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CS 4635 Knowledge-Based AI

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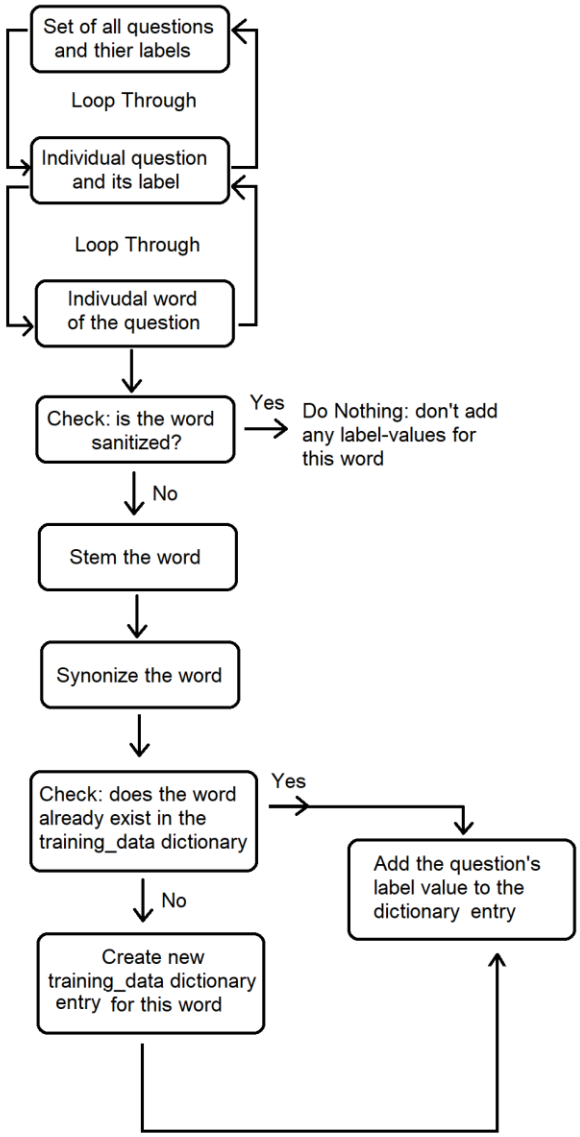
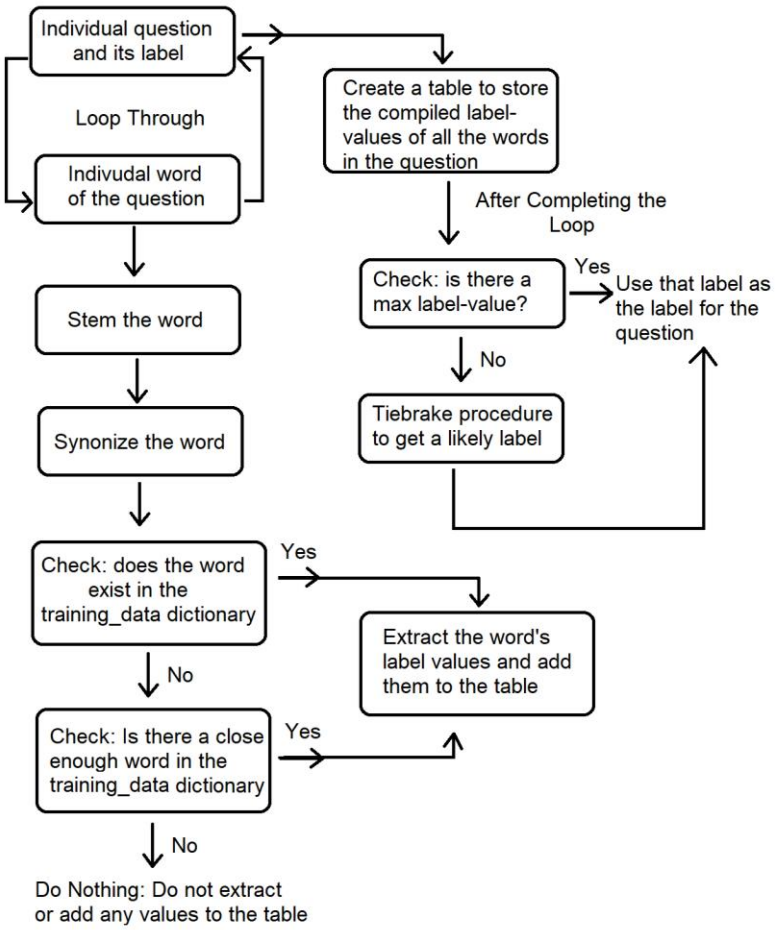
Project 3 Reflection

Agent Block Diagram:

Block Diagram for Agent Trainer



Block Diagram for Agent Classifier



Block Diagram Description:

Shown previously are the block diagrams for my agent, they are split between the agent's trainer and classifier systems. The trainer is the portion of my agent that converts a series of testing questions/labels into a system of rules. These rules are then passed onto the agent's classifier, which applies the various rules in order to determine the correct label to assign to a singular question.

