iJRASET
International Journal For Research in Applied Science and Engineering Technology



INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 6 **Issue:** VII **Month of publication:** July 2018

DOI: http://doi.org/10.22214/ijraset.2018.7135

www.ijraset.com

Call: 08813907089 | E-mail ID: ijraset@gmail.com

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 6.887
Volume 6 Issue VII, July 2018- Available at www.ijraset.com

Smart Education System Developed by Sentiment Analysis of Students Using PMM Neural Networks

Siddharth Shrotriya[1], Nidhi Kumari[2]
[1, 2]*Jazari Research Institute of Artificial Intelligence, India*

Abstract: ***Deep learning can provide many improvements to the existing systems which can also help the society in having reliable education management structures around them. Nowadays, students in SAARC nations follow a primitive education curriculum which neither challenges nor completely utilise their abilities. In this research, we are proposing a unique and manageable education system which can make India grow rapidly in near future as students are the backbone of any nation. We have accomplished this proposal with the help of sentiment analysis techniques implemented through a new type of neural network architecture, which we have named as PMM Networks. This system can be implemented not just by SAARC nations but by many other developing nations to provide a desirable curriculum to their school and college level students. We have tested this system on a group of students from several states of India and found great results and the students were also happy and eager to attend colleges which will provide such curriculums. We have also developed a feasibility model for the Ministry of Education of the nations to implement such a preferential system at the national level.***

Keywords*: Deep Learning, Machine Learning, Artificial Intelligence, Neural Networks, Activation Function, Education, SAARC, Curriculum, Sentiment Analysis.***

I. INTRODUCTION

Education is the key to growth of any developing nation. It is the responsibility of governing bodies to provide a fruitful and challenging curriculum both at school and college level for the residential students. A preferential curriculum is made by understanding the sentiments and abilities of the students and then deep learning helps in finding groups of such students from a geographical area who can group and study together. Sentiment Analysis can help in understanding the behavioural pattern of any individual by their online and offline habits. It is mainly used by online retailers to list suitable products for their customers or news aggregators to provide useful news to their audience. Neural networks are widely used in finding patterns and helps in such type of sentiment analysis. Most popular neural network in this field is LSTM (Long Short-Term Memory) networks [1]. But, these models also have some drawbacks such as slowness in computation and not been able to remember high amount of sequences which are in the order of 10,000's. So, we are proposing a modified LSTM cell network which can remember only the desired cell states and ignore the things which are not required for future predications. We have named this network structure as PMM or Preferential Memory Model. These neural networks are solving the problem of Sentiment analysis [2] based on some personal and skill tests taken on all the concerned students. Along with this, these networks are also learning the pattern among all the students in the survey to group them in certain categories which can be further used for making custom batches in the respective institutions.

II. DATA COLLECTION

Input data is collected via a survey conducted online for the people from major cities of India. The aim of these survey is to perform 2 tests on the students. First test is a behaviour test which consist of 40 general questions and provides us the knowledge of real desires of the students in relation to their career prospects. Second test is a skill test conducted after the first one which will analyse if the student has a potential of pursuing the desired career. For example, a student who wants to be a pilot must have good eyesight and student who wants to be an engineer must have the curiosity to learn old and new technologies. This data is then passed as input to the first layer of the neural network. It's used for both sentiment analysis and to build batches of students having likewise traits.

III. TECHNOLOGIES USED

Data clean-up and management is done using Hadoop Distributed File System and Resource Negotiator. Data Analysis and Deep Learning part is done in Python programming language using third party libraries. The custom neural network is built in Keras framework and TensorFlow libraries. Modified LSTM or PMM is made as a firmware script of Keras framework. I-python Notebooks are used to perform Data visualisation and presentation.

©IJRASET: All Rights are Reserved

IV. SENTIMENT ANALYSIS

Sentiment analysis is a type of data mining that measures the inclination of people's opinions through natural language processing (NLP), computational linguistics and text analysis, which are used to extract and analyse subjective information from the Web - mostly social media and similar sources. The analysed data quantifies the general public's sentiments or reactions toward certain products, people or ideas and reveal the contextual polarity of the information. That's why it is also known as opinion mining. We use this analysis to find the educational sentiments [3] of a person and what subjects he should learn to reach his desired level of competence. A sample output of this technique looks like Fig. 1 and is used for finalizing the curriculum for like-minded students having same set of subjects. A set of 7 subjects are chosen from a list of 100 possible students. Now a curriculum can have 5-7 chosen subjects for the secondary as well as the higher education of a student so that he can learn the preferred topics right from a young age till graduation.

