Preliminary Research/Learning Objectives

Chatbots are the application of machine learning technology (the process by which we gain artificial intelligence). Such that, to get to the point where we can program a chatbot, we will have understand the following criteria :

- **LO-1** - How to program in python (there are other languages that you can create a chatbot in, but python has the 'greatest' suite of libraries to reduce the work of the developer).
- **LO-2** - A working understanding of machine learning.
  - Neural Networks. Below are some of the most fundamental principles employed in the currently developed Children's Legal Centre Chatbot. It would be good to familiarise yourself with these.
    - Embedding Layer (the principles of what it's doing)
    - MLP (Multi-layer Perceptron model).
    - Classification through a Softmax layer.
    - One Hot Encoding
- **LO-3** - How chatbots work.
  - Understand the difference between closed/open domain
  - Differences between retrieval/generative models.

To help you with these objectives, I have provided below some links to resources. Included are various forms of material to suit how you would like to learn. That is, I have tried my best to include videos, reading material, and some practical challenges.

LO-2 - Understanding of Machine Learning

Machine learning is very broad subject, artificial intelligence even more so. So, we will just focus on what it will take to create a chatbot.

Reading Material

(Article) Using neural nets to recognize handwritten digits - http ://neuralnetworksanddeeplearning.com/chap1.html
(Article) An Intuitive Understanding of Word Embeddings : From Count Vectors to Word2Vec - https ://www.analyticsvidhya.com/blog/2017/06/word-embeddings-count-word2veec/

Videos

How Neural Networks Work - https ://www.youtube.com/watch?v=IHZwWFHWa-w
Introduction to Word Embeddings - https ://www.youtube.com/watch?v=Eku_pbZ3-Mw
Neural Networks : Multilayer Perceptron - https ://www.youtube.com/watch?v=u5GAVdLQyIg
The Softmax Output Function as presented by Geoffry Hinton - https ://www.youtube.com/watch?v=mlaLLQofmR8
Neural Networks [10.3] : Natural Language Processing – one-hot encoding - https ://www.youtube.com/watch?v=iZ3e_cifP7Y

Practical Exercises

Implementing a Neural Network from Scratch in Python – An Introduction - http ://www.wildml.com/2015/09/implementing-a-neural-network-from-scratch/

Shortlist of Python Libraries Available

- Tensorflow
- Sklearn
- Keras
- PyCaffe

LO-2 – How Chatbots Work

Reading Material

(Article) How to Build a Chatbot – Part 1 - https ://chatbotsmagazine.com/how-to-build-a-chatbot-part-1-5f4a41ee3ba8

(Research Paper) A Neural Conversational Model - https ://arxiv.org/pdf/1506.05869.pdf

(Article) Chatbots with Machine Learning : Building Neural Conversational Agents - https ://blog.statsbot.co/chatbots-machine-learning-e83698b1a91e (Note, they refer to selective models, which are another way of saying retrieval based).

(Article) Ultimate Guide to Leveraging NLP & Machine learning for your Chatbot - https ://chatbotslife.com/ultimate-guide-to-leveraging-nlp-machine-learning-for-you-chatbot-531ff2dd870c

Videos

How to Make a Chatbot – Intro to Deep Learning #12 - https ://www.youtube.com/watch?v=t5qgjJIBy9g

Practical Exercises

Use the chatterbot python module and create a command line chatbot – you can get it to say anything you want. https ://github.com/gunthercox/ChatterBot