This report highlights the application and evaluation of the Hidden Markov Models (HMMs) in speech recognition. By emphasising the usability of Backward Algorithm’s role in probability computation as well as Forward and Viterbi algorithms, Group 1 was able to integrate theoretical speech recognition concepts with practical applications. Thus, illustrating the capabilities and constraints of HMM-based speech recognition with the provided speech data. The model’s performance had a varying degree of success and failure when recognising the 11-word vocabulary, with a 0% predicted accuracy with had”, ”hard”, ”heed”, ”hod”, ”hud” and ”whod” , and a 100% predicted accuracy with hid” and “hoard”. This was likely due to overfitting, suboptimal convergence, and limited data diversity.

To conclude, this project has offered valuable insights into the effectiveness of maximum likelihood training and its impact on improving speech recognition. Moreover, the use of data augmentation, of which targeted underrepresented speech patterns, showed promise in enhancing accuracy. Which suggests value of further exploration into techniques like time stretching and pitch shifting. Therefore, for future work, when looking to improve results, the integration of diverse datasets, advanced augmentation, and optimised model parameters is recommended. This could potentially be done by combining HMMs with modern machine learning methods for thorough speech recognition.