Graphical framework for defining Context(s) to Virtual Assistants

Abstract

When we have a conversation with a Virtual assistant, there is a theme that is extracted, a context determined from the conversation and a sentiment decoded. Data is being put into classifications and regressions and churned in appropriate models to arrive at (indicative) information to work with.

What can be determined could be one of many contexts inflected in the conversation. The context in a conversation can be very likely multilayered and multifaceted. A graphical framework may help define to Virtual assistants these contexts present in the conversation..

Background

At the most fundamental level, Machine learning involves splitting data into groups. Deep reinforcement learning procedures demand large amounts of training data. For solution to any machine learning problem, we identify the error and go about minimising the error [1].

Natural Language Processing has enabled virtual assistants to have sophisticated conversations with human beings and respond in context [2]. This is possible by having huge datasets and successive transfer learning cycles passed into the machine learning algorithm. This training enables the system to predict the result required.

Since our contexts are not straightforward and objective, it needs to be translated into a different form before it can be fed to Virtual assistants. What defines contexts for human beings could be translated as boundaries for the assistant to navigate in. By giving the Virtual assistant access to a working knowledge of each facet of a conversation's context, it could be that much more accurate in its replies being inline with the background of

the conversation. A good way to go about this is to capture the above as an input-output model [4]. Taking it a step higher, representing each component of the context as an element in the graphic layout could be tried here. Semantic spaces are a popular framework for the representation of word meaning, encoding the meaning of lemmas (a set of words) as high-dimensional vectors. [5]

Consider a conversation between the assistant and a human being. Suppose a conceptual landscape can be visualised for this conversation. Subject(s) and object(s) and every construct or element in the conversation become physical points in this landscape. Additionally everything that can inflect into the meaning of the conversation, including say, the physical environment of where the conversation is happening translates into an attribute the landscape. Let us try and demarcate quadrants. Suppose we have one side representing the beginning state of a conversation. The end state could be associated to the opposite quadrant.

In many cases the conversation will probably not have a beginning and an end state(s) but would coincide in the landscape. But many conversations will contain a unique starting point and an end point in the landscape that best defines the conversation. It could very well be many connected landscape areas as there could be multiple contexts. But for arriving at something concrete initially we can look at simple conversation where the landscape is a single overall entity and everything considerable and shouldn't be missed is present in it.

Could the inflection of a string of words in the conversation point to a direction in the landscape described earlier? Can the inflection of the words or the sentence be translated to a journey of subject(s) and object(s) across this landscape? Consider defining the conversation graphically as system of spaces and vectors. There could be bounds defined in the conversation from what's derivable as subject(s) and objects(s) and their current states. A vector has both the magnitude as well as direction. This could be used to identify what tilts it and towards which quadrant. For simplicity all of this can be attempted in a 2 dimensional space.

Research Questions

Can we arrive at objective definitions of contexts?
Can a single small conversation be vetted out in this model of representation so that all possibilities and shortcomings of the representation can be identified?
Can a topological map of this framework be created by finding invariants in different conversations?

References

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