**How Deep Network is Your Love?**

**Purpose statement:**

The paper I propose will combine research from computer science, deep learning and artificial intelligence (hereafter AI) with the work of French sociologist and philosopher Gabriel Tarde’s psycho-sociology of desire in order to determine whether deep learning and AI is more capable of grasping the structures of our desire than we are.

The format of dating sites such as OK Cupid, Guardian Soulmates or Matchmaker.com revolves around the lonely punter, user, answering questions and filling out forms in order to get a list of results from a database. Certainly, those lists can be tailored, made special, served up with smart algorithms but the interaction of answering questions, as exciting as it may get, may become a bit tedious and more importantly too deliberate.

Applications such as Grinder or Tinder, on the other hand, record a user’s swiping activity and history. They combine swiping data along with anything they can gather from Facebook in order to match people up. Monitoring clicks, swipes and likes may tell the system a lot about how and why people want to consume content but it’s unlikely to find out much about their deepest sexual desire, especially since Facebook censors much of its sexual content.

In a lot of these examples most of the interaction is done consciously. The user is quite aware of their answer to questions or their swiping choice. Nothing of the unconscious is going to slip and therefore the algorithm will remain fairly superficial. It will not get into the deepest desires of the person or their network.

Desire doesn’t work that way, however. It is something that always catches you from behind, that you’re not aware of. It is unconscious or non-conscious. More than this, for sociologist Gabriel Tarde beliefs and desires are fundamentally social. Every natural phenomenon is seen through the lens of tradition and custom. Even desire for nutrition and reproduction have been transformed into a national product. Sexual desire, for instance, often mutates into the desire to marry in a manner suitable to the different traditions. Additionally, the desire for food is often seen as the desire for bread and meat in one place and grain and vegetables in another.

Given that desires are varied, complex and largely unconscious my paper will investigate how possible it is for deep learning algorithms to learn our desires better than we can learn them ourselves. It will do so by looking at the work of computer scientists from Google Deep Mind, Microsoft, Facebook AI and other research in the field of AI in relation to the work of the socio-psychologist Gabriel Tarde. Using both Tarde’s theories and the deep learning models discussed in particular papers on AI, I will construct and test a prototype chat bot that casually converses with users in order to infer the type of relationship they want.

At this moment, the capabilities in neural network technology allow people, users or lonely-hearts to casually chat in confidence to a bot, a conversational AI that learns about their desire, their likes, dislikes, past history. Through the statistical modelling of the structures of the user’s desire the bot can match them with other users on the system. The bot can also follow up later and ask them how their date went. In this manner, the system begins to understand which of the modelled desires match and which ones don’t. Since the structures are built using deep neural networks in a certain sense, as with many AI model results, they will only be understood through AI as a medium.

In other words, the online dating scene at this moment has the potential to be less personality test and more Samantha from the Spike Jones’ film *Her*. All this is due to the advancements in neural networks such as the Facebook AI and New York university project entitled End-to-End Memory Network.

To understand what neural networks are it’s useful to think of them as a means for any computing device to make an informed choice based on trial and error. Every time the network makes a mistake and is corrected it adjusts itself enough to minimise the chance of another similar error occurring in the future.

Neural networks base their choice and answers on statistical prediction models. In order for the predictions to be more accurate, however, they need to keep things in memory. The bigger and more continuous the memory, the more complex the statistical model, and therefore the better the prediction. Consequently, the more powerful the memory models the more likely the neural network’s predictions is to resemble intelligent reasoning. Or in other words, the larger and more effective the memory the more likely it is for neural networks to learn from conversations through inference.

Previously, in order to process what is referred to as natural language tasks, tasks such as reading and summarising a given text or learning by inference through question and answer dialog, models were built around rules which mapped so-called natural language to logical forms. Such a mapping was nothing more than semantic parsing and as such the system was not able to infer much from its semantic analysis. Deep learning and neural networks use statistics instead of logic to analyse the results of an experiment, predict an outcome and make decisions. However, as previously explained, in order for them to create statistical models complex enough for them to learn through inference they need a suitable and robust memory.

The LTSM, Long Short-Term Memory, network was the first type of neural network that introduced memory in order to keep in mind things that happen a few frames in the past. However, “The LSTM-based models address this through local memory cells which lock in the network state from the past”[[1]](#footnote-1). The memory of these neural network models is nothing more than the latent state of the network which over long timescales is inherently unstable.

