

ADNI Progress report

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Part I

Using HMMs to predict disease progression

1 Distribution of labels over states

For each patient we consider, we look at **all visits** they have in the database, and if we find that they were labelled as AD on their **last visit**, we retrospectively label all their previous ‘MCI’ diagnoses as ‘MCI-C’ to label their conversion. Non-converters are labeled ‘MCI-NC’. This will likely help us gain perspective into the ‘mis-classifications’ the HMM model makes for the MCI patients.

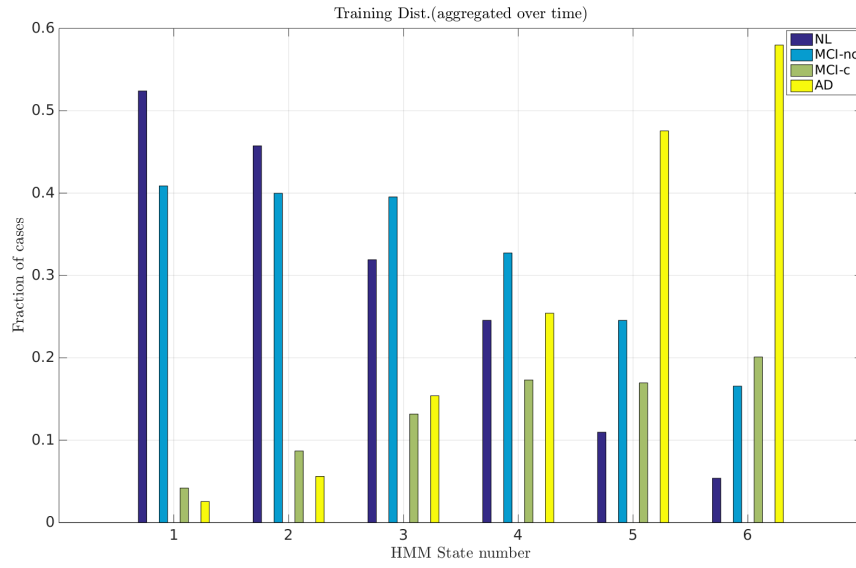


Figure 1: Distribution of labels given HMM state (Training set)

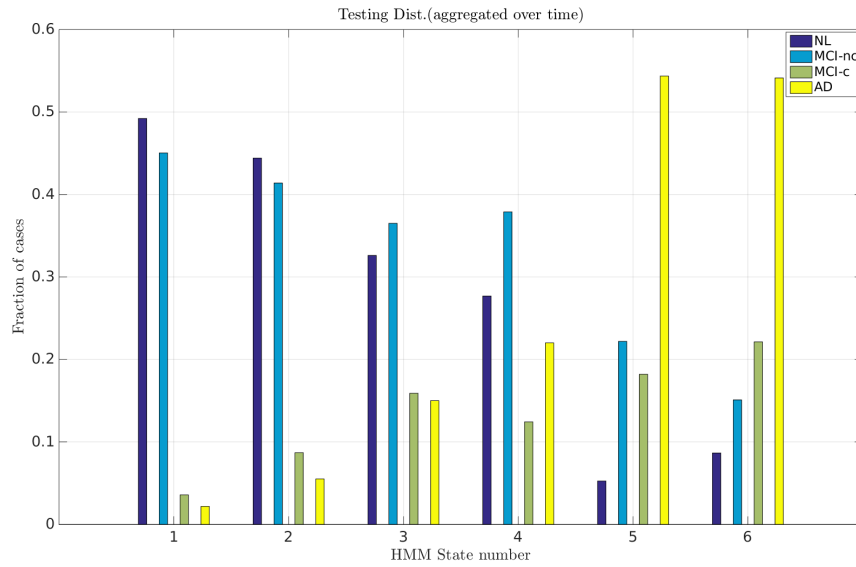


Figure 2: Distribution of labels given HMM state (Test set)

2 Distribution of labels over terminal HMM state

For each patient, we look at the terminal state they end up in as obtained by the ML Viterbi path. This information is aggregated to look at the distribution of clinical labels at each terminal HMM state.