Student ID	Subject 1	Subject 2	Subject 3	Subject 4	Subject 5	Subject 6	Subject 7
101	computers	fashion design	crafting	football	cooking	history	singing
102	commerce	maths	econmoics	media	fashion design	photography	physics
103	history	hotel managemnet	writing	maths	cooking	swimming	basketball
104	hotel managemnet	music	geography	biology	crafting	maths	dancing
105	commerce	politics	nuclear-phy	doctor	chemistry	maths	photography
106	business	geography	media	blacksmith	chemistry	politics	dancing
107	commerce	media	computers	physical training	archealogist	pottery	agriculture
108	civics	politics	business	cricket	biology	singing	animation
109	politics	commerce	physics	archealogist	hotel managemnet	astronaut	media
110	hotel managemnet	electronics	computers	singing	football	biology	animation
111	aviation	animation	physical training	computers	blacksmith	econmoics	photography
112	photography	maths	econmoics	archealogist	singing	geography	writing
113	football	pottery	aviation	singing	swimming	electronics	physics
114	crafting	hockey	blacksmith	football	marketing	hotel managemnet	geography
115	econmoics	maths	writing	physical training	fashion design	hotel managemnet	geography
116	marketing	politics	aviation	doctor	archealogist	computers	astronaut
117	dancing	history	cinematography	basketball	agriculture	physics	marketing

Fig. 1 A sample output from Sentiment Analysis.

V. SEMI SUPERVISED ENVIRONMENT

With more common supervised machine learning methods, you train a machine learning algorithm on a labelled dataset in which each record includes the outcome information. This allows the algorithm to deduce patterns and identify relationships between your target variable and the rest of the dataset based on information it already has. In contrast, unsupervised machine learning algorithms learn from a dataset without the outcome variable. In semi-supervised learning, an algorithm learns from a dataset that includes both labelled and unlabelled data, usually mostly unlabelled. In our model, we try to find the sentiments or actual educational requirement of a student on uncategorised data which comes under unsupervised learning. Then we also find the common traits to create batches of like-minded students which comes under supervised learning. Thus, our complete system follows semi-supervised environment. [4].

VI. NEURAL NETWORK DESIGN

PMM (Preferential Memory Model) is built upon basic LSTM cell [5] while changing and adding some of the features. In a traditional LSTM cell, the key is the cell state, the horizontal line running through the cell diagram. The cell state is kind of like a conveyor belt. It runs straight down the entire chain, with only some minor linear interactions. It's very easy for information to just flow along it unchanged. The LSTM does have the ability to remove or add information to the cell state, carefully regulated by structures called gates. Gates are a way to optionally let information through. They are composed out of a sigmoid neural net layer

©IJRASET: All Rights are Reserved

ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 6.887
Volume 6 Issue VII, July 2018- Available at www.ijraset.com

and a pointwise multiplication operation. The first step in our PMM model is to decide what information we are going to throw away from the cell state. This decision is made by a sigmoid layer called the forget gate layer. The next step is to decide what new information we are going to store in the cell state. This has two parts. First, a sigmoid layer called the input gate layer decides which values we will update. Next, a bipolar sigmoid layer creates a vector of new candidate values, that could be added to the state. In the next step, we'll combine these two to create an update to the state. While creating estimation vector, bipolar sigmoid is used in place of usual Tanh activation to understand more information at a given timestep.

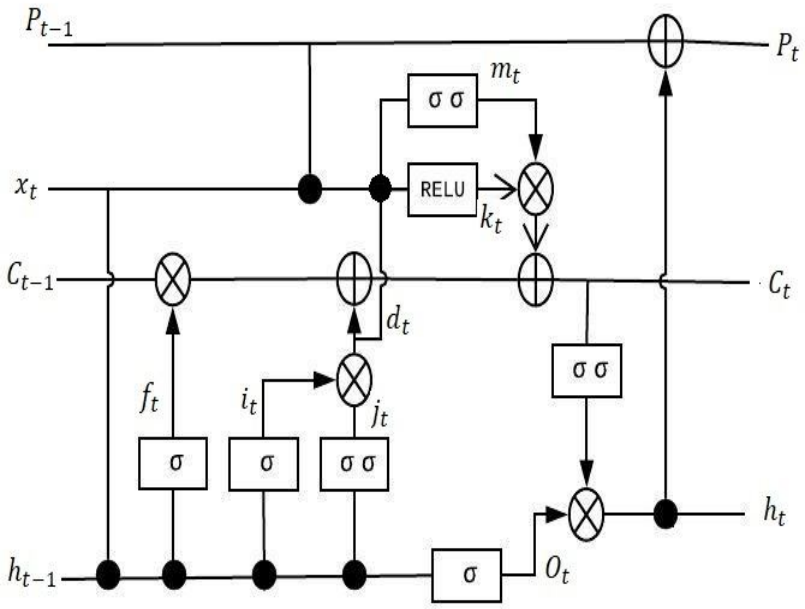


Fig. 2 PMM cell internal layer structure.

Preferential state line is added to keep the input gate in-check using an extra gate. If the input gate does not think that any information [6] is worthy of storing because of its inability to remember long sequences, then preferential gