make a computer friend that can talk to people in a way that matches how they're feeling.  If someone is sad, the chatbot will talk in a caring way to make them feel better.  **Scope**  Our research focuses on creating a friendly computer system that uses questions and friendly chats to help people with their feelings. It wants to use smart computers to understand emotions and give advice that can make people feel better. This system is meant to be easy to use and safe, so everyone can use it and feel a little better. |

**2. Key Findings and Insights**

List the most significant findings and insights from your literature review. Include relevant citations.

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| **Paper name** : Assessment and Prediction of Depression and Anxiety Risk Factors in Schoolchildren: Machine Learning Techniques Performance Analysis.   * The paper "Assessment and Prediction of Depression and Anxiety Risk Factors in Schoolchildren: Machine Learning Techniques Performance Analysis" aimed to develop a machine learning model to assess and predict depression and anxiety risk factors in schoolchildren. The study used a cross-sectional design and included a total of 1,138 schoolchildren from the West Bank area of Palestine.   **Paper name :** predicting Anxiety, Depression and Stress in Modern Life using Machine Learning Algorithms   * The study found that machine learning algorithms can be used to accurately predict anxiety, depression, and stress levels in individuals based on their demographic information and lifestyle factors such as exercise habits and social media usage. * The Random Forest algorithm was found to be the most accurate in predicting anxiety, depression, and stress levels, followed by the Support Vector Machine algorithm and the K-Nearest Neighbor algorithm. * The study found that demographic factors such as age, gender, and education level were important predictors of anxiety, depression, and stress levels, while lifestyle factors such as social media usage and exercise habits also had a significant impact on an individual's mental health.   **Paper Name**: A Review of Generalizable Transfer Learning in Automatic Emotion Recognition Kexin Feng\* and Theodora Chaspari .   * Transfer learning is a promising approach for improving the generalizability of automatic emotion recognition systems. By leveraging knowledge learned from one domain to improve performance in another, transfer learning can help overcome the problem of data scarcity and variability in emotion recognition. * Pre-training on large-scale datasets using deep learning architectures like Convolutional Neural Networks (CNNs) and Recurrent Neural Networks (RNNs) has shown to be effective for improving transfer learning performance. These pretrained models can be fine-tuned on smaller emotion-specific datasets to achieve better results. * Domain adaptation methods, which aim to adapt the pre-trained models to the target domain, can also improve transfer learning performance. These methods include adversarial training, domain confusion, and model adaptation techniques. * Despite the progress made in transfer learning for automatic emotion recognition, there are still several challenges that need to be addressed, including the lack of standardization in dataset collection and annotation, the need for more diverse and representative datasets, and the development of more effective domain adaptation techniques. |

**3. Research Gaps**

Identify gaps or areas in the existing research that your project aims to address. Explain why these gaps are significant.

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| * We noticed a few missing pieces in how mental health is currently assessed and supported. First, there's a problem with how expensive and not easy to reach the help is for many people. We want to make it cheaper and more accessible by using technology. * Secondly, current ways of figuring out if someone needs mental health help often only look at a small part of their life, like answering questions. We want to look at a person's whole life, like what music they like or how they eat, to get a better idea of how they're doing mentally. * Lastly, we noticed that when people do reach out for help, the responses they get often feel generic and not really understanding of how they feel. We want to change that by creating a system where the responses are more personal and supportive, matching how the person feels. * By fixing these issues, we hope to make mental health help better and more comfortable for everyone. |

**Section 2: Project Proposal**

**4. Project Title**

Propose a descriptive and catchy title for your project.

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| **Detecting Mental Health Through Screenings and Chatbot Interventions** |

**5. Project Objectives**

List specific and measurable objectives that your project aims to achieve.