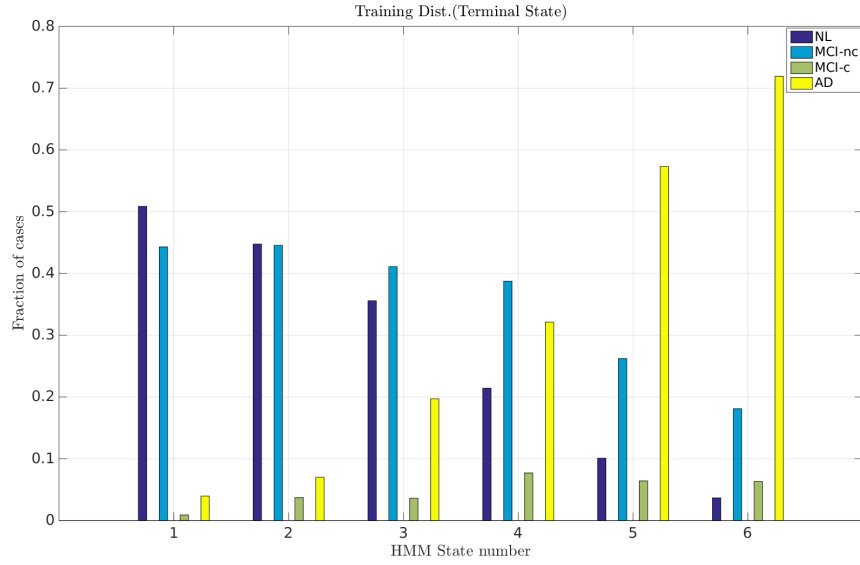


Figure 3: Distribution of states given terminal HMM state (Training set)

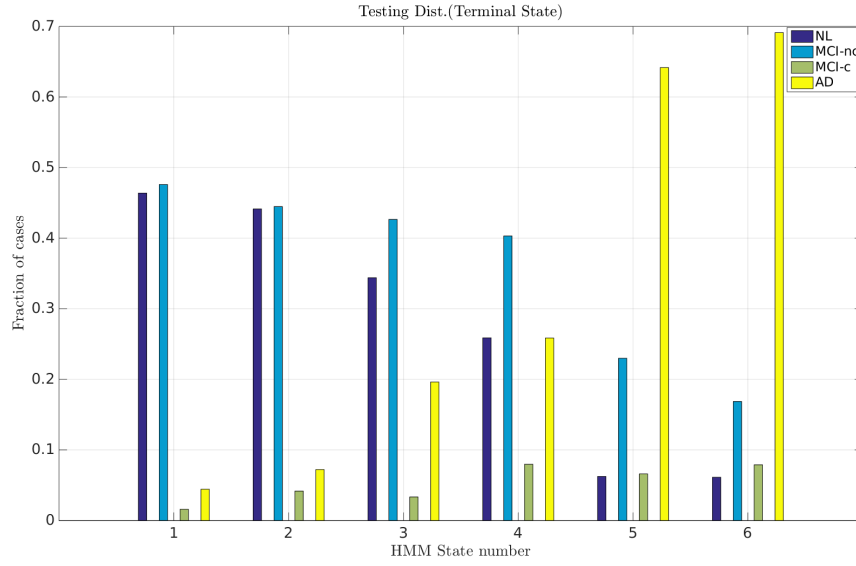


Figure 4: Distribution of states given terminal HMM state (Test set)

3 Clinical variables

We explore the use of MMSE and CDR scores. Shown below are their ground-truth distributions to get a sense of their utility.

