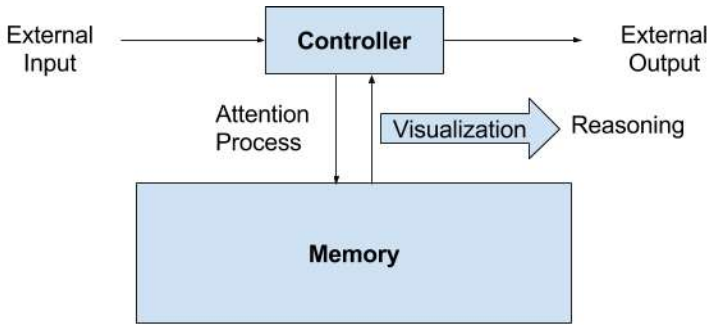

Figure 1.1: **General architecture of a RAM based model.**

of a set of entities where each entity is a representation or encoding of an external input seen by the controller, the **attention** process is the process or mechanism through which the controller interacts with the memory and the **reasoning** behind production of an external output follows from the graphical visualization of the interaction between controller and memory. Fig. 1.1 shows a general architecture of a RAM based model.

Following example demonstrates why RAM based machine learning models are superior to the existing machine learning models in terms of similarity with the way human beings think. Consider the comprehension:

1. John went to the kitchen.
2. John picked up the knife.
3. John dropped the knife on the floor.
4. Marry came into the kitchen.
5. Marry picked up the knife from the floor.
6. John went to the bathroom.
7. Marry went to dining room.

Now, try to answer the following query based on the above comprehension: Where is the knife? Your answer must have been “dining room”.

Such question answering tasks have been successfully solved using recurrent neural networks. Recurrent neural networks (RNNs) are a class of artificial neural network architecture that-inspired by the cyclical connectivity of neurons in the brain-uses iterative function loops to store information. Though one might get high accuracy in terms of the correctness of the answer to the query using RNN, but RNN fails to provide an explicit explanation behind the production of a particular answer. On the contrary, RAM based model stores a representation of each sentence of the comprehension as an entity in the memory, searches for the entities in the memory relevant for answering the query and finally computes the answer to the query based on the searched relevant entities.

In this thesis, we focus on applying RAM based models in the domain of sequence to sequence learning where the aim is to find a mapping between a sequence of inputs to a sequence of outputs, in the domain of question answering where the aim is to build a model that can answer any query based on a given comprehension and in the domain of building game playing agents where the aim is to find an optimal policy which is a mapping from the state of the agent to a legal action so that, on following the optimal policy, the overall reward or score of the agent gets maximized.

1.1 Structure of the Thesis

Chapter 2 briefly reviews supervised sequence to sequence learning. Chapter 3 provides background material on artificial neural networks and recurrent neural networks. Chapter 4 and 5 investigates Neural Turing Machine with application in sequence to sequence learning and End to End Memory Networks with application in question answering tasks, respectively. Chapter 6