

# **PROJECT**

## **Lip Reading using Deep Learning**

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## **Description:**

The project's objective is to create an end-to-end machine learning solution for word detection in videos of people speaking, using deep learning techniques such as LSTM and Neural Networks. This lip reading system will improve traditional speech recognition by providing robustness in noisy environments and eliminating the need for transcribed audio data, making it cost-effective and efficient. Furthermore, it will enable multi-modal applications, enhancing real-time communication, and significantly improve accessibility and inclusivity for individuals with hearing impairments by serving as a vital communication tool.

## **Empathy Map:**

### **Step 1: Empathizing with the User**

**WHO are we empathizing with? What is their situation and role?**

- We empathized with individuals heavily reliant on lip reading for effective communication. They navigate a variety of environments where clear speech is crucial, often facing challenges in noisy or visually cluttered spaces.

- Their role is that of active participants, engaging in conversations and interactions where lip reading plays a pivotal role.

## **Step 2: Understanding their Auditory Experience**

### **What do they HEAR?**

- They rely on visual cues, facial expressions, and lip movements to understand spoken language, often supplementing their auditory input.
- Conversations and interactions play a critical role in their communication, with clear enunciation being essential.

## **Step 3: Observing their Actions**

### **What do they DO?**

- They actively participate in conversations, using lip reading as a primary means of understanding and responding.
- Positioning themselves strategically to optimize their view for lip reading is a common behaviour we observed.

## **Step 4: Listening to their Voice**

### **What have we heard them say? What can we imagine them saying? What do they SAY?**

- We heard them emphasize the importance of clear, visible speech for effective interaction, and express gratitude for those who make an effort to facilitate accessible communication.
- They may express a desire for greater awareness of their communication needs and the challenges they face.

## **Step 5: Observing their Visual Experience**

### **What do they SEE?**

- They visually process their surroundings, relying on visual cues and context for understanding.
- Their observations play a pivotal role in navigating environments and engaging in effective communication.

## **Step 6: Recognizing their Needs and Goals**

**What do they need to do differently? What job(s) do they want or need to get done?**

**What decision(s) do they need to make? How will we know they were successful?**

- They need to advocate for clear communication, ensuring others are aware of their reliance on lip reading.
- Ensuring effective communication in various environments is a crucial job they need to accomplish.
- Decisions regarding disclosing their reliance on lip reading and seeking out well-lit spaces are imperative.
- Success is measured by their ability to navigate environments and situations using visual cues effectively.

## **Step 7: Understanding their Thoughts and Emotions**

### **a) GAINS - What are their wants, needs, hopes, and dreams?**

- They desire inclusive environments where their communication needs are acknowledged and accommodated.
- They hope for seamless interactions and the ability to express themselves effectively.

### **b) PAINS - What are their fears, frustrations, and anxieties?**

- They fear being misunderstood or excluded from conversations due to communication barriers.
- Frustration arises in noisy or visually cluttered spaces where lip reading becomes challenging.

### **c) Other Thoughts and Feelings**

- They may feel empowered when others take the initiative to facilitate accessible communication.
- In situations where clear communication is prioritized, they may experience a sense of inclusion and understanding.

By creating this empathy map, we gained valuable insights into the experiences and needs of individuals reliant on lip reading. This understanding will inform our approach to developing a more effective lip reading model. The work was divided among the team members as follows:

# **Brainstorm & Prioritize Ideas:**

## **Step 1: Define the Problem Statement**

- We began by outlining the objective of the project: to develop an end-to-end machine learning solution for accurate lip reading.
- We emphasized the potential benefits, including improved speech recognition, accessibility for the hearing-impaired, and multi-modal applications.

## **Step 2: Individual Brainstorming of Ideas**

- Each team member independently brainstormed ideas for the lip reading model, generating a variety of potential approaches and techniques.
- We attached these ideas as sticky notes to the brainstorming map, ensuring a diverse range of perspectives and suggestions.

## **Step 3: Grouping Ideas and Creating Clusters**

- We gathered as a team to collectively review and organize the sticky notes.
- Taking turns, we shared our ideas and began clustering related notes. For example, ideas related to model architecture were grouped together, as were suggestions for dataset collection and preprocessing.

## **Step 4: Prioritization Using Feasibility-Importance Grid**

- With our ideas now grouped, we transitioned to prioritization. We used a feasibility-importance grid to guide our decision-making process.
- We evaluated each cluster of ideas based on two dimensions: feasibility (how easily it can be implemented) and importance (how critical it is to the success of the project).
- We collectively placed each cluster on the grid, leading to a visual representation of which ideas were both feasible and crucial, helping us identify the most valuable areas to focus on.

By following these steps, we were able to systematically generate, organize, and prioritize ideas for the lip reading model, ensuring that our efforts were aligned with the project's goals and potential impact. This collaborative approach resulted in a well-informed and balanced decision-making process.