3.1 MMSE

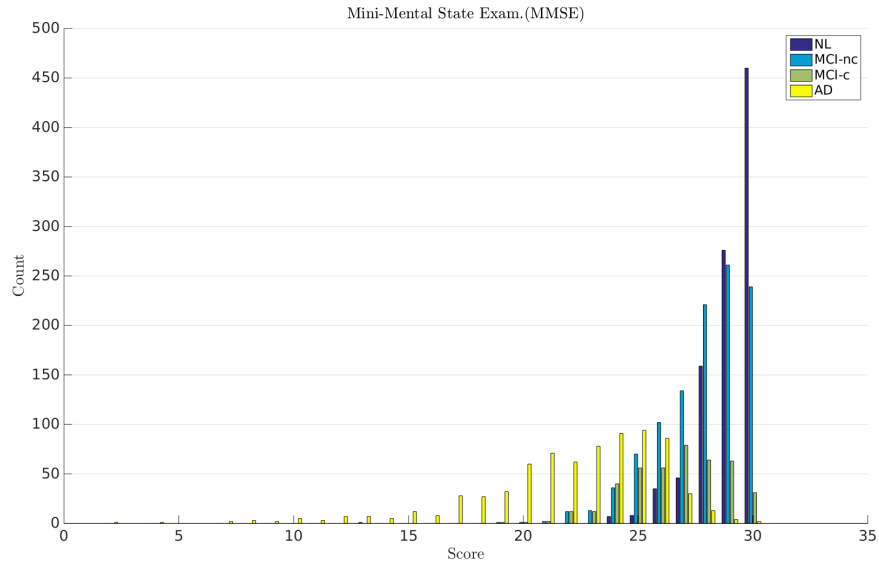


Figure 5: Distribution of MMSE given clinical label

3.2 CDR

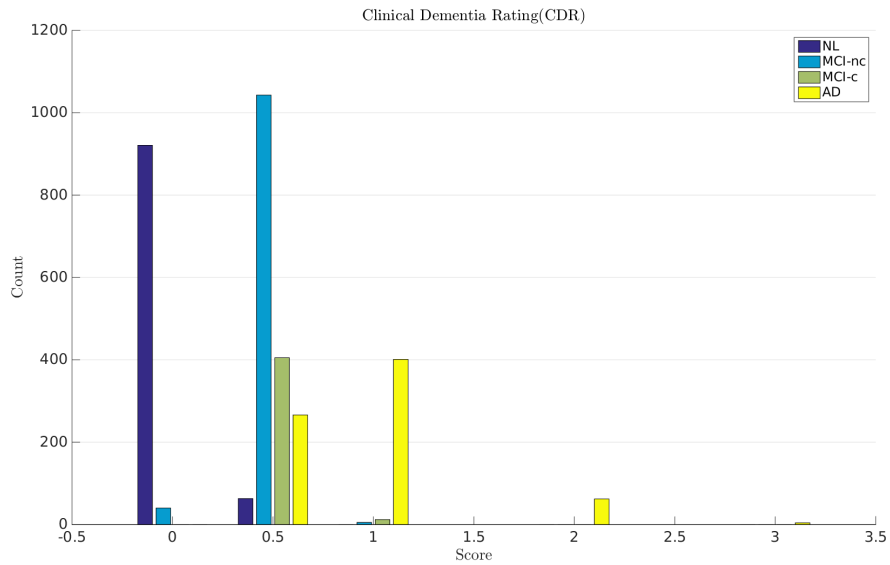


Figure 6: Distribution of CDR given clinical label

3.3 Correlation of HMM state with Clinical Variables

We observe the mean score of clinical variables (MMSE/CDR) given the most likely HMM state as decided by the Viterbi algorithm.

