As stated in “Predicting Future Locations with Hidden Markov Models”:

The previous proposed methods for the analysis of location histories can be classiﬁed according to the manner by which data are modeled, into three general distinct approaches, namely:

1. State-space models,

State-space models attempt to capture the variation in spatial sequences through sequence models such as generative Hidden Markov Models (HMMs) [17], discriminative Conditional Random Fields (CRFs) [21, 19], or extensions of these two well-known approaches

1. Data mining techniques,

Explore frequent patterns and association rules, by deﬁning a trajectory as an ordered sequence of time-stamped locations, and using sequence analysis methods such as modiﬁed versions of the Apriori algorithm

1. Template matching techniques.

Compare extracted features to pre-stored patterns or templates, using similarity metrics speciﬁc for sequential or time-series data.

1. Compute the set of sequences corresponding to all possible next places to be visited in order to group temporal sequences according to three clusters with one Hidden Markov model for every cluster.

They used

1. use the forward algorithm to compute the probability of all such sequences, and
2. Return the next place corresponding to the sequence with the highest probability.

They cluster the historical locations based on temporal characteristics into three clusters for weekdays and weekends, and they attached a hidden Markov model for every cluster to find the best state transitions and probabilities, and finally they used Baum-Welch algorithm in order to find the most probable next location

The results of their work shows a prediction accuracy of 13:85%, when considering regions of 1280 squared meters.

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|  | References Mathew, W. R. (2012). Predicting future locations with hidden Markov models. *ACM conference on ubiquitous computing* (pp. 911-918). |