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| 1. Gathering structured, and unstructured files and storing them in a database   Collecting the required information and arranging it accordingly. Cleaning and processing the files according to the requirements.   1. Develop a Comprehensive Mental Health Questionnaire:   Create a web-based questionnaire that covers various aspects of mental well-being. Starts with brief mental health questions that cover every aspect, and moves to in-depth analysis which includes screen time analysis, food analysis, physical activity, facial recognition, and detection through songs.  Detecting health disorders such as depression, stress, anxiety, bipolar disorder, ocd questions.  Measure its effectiveness in gathering essential mental health insights.   1. Implement Machine Learning Algorithms for Assessment:   Utilize machine learning algorithms to analyze the questionnaire responses and assess potential mental health challenges.  Achieve an accuracy rate of at least 85% in identifying mental health conditions.  Identifying the main problem of the user and providing the necessary details to overcome it.   1. Design and Train an Empathetic Chatbot:   Develop a chatbot that adapts its responses based on the user's emotional state, detected either through text or other indicators.  Measure the chatbot's effectiveness in providing appropriate and empathetic responses, targeting a user satisfaction rate of 90%.   1. Conduct Thorough Testing and Validation:   Conduct extensive testing of the system, including user experience testing and diagnostic accuracy validation.  Ensure a minimum of 100 users participate in the testing phase to gather diverse feedback and validate the system's functionality.   1. Facilitate Accessibility and Affordability:   Ensure the system is accessible to a wide range of users, including those with limited technology literacy.  Maintain the cost of system free ensuring affordability for a broader user base. |

**6. Target Audience**

Describe the intended audience or users of your project. Include demographics and user needs.

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| * The intended audience for our mental health project includes individuals aged 18-65, encompassing a wide demographic range. * We aim to cater to those struggling with mental health issues such as anxiety, depression, stress, OCD, bipolar disorder, and social anxiety. * Our system addresses the needs of people who might find it difficult to express their emotions openly or seek professional help due to various reasons, including stigma or financial constraints. * The users we target are tech-savvy and comfortable with using web-based platforms and mobile applications. * They seek a confidential, accessible, and affordable way to assess their mental well-being and receive emotional support, which our interactive chatbot can provide in a personalized and empathetic manner. |

**7. Problem Statement**

Clearly define the problem your project seeks to solve. Explain its significance.

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| Promoting and maintaining positive mental health has become an imperative global concern in today's world. Across the globe, countless individuals grapple with a spectrum of mental health challenges, encompassing anxiety, depression, OCD, Bipolar Disorder, stress, eating disorders, and the pressures of work and education. Addressing this issue is paramount, necessitating the implementation of ongoing initiatives to alleviate the prevalence of mental health issues. As these disorders continue to impact people's well-being, the integration of technology for effective assessment and support emerges as a pivotal strategy.  Conventional methods of mental health evaluation contend with significant obstacles, including societal stigmatization, financial implications, and accessibility limitations. In response, our innovative system stands as a cost-effective, digitally-driven solution, where user privacy is upheld. Our system orchestrates a comprehensive screening process to meticulously analyse the user's concerns and offer tailored resolutions. Moreover, it incorporates an interactive chatbot to provide essential emotional support.  The system efficiently gathers diverse data, encompassing unstructured files, refined datasets, questionnaires, and data from APIs, all stored within a dedicated database to facilitate prediction modelling. The process commences with a streamlined web-based questionnaire, known as the BRIEF MENTAL HEALTH SCREENING, designed to furnish users with insights into their mental well-being. Through machine learning algorithms, the system assesses whether individuals might be grappling with mental health issues. For users seeking specific insights into potential disorders, an in-depth analysis is initiated. Age-specific queries guide this phase, detecting mental health will be done by novel indicators like musical preferences, dietary habits, facial recognition, and screen time. After identifying mental illness battery of screenings to detect specific disorder such as depression, anxiety, stress, social anxiety, bipolar disorder, OCD will take place. A cumulative score synthesized from these assessments culminates in a holistic understanding of the user's situation.  Post-diagnosis, our system extends its support further by offering an interaction platform with an emotionally attuned chatbot. This dynamic chatbot adapts its responses to align with the user's emotional state, providing an empathetic and personalized interaction. Whether the user is in distress or feeling down, the chatbot's responses mirror their emotional disposition, fostering a sense of confidence and encouragement. By adopting an all-encompassing methodology, our system strives to comprehensively address mental health challenges, sparing no effort to enhance well-being. |

**8. Solution Overview**

Provide an overview of the proposed solution, including its novelty and how it addresses the problem.