However, recently there have been some advancements in this area with the End-to-End Memory Network project, and its many variants, which tries “to build a purely neural network-based reasoning system with fully distributed semantics that can infer over multiple facts to answer simple questions, all in natural language”[[2]](#footnote-2). These networks are different from a regular LSTM-based model in that it uses a global memory across all instances of the network.

Another example of a deep learning algorithm capable of reasoning is “Neural Reasoner, a framework for neural network-based reasoning over natural language sentences. Neural Reasoner is flexible, powerful, and language independent”[[3]](#footnote-3). Neural Reasoning is capable of completing tasks which require lots of supporting facts, facts that are in themselves complex such as learning through dialog. These networks will also know when to stop based on the data, such a feat will prove central to an algorithm that is attempting to learn through conversation and interaction.

The bottom line is that the models that have been developed allow the implementation of a chat bot that acts as a confidant that learns what the user wants without any deliberate action from the user. They do so because they are able to build complex statistical models of desire through inference. In other words, they learn complex facts about the user without the user deliberately informing the bot of these facts. They then use these facts to build statistical models that they can match with other models.

The reason Tarde is interesting in this respect is because he believes that desire can be assessed through statistical analysis. In that sense, his ideas are perfectly aligned to the types of models that the chat bot will produce in my paper’s experiment. The way that statistics functions in Tarde’s work is that it measures rates and directions of what Tarde refers to as imitation. Imitation is the concept at the heart of Tarde’s psycho-social theory. He believes that society begins with one man imitating or copying another. All inventions, for example, are comprised of prior imitations. Everything that is social and non-vital or physical is caused by imitation. However, at the driving force of all imitation is belief or desire according to Tarde. Consequently, Tarde believes that by measuring the quantity and direction of imitation (what he also sometimes refers to as contagions or copies) statisticians are able to get an idea of the different desires that drive these imitations.

In fact, Tarde regards himself as a statistician. And he believes that the art of statistics is in the choice of units, what the statistician is measuring. His gripe, however, is that the choice of units in current statistical modelling, and this continues today, is driven by commerce. Statistics of commerce and industry form the current foundations of all statistics. Their choice of unit, what they measure, is supply, demands or profit and this is a problem. According to Tarde statistics should adopt the point of view of desire. Instead of the table of profit we need to build a table of desires. In other words, we need another practice of statistics.

The sociological statistician should measure beliefs and desire for two reasons:

1. To study the imitative power of every invention in every time and place.
2. To demonstrate the benefits or harmful effects of imitation of certain inventions.

Now, imagine that the new statistical neural networks chat bots discussed so far were based on Tarde’s theories of desire rather than commerce? Would these chat bots be able to understand our desire better than we can? This is the premise upon which this research paper is built.

**Research questions:**

The kernel of this project is the third research question. Answering the first two questions will provide the context and open up the broader issues addressed by the last question.

1. What are Gabriel Tarde’s ideas around imitation, desire and statistics?
2. What is the state of current research on deep learning and social reasoning?
3. Can deep neural networks learn more than we do about our own desires?

**Method(s) of analysis:**

In addition to the theoretical analysis, the research will employ a method of action testing an experimental deep neural network chat bot prototype running on End-To-End-Memory Networks written by Facebook AI and New York university. The chat bot will be deployed onto slack and will attempt to instigate casual conversation with users in order to learn facts about them. A version of this chat bot—named Casper—has already been deployed on the Digital Anthropology Lab’s slack network so the task would now be to upgrade the neural network to an End-To-End Memory network and retest.

**Works Cited:**

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**Biographical summary**

Maria Dada is Research Fellow at the Digital Anthropology Lab at UAL. Her research is placed within the fields of design and material culture. She investigates the possibilities of the digital in reconfiguring socio-political and economic structures. A PhD candidate in science and technology studies at Durham University, she holds an MA from the Centre for Research in Modern European Philosophy and a BSc in Computing and Communication Arts from the Lebanese American University in Beirut. She also has ten years of experience as an interaction designer for Google, Abbey Road and Warp.net.

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1. Peng, Baolin, Lu, Li, Wong, and Kam-Fai. "Towards Neural Network-based Reasoning." p3. [↑](#footnote-ref-1)
2. Sainbayar, Arthur, Weston, Jason, Fergus, and Rob. "End-To-End Memory Networks." p1. [↑](#footnote-ref-2)
3. Ibid. p12 [↑](#footnote-ref-3)