Chapter 14
Graph and Neural Network–Based Intelligent Conversation System

Anuja Arora
Jaypee Institute of Information Technology, India

Aman Srivastava
Haptik Inc., India

Shivam Bansal
Exzeo Software Private Limited, India

ABSTRACT

The conventional approach to build a chatbot system uses the sequence of complex algorithms and productivity of these systems depends on order and coherence of algorithms. This research work introduces and showcases a deep learning-based conversation system approach. The proposed approach is an intelligent conversation model approach which conceptually uses graph model and neural conversational model. The proposed deep learning-based conversation system uses neural conversational model over knowledge graph model in a hybrid manner. Graph-based model answers questions written in natural language using its intent in the knowledge graph and neural conversational model converses answer based on conversation content and conversation sequence order. NLP is used in graph model and neural conversational model uses natural language understanding and machine intelligence. The neural conversational model uses seq2seq framework as it requires less feature engineering and lacks domain knowledge. The results achieved through the authors' approach are competitive with solely used graph model results.
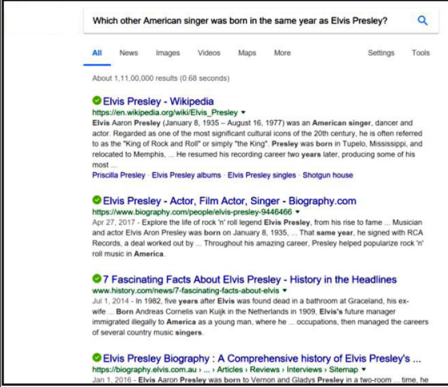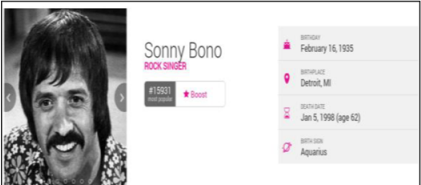
INTRODUCTION

Chatbots are artificial intelligent systems and usually interact in text or voice interface form. In past, these interactions were straight forward, for example:

- Customer care inquiry systems which provide fix number of option according to users' problems;
- Weather report system;
- Bot troubleshoots a problem with Internet Service;
- etc.

In recent years, Chatbots have gained popularity and has become hot computational research topic. Many companies are developing bots which may have natural conversations indistinguishable from human ones. Efficiency of chatbot systems depend on the suitability and coherence of system generated outcome from the knowledge base corresponding to user query. For example: User asked query from the search engine chatbot system is "Which other American singer was born in the same year as Elvis Presley?". Google search has generated an outcome which is shown in figure 1(a) whereas based on knowledge understanding outcome should looks like as presented in figure 1(b). The outcome as shown in figure 1(b) is possible using DBpedia knowledge base but depends on how system has been built.

As shown in figure 1, outcome/ response are basically dependent on the natural conversation instead of terms used/ asked in the system. In this research paper, we are hoping to develop chatbot system to have natural conversation indistinguishable from human ones. Researchers are generally using linguistic rule based approaches, natural language processing, and deep learning techniques to achieve it.

Figure 1. Chatbot and Search Engine result comparison

Search Query: Which other American singer was born in the same year as Elvis Presley

(a) **Google Search Engine Results**

(b) **Expected Results (DBpedia Knowledge base)**

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