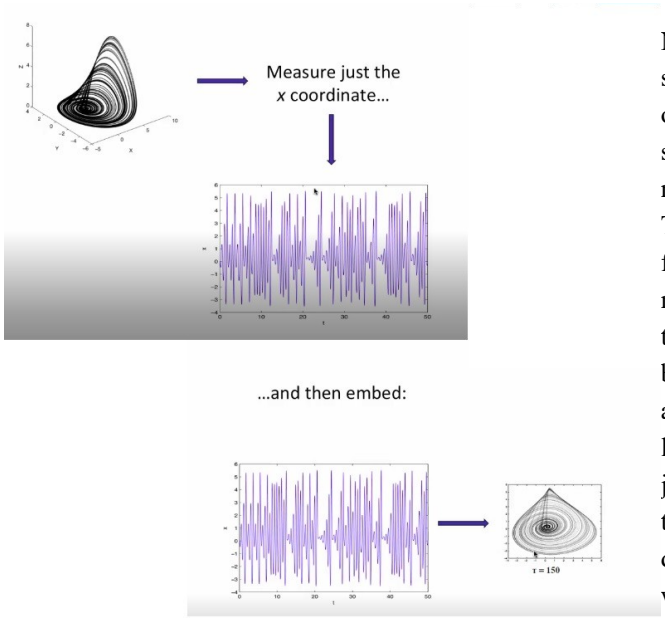
Research Proposal:

Predicting Natural Language Conversations by reconstructing the speaker's original thought patterns

Predicting Natural languages is an active area of research. In more recent years, interest in this field was renewed with the rise in literature revolving around Deep Learning architectures like Long-Term-Short-Term Memory (LSTM) - a variant of the original Recurrent-Neural-Networks (RNNs) - which has proven itself very good at learning (unsupervised) from time-series data (like sequences of natural language text). Although Deep learning has made great strides in predicting natural language conversations, the success is currently limited to predicting short-term responses. The deeper into the conversation the network predicts, the more generic and less consistent its replies tend to become. Current research is aimed at resolving this issue, using such techniques as hierarchical architectures which can analyse the conversation's attention and even intention! It is becoming more and more apparent that the text alone is insufficient to accurately model and predict natural language conversations. The speakers' underlying intentions (or thought patterns) can no longer be ignored, but how do we model such an abstract concept?



Natural Language Text is time-series data and, like all time-series data, it is a flattened, 1-dimensional representation of the original system's (higher-dimensional) dynamics (i.e. the speakers' intentions or thought patterns). You can think of natural language text as a linear compression of our thoughts. The difficulty with predicting the next word, phrase or reply from the natural language text (or any time-series data for that matter) is that its only a projection (a 1D representation) of the true higher-dimensional dynamics. Its like trying to predict a ballet dancers next movements by watching her shadows. This also explains why longer conversations are rarely linear and 1D like the text that represents it. It can seem like a conversation jumps topic momentarily only to return back and resume an old trail of thought much later. Natural language is multi-dimensional because the underlying dynamics of the system which produces it (our thoughts) is multi-dimensional.

So, before we analyse the data, we need to unflatten it back into its original M-dimensional dynamics. We need to uncompress the text to remodel the original thought patterns. There are methods routed non-linear dynamics anc complexity science for doing just that. One such method, 'delayed-coordinate embedding', has been used on time-seried data to successfully reconstruct the original higher-dimensional dynamics of casino roulette wheels, stock markets and other complex systems. It is even able to reconstruct chaotic systems (such as the Lorenz equations) and make accurate predictions about them that are not possible by analysing the time-series data alone. Therefore, I propose we use delayed-coordinate embedding to reconstruct the original M-dimensional dynamics of the speaker's thought patterns (the source of the natural language's dynamics) from the flattened, 1D Natural language text, thus enabling us to better predict the long-term flow of the natural language conversation.