My agent trainer works by iterating through all the words used throughout every question, and then creating a mapping between the individual word and the labels of the types of questions it appeared with. It starts by looping through each question, and the individual words of each question. After extracting a word, it begins by checking if that word is "Sanitized" or not. A "Sanitized" word is one that I have chosen to purposefully exclude from the label assigning process, due to the high frequency of such words appearing in questions, examples would include things such as the articles; "the", "a", and "an". After that my agent "Stems" the word, turning words with pluralization into their singular forms, so "assignments" would become "assignment". After stemming, my classifier looks to reduce many words that express the same idea into a single word through the process I call "Synonize-ing" the words. For example, the word "class" and "course" have the same meaning, so they are reduced down to the common word "class". This is done in order to improve the later classifying process. Finally, my trainer adds the question's label for that word to an existing dictionary entry or create a new entry to add it to. Each word can be assigned multiple labels, including multiple instances of the same label.

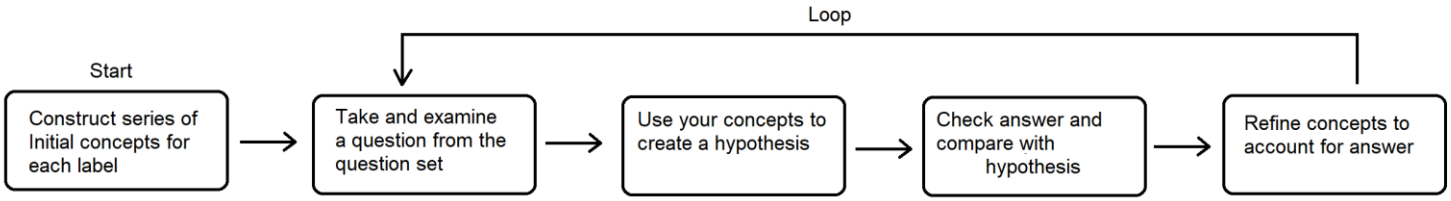
My agent classifier when posed with a question to label, will use the various label mappings of the words within the question in order to determine the label it will assign. It does this by looping though the individual words of the question, and in a process similar to the trainer; it "Stems" and "Synonizes" the word. After which it looks to see if the dictionary contains the word or a word "close enough" to it and extracts its label mappings. If the agent fails to find a comperable match in the dictionary, the word is discarded entirely. After extracting the word's label mapping the agent adds them to a table, which holds all the labels of every word that appeared in the question. Finally, after checking every word in the question; the classifier assigns the label that appears the most in the table, picking randomly in the case of a tie.

KBAI techniques:

The KBAI techniques most clearly exemplified through my agent are incremental concept learning and classification. My agent uses incremental concept learning during its training process, where it slowly constructs a set of mappings between the various words and the labels, they are most likely to appear with. In the case of this assignment, the concept that my agent learns are the types of questions represented by the various labels. And it learns of these concepts through being shown positive examples.

My agent then uses the technique of classification, in order to determine the label that it will assign to the question. My agent uses a rather naive process of classification where it simply picks the label that appears the most across all the words within the question. This is why my agent has to go through many reductionary steps, such as "Stemming" and "Synonizing". These steps intend to keep the total number of words with common meanings down to an absolute minimum, as having words with the same meaning would "split" the total count for their labels that would otherwise be combined.

Relation to Human Cognition:



Shown above is a diagram that demonstrates the mental process a person would go through in order to similarly perform that same task as my agent. Firstly, the individual examines the labels provided in the training set. They would then, from simply knowing the title of the label itself, extrapolate out and make some hypothesis for what they believe to be concept represented by the label. After that they then read through each question and using their model, they make an estimated guess about what label they would assign to the question. They would then compare their answer with the actual one, and then adjust their mental concept in order to account for any discrepancies.

My agent learns in a much more simplistic way when compared with human process. This is because my agent is only capable of learning through positive examples, resulting in a rather one-sided view that often overgeneralizes the concept. My agent is limited in this regard because it is not capable of making and testing hypothesis. This restriction is the consequence of the rather simplistic nature of my agent; on the flipside however, my agent's simplicities allowed me to construct it within the project's timeframe.

Strengths and Weaknesses:

I would say that my system is robust, yet it comes with some glaring problems that need to be addressed. My agent performs best when each label is provided with a set of unique words that don't overlap in their meaning/functionally. As expanded upon above this is because of the way my agent's classifier functions; words with the same meaning would "split" the total count for their labels that would otherwise be combined. This would often result in the second-most-likely tag to be selected as the maximum instead. I was able to use a well know series of stemming rules in order to reduce this problem occurring with pluralization. However, in the absence of a well-defined system for determining if different words share a common meaning; my "Synonizing" system had to be manually created by hand, which will likely result in many errors.