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| Our proposed solution is a pioneering digital platform, purpose-built to transform the way we approach mental health assessment and support. It ingeniously amalgamates sophisticated technology, including machine learning algorithms and an empathetic chatbot, to deliver a holistic approach to addressing mental health challenges.  **Novelty and Innovation:**  Comprehensive Mental Health Assessment:   * Our platform employs a sophisticated and user-friendly web-based questionnaire, named "BRIEF MENTAL HEALTH SCREENING." It covers a broad spectrum of mental health aspects, making it a comprehensive tool for assessment.   Integration of Innovative Indicators:   * A distinguishing feature is the inclusion of unique indicators like musical preferences, dietary habits, facial recognition, and screen time analysis. These unconventional markers provide a nuanced and comprehensive understanding of an individual's mental state, setting our approach apart.   Machine Learning for Accurate Detection:   * Machine learning algorithms analyze the diverse data collected, aiding in precise and accurate detection of potential mental health challenges. This intelligent assessment represents a breakthrough in effectively leveraging technology for mental health evaluation.   Empathetic Chatbot for Emotional Support:   * Central to our solution is an emotionally attuned chatbot that adapts its responses to match the user's emotional state. This empathetic interaction serves to make users feel understood and supported, significantly enhancing their mental well-being.   **Addressing the Problem:**  Affordability and Accessibility:   * Overcoming financial and accessibility barriers is a core objective. By offering an affordable and easily accessible digital platform, we aim to make mental health assistance available to a broader spectrum of individuals, addressing a significant issue.   Privacy-Preserving Approach:   * User privacy is a non-negotiable priority within our system. Through stringent privacy measures, secure data storage, and encryption techniques, we ensure a confidential environment for users to freely share their mental health concerns.   Personalized and Targeted Support:   * Tailoring solutions to individuals is a critical feature of our system. It ensures that users receive advice and support customized to their unique circumstances, enhancing the effectiveness of the support provided.   Early Detection and Intervention:   * By focusing on comprehensive assessment and early detection of potential mental health issues, our system empowers individuals to seek timely intervention and support. This early intervention approach is crucial in mitigating the severity of mental health conditions and improving long-term outcomes.   In summary, our solution represents a paradigm shift in mental health support. By leveraging cutting-edge technology, preserving user privacy, and prioritizing personalized support, we aim to revolutionize mental health assessment and support, making a significant and positive impact on the mental well-being of individuals. |

**9. Key Features and Functionality**

List the main features and functionalities your project will include. Explain how each feature contributes to solving the problem.

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| BRIEF MENTAL HEALTH SCREENING Questionnaire:   * Functionality: A user-friendly web-based questionnaire that comprehensively covers various aspects of mental well-being. * Contribution: This feature enables users to perform an initial self-assessment, initiating the process of understanding their mental health status. It acts as a pivotal entry point for further assessment.   Innovative Indicators Analysis:   * Functionality: Analyzing novel indicators like musical preferences, dietary habits, facial recognition, and screen time. * Contribution: By incorporating these innovative markers, the system gains a nuanced understanding of the user's lifestyle and behavioral patterns, enriching the overall mental health assessment.   Machine Learning Algorithms:   * Functionality: Advanced algorithms for precise analysis of gathered data, aiding in the detection of potential mental health challenges. * Contribution: Machine learning algorithms ensure accuracy and efficiency in identifying mental health issues, facilitating targeted support and intervention.   Battery of Screenings for Specific Disorders:   * Functionality: Conducting targeted screenings for disorders such as depression, anxiety, stress, social anxiety, bipolar disorder, OCD, etc. * Contribution: This feature provides a thorough examination for specific disorders, ensuring a comprehensive diagnosis and enabling tailored support strategies.   Emotionally Attuned Chatbot:   * Functionality: An interactive chatbot that adapts responses based on the user's emotional state and facilitates open conversation about their mental health. * Contribution: The empathetic chatbot creates a safe space for users to express their emotions, fostering a sense of understanding and support, which is crucial for mental well-being.   Secure Database for Data Storage:   * Functionality: A dedicated and secure database to store diverse data sources, maintaining user privacy and data integrity. * Contribution: A secure database ensures confidentiality, addressing concerns about privacy and promoting trust among users.   Tailored Resolutions and Advice:   * Functionality: Providing personalized advice and resolutions based on the assessments and user input. * Contribution: Tailoring advice ensures that users receive guidance that is relevant to their unique mental health situation, increasing the efficacy of the support provided.   Accessibility and User-Friendliness:   * Functionality: Designing the platform with a user-centric approach, ensuring easy access and navigation. * Contribution: Enhancing accessibility encourages more users to utilize the platform, making mental health support available to a broader demographic. |