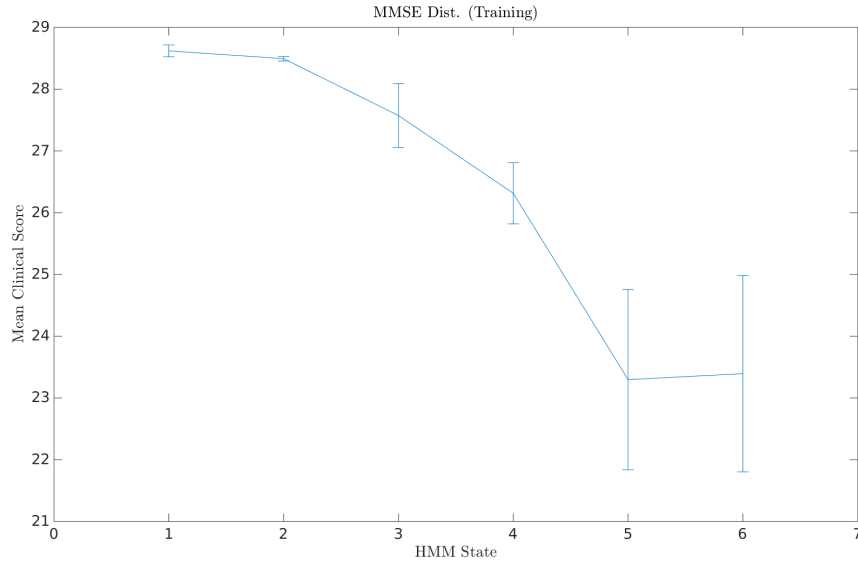


Figure 7: Mean MMSE score given Viterbi state (Training set)

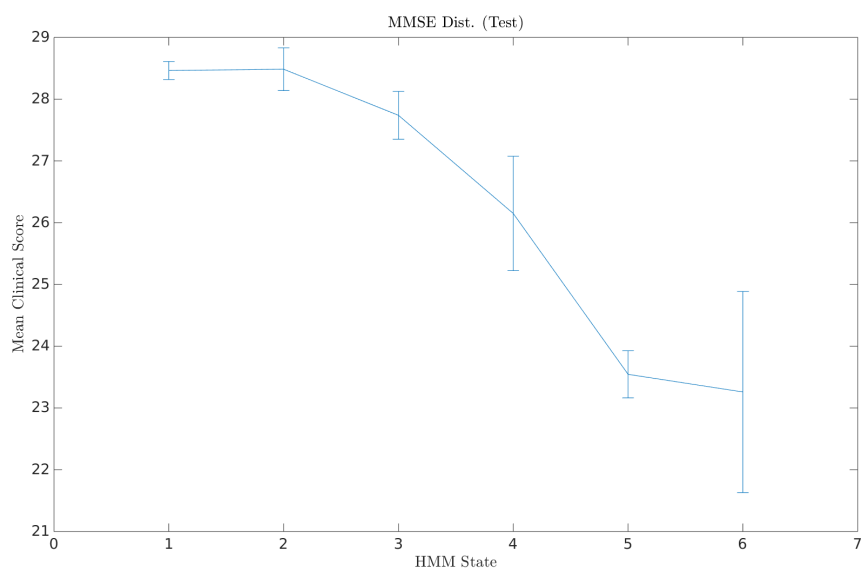


Figure 8: Mean MMSE score given Viterbi state (Test set)

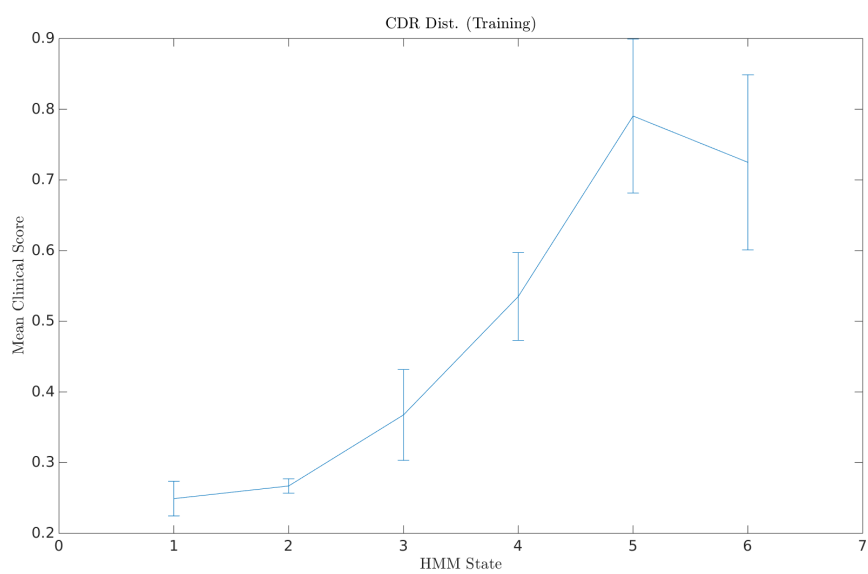


Figure 9: Mean CDR score given Viterbi state (Training set)

