**Detailed Description of neural network**

**1. Metadata and Imports**

* **Encoding Declaration**: The script specifies UTF-8 encoding.
* **Library Imports**:
  + pandas and numpy for data manipulation.
  + spacy for natural language processing.
  + collections and gensim for handling word embeddings.
  + matplotlib.pyplot and sklearn for machine learning and visualization.

**2. Data Loading**

* **Data Import**: The script reads a CSV file final.data\_finclub.csv using pandas. The file is encoded in latin1.

**3. Spacy Setup**

* **Spacy Model Download**: The script uses a system command to download the en\_core\_web\_sm model for Spacy.
* **Model Loading**: The Spacy model is loaded with Named Entity Recognition (NER) and parser disabled for efficiency.

**4. Tokenization Function**

* **Tokenize Function**:
  + Lemmatizes tokens.
  + Converts tokens to lowercase.
  + Removes stop words, punctuation, tokens shorter than three characters, and spaces.

**5. Gensim Setup**

* **Gensim Installation**: Ensures the gensim library version 4 or above is installed.
* **Word2Vec Model Loading**: Downloads and loads the pre-trained Google News vectors using Gensim's KeyedVectors.

**6. Sentence Vectorizer**

* **Function**: sentence\_vectorizer creates vectors for each sentence by summing word vectors.
  + Iterates over each statement.
  + Tokenizes the statement and sums up word vectors.
  + Handles missing words by skipping them.

**7. Data Processing**

* **Print Statements**: Prints the Headline column of the dataframe.
* **Vectorization**: Applies sentence\_vectorizer to the Headline column to preprocess the training corpus.

**8. Additional Libraries and Setup**

* **Import Spacy Again**: (Seems redundant as it's already imported earlier.)
* **Additional Imports**:
  + matplotlib.pyplot for plotting.
  + sklearn modules for metrics and model selection.