**10. Technology Stack**

Specify the technologies, frameworks, and tools you plan to use. Explain why they are suitable for your project.

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| Programming Languages:  Python:   * Reason: Python is widely known for its versatility and has a plethora of libraries and frameworks relevant to machine learning and data analysis, making it a natural choice for implementing machine learning algorithms and data processing in this project.   Web Development Framework:  Flask:   * Reason: Flask is a high-level Python web framework known for its speed, security, and scalability. It provides built-in authentication, making it suitable for creating a secure platform. Its structured approach expedites development, crucial for a complex project like this.   Machine Learning and AI Frameworks:  Scikit-learn:   * Reason: Scikit-learn is a powerful library for machine learning in Python. It's efficient, easy to use, and provides a wide array of tools for data analysis and modeling, aligning perfectly with the machine learning components of the project.   TensorFlow and Keras:   * Reason: TensorFlow is a popular open-source machine learning framework known for its flexibility and scalability. Keras, integrated with TensorFlow, offers a simplified interface for building neural networks, ideal for developing and training deep learning models to enhance mental health assessment.   NLTK (Natural Language Processing Library):   * Reason: It Is used to analyze the user passage and analyze the emotion of the user. It has the capability to predict whether the user is sad, happy, or depressed based on their polarity level.   OpenCV, DeepFace, FaceNet:   * Reason: It is used to analyze the user's emotion from the face and detects mental health. It uses deep learning procedures to perform the tasks.   Database:  MySQL:   * Reason: MySQL is an open-source relational database management system (RDBMS) that has been widely used for decades. It's known for its reliability, performance, and ease of use. MySQL can handle large amounts of data and transactions efficiently, making it a suitable choice for this project. Additionally, it integrates well with Python through various connectors, allowing seamless communication and data retrieval.   Front-End Development:  ReactJS:   * Reason: ReactJS is a JavaScript library known for its efficiency and flexibility in building dynamic user interfaces. Its component-based architecture and virtual DOM enable seamless updates and interactions, ensuring a responsive and engaging user experience.   HTML5, CSS3, JavaScript:   * Reason: These are fundamental technologies for web development, ensuring the creation of a visually appealing and interactive front-end user interface.   OpenAi:   * Reason: OpenAi is a popular platform for developing conversational agents (chatbots). They provide natural language processing capabilities, making them suitable for creating an emotionally attuned chatbot that can engage with users based on their emotional state.   Heroku (Not fixed):   * Reason: We are thinking of deploying our project in Heroku making it available for every user. |

**Section 3: Brainstorming**

**11. Brainstorm Ideas**

Brainstorm additional ideas or concepts related to your project, even if they aren't part of the core proposal.

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| Augmented Reality (AR) Relaxation: Integrate AR to create calming and soothing environments for users to immerse themselves in, aiding in relaxation and stress reduction.  AI-Enhanced Cognitive Behavioral Therapy (CBT): Develop an AI system that assists in CBT exercises, tracks progress, and provides personalized CBT strategies based on the user's responses and progress.  AI-Driven Mental Health Education: Develop an AI-powered educational tool that provides information about mental health conditions, treatment options, and coping strategies in an accessible and interactive manner. |

**12. Feasibility Assessment**

Evaluate the feasibility of your project in terms of:

Resources (e.g., budget, equipment, software)

Timeframe (e.g., project duration, milestones)

Skills and expertise (e.g., team members, training)