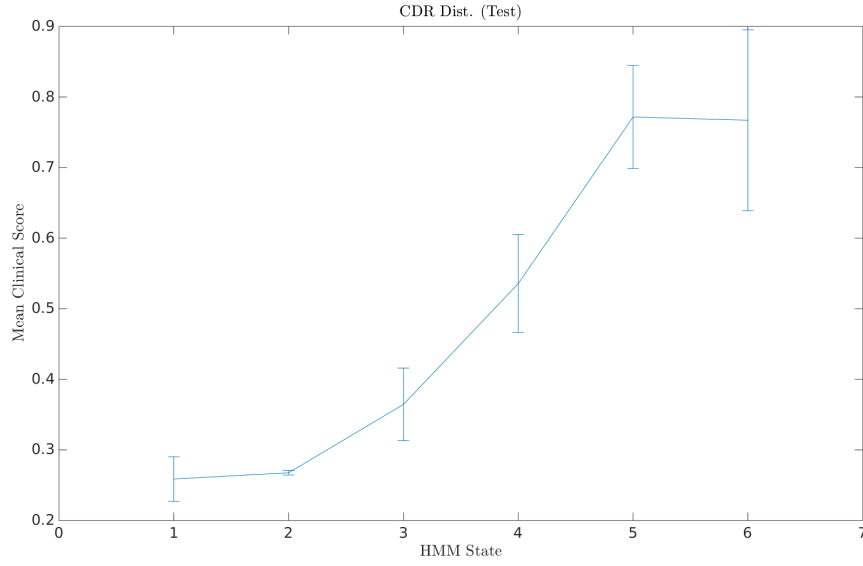


Figure 10: Mean CDR score given Viterbi state (Test set)

3.4 Distribution of Clinical Variables given HMM state

We observe the distribution of clinical variables (MMSE/CDR) given the HMM state as assigned by the Viterbi algorithm

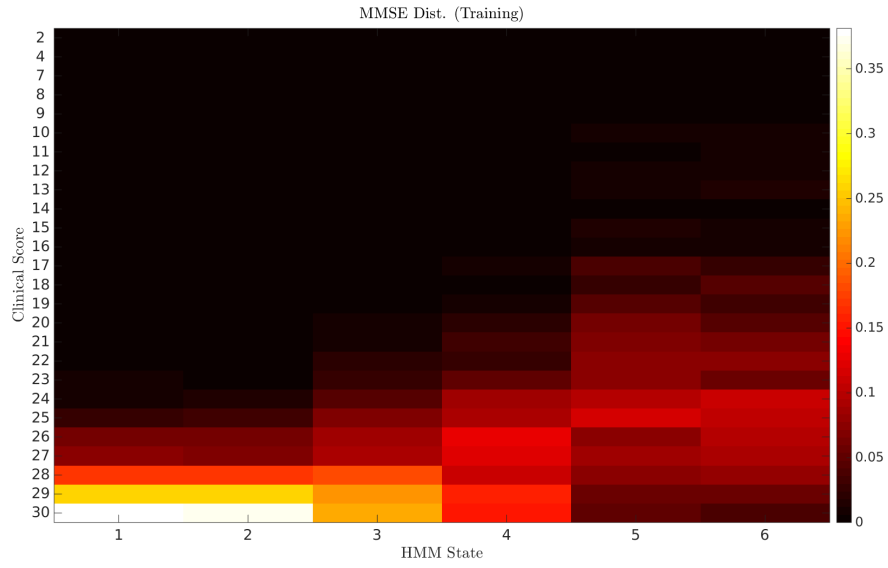


Figure 11: Distribution of MMSE score given Viterbi state (Training set)