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| Resources:   * Budget: The project will require funding for software development, integration of AI algorithms, database management, and openAi library charges, api integration charges, and deployment charges. Cost-effective utilization of available resources is crucial. * Equipment: Standard computing equipment, servers, and devices for testing the system are necessary. Cloud computing resources might be considered for scalability and cost-efficiency. * Software: Access to various AI libraries and frameworks, databases, development environments, and project management tools will be essential.   Timeframe:   * Project Duration: The project's duration will depend on its complexity and scope. Our comprehensive mental health platform with AI integration may take 4 months to 6 months. * Milestones: Milestones could include system design completion, collection of data, cleaning procedure, model development, model testing, tuning procedure, AI algorithm integration, beta testing, user feedback incorporation, and final deployment. Breaking down the project into achievable milestones is critical for progress tracking.   Skills and Expertise:   * Team Members: We are a multidisciplinary team, including AI/ML experts, software developers, UI/UX designers, mental health professionals, and team leader. * Training: Continuous training of ML models, updating data is necessary to keep the team updated with evolving AI technologies, mental health advancements, and software development trends. Workshops, online courses, and seminars can be considered. |

**13. Risks and Mitigations**

Identify potential risks or challenges your project may face and propose strategies to mitigate them.

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| Technological Challenges:   * Risk: Technological limitations hindering the full implementation of desired features. * Mitigation: Conduct thorough technology assessments prior to development, plan for scalability, and be ready to adapt to new technologies as they emerge.   User Resistance and Stigmatization:   * Risk: Users might resist using a mental health platform due to societal stigmatization. * Mitigation: Raise awareness about mental health, educate users on the benefits of the platform, and ensure confidentiality and privacy to reduce stigma.   Resource Constraints:   * Risk: Budget or resource limitations impacting project progress and completion. * Mitigation: Efficiently allocate resources, prioritize critical features, explore funding opportunities, and consider strategic partnerships for resource augmentation.   Data Privacy and Security:   * Risk: Unauthorized access or breaches compromising sensitive user data. * Mitigation: Implement robust encryption protocols, conduct regular security audits, comply with data protection regulations (e.g., GDPR), and educate the team on security best practices.   User Adoption and Engagement:   * Risk: Low user engagement impacting the effectiveness of mental health support. * Mitigation: Conduct user research to tailor the platform to users' needs, provide intuitive UI/UX, and continually gather feedback for iterative improvements.   Algorithm Accuracy and Bias:   * Risk: Biased algorithms leading to incorrect mental health assessments or reinforcing stereotypes. * Mitigation: Diversify the training dataset, actively test for biases, and employ explainable AI techniques to ensure transparency and fairness. |

**Section 4: Next Steps**

**14. Project Timeline**

Create a detailed timeline outlining the major project milestones and deadlines. Include key activities and their estimated durations.

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| Month 1: Project Initiation and Planning  Week 1-2: Project Kickoff and Team Setup   * Define roles and responsibilities * Set up communication channels   Week 3-4: Detailed Project Planning   * Finalize project scope and objectives * Develop a Work Breakdown Structure (WBS) * Draft risk management and mitigation plan   Month 2: Research and System Design  Week 1-2: User Research and Requirement Analysis   * Conduct surveys and interviews * Gather user stories and preferences   Week 3-4: System Architecture and Design   * Define system components and interfaces * Design database schema * Outline the AI chatbot architecture   Month 3: Development and Testing  Week 1-2: Frontend and Backend Development   * Develop the web-based questionnaire interface * Implement the database and server-side logic   Week 3-4: AI Chatbot Integration and Testing   * Integrate the adaptive chatbot * Conduct functional and usability testing   Month 4: Integration, Optimization, and Deployment  Week 1: Data Integration and System Optimization   * Integrate various data sources and APIs * Optimize the system for performance and scalability   Week 2-3: User Acceptance Testing and Feedback   * Conduct UAT with a select group of users * Gather feedback for final refinements   Week 4: Finalize and Deploy the System   * Incorporate feedback and make necessary adjustments * Deploy the system for public use * Post-Deployment   Continuous Monitoring and Improvement   * Monitor system performance and user feedback * Implement updates and improvements based on feedback and usage patterns * This timeline provides a structured approach, allowing for development, testing, and refinements within the 4-month timeframe. It ensures adequate time for each phase, critical to the success of the mental health detection and support system. |

**15. Resource Requirements**

List all the resources required for your project, such as hardware, software, datasets, or personnel. Include estimated costs if applicable.

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| Hardware:   * Servers and cloud infrastructure for hosting the application and database. * Estimated Cost: Varies based on cloud provider and usage.   Software:   * Development IDEs (Integrated Development Environments) for programming. * Version control systems for tracking code changes and collaboration. * Database management system (e.g., MySQL) for data storage and retrieval. * AI and machine learning frameworks (e.g., TensorFlow, PyTorch) for chatbot development and sentiment analysis. * Web development frameworks (e.g., ReactJS, Node.js) for building the user interface and backend. * Emotion recognition libraries (e.g., OpenCV) for detecting emotions from facial expressions. * Text processing libraries (e.g., NLTK, spaCy) for natural language processing. * Estimated Cost: Varies based on licenses and usage.   Datasets:   * Diverse datasets for training the machine learning models, including mental health indicators, emotional expressions, etc. * Open datasets related to mental health and emotions. * Estimated Cost: Some datasets might be freely available, while others might require purchasing.   Training and Skill Development:   * Training programs to upskill the team on specific technologies and frameworks. * Estimated Cost: Varies based on the training programs chosen.   Miscellaneous:   * Internet and communication expenses. * Travel expenses if on-site meetings or consultations are needed. * Contingency for unforeseen expenses. * Estimated Cost: Varies based on actual needs. |

**16. References**

Provide a comprehensive list of references and sources used in your literature review. Follow a citation style guide.

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| 1) https://www.who.int/health-topics/mental-health#tab=tab\_1  2) https://www.who.int/health-topics/mental-health#tab=tab\_2  3)Predicting Anxiety, Depression and Stress in Modern Life using Machine Learning Algorithms by  Anu Priyaa, Shruti Garga,\*, Neha Prerna Tigga  Department of Computer Science and Engineering, Birla Institute of Technology, Mesra, Ranchi – 835215, India  4)A Review of Generalizable Transfer Learning in Automatic Emotion Recognition by  Kexin Feng\* and Theodora Chaspari  HUman Bio-Behavioral Signals (HUBBS) Lab, Texas A&M University, College Station, TX, United States  5)Stress detection using natural language processing and machine learning over social interactions  Tanya Nijhawan1, Girija Attigeri2\* and T. Ananthakrishna1  6)Efect of AI chatbot emotional disclosure on user satisfaction and reuse intention for mental health counseling: a serial mediation model  Gain Park1 · Jiyun Chung2· Seyoung Lee  7)Sentiment Analysis using Chatbot and Mental Health Tracker  Chanchal Bhangdia, Shailaja Jadhav2, Tanvi Gadgil3, Anjali Kumari4 , Mrunali Dasari5 |

**Section 5: Reflection**

**17. Reflect on the Worksheet**

Write a reflective paragraph on how completing this worksheet has contributed to the refinement of your project proposal. Identify any areas where you need further clarification or research.

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| Completing this worksheet has been really helpful in making our mental health project idea clearer and more organized. It made us think deeply about what we want to achieve and how to do it. We got a better understanding of what tools and technologies we need, and also how much time and money it might take. We realized there are some challenges, like not having enough expertise in certain areas, but we have plans to deal with them. Doing this worksheet showed us what we know well and what we need to research more. One thing we're still figuring out is how to publish our project in a cost-effective way to share our work with others. |

**Section 6: Feedback**

**18. Peer Review**

Share your worksheet with a peer or mentor for feedback and comments. Ask them to provide constructive suggestions and insights.

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**Section 7: Finalizing Your Proposal**

**19. Final Project Proposal**

Based on the information in this worksheet, write a comprehensive project proposal document that includes all the elements discussed. Ensure that your proposal is well-structured and addresses each aspect thoroughly.