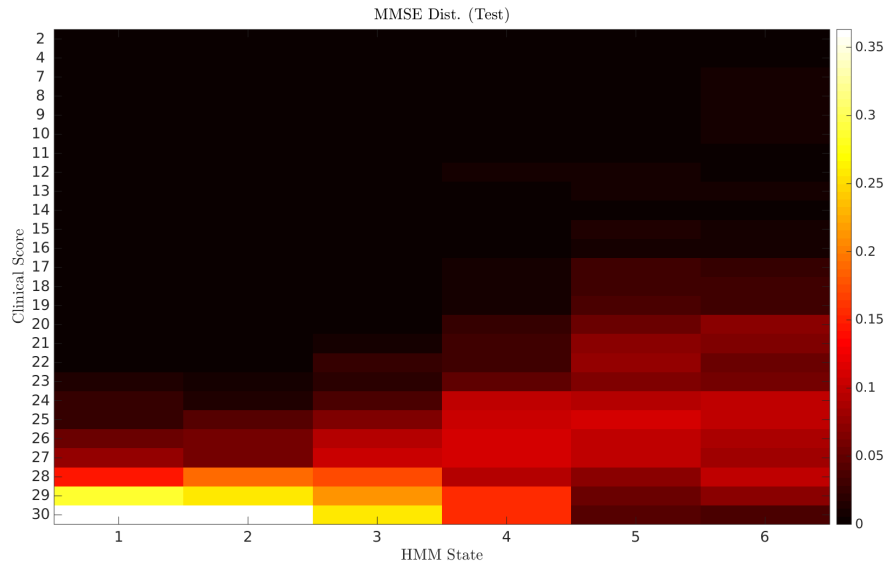


Figure 12: Distribution of MMSE score given Viterbi state (Test set)

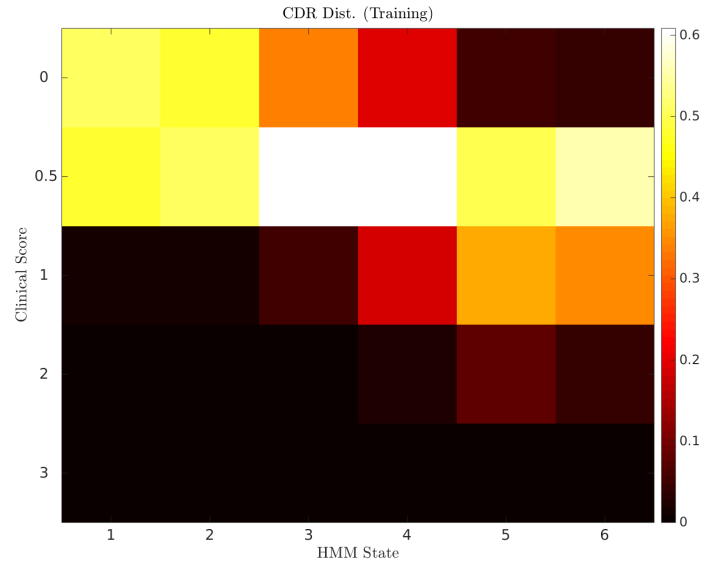


Figure 13: Distribution of CDR score given Viterbi state (Training set)

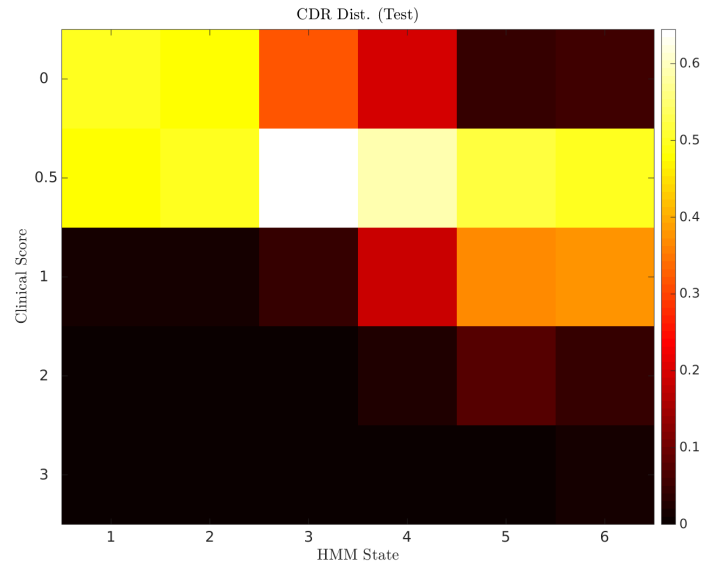


Figure 14: Distribution of CDR score given Viterbi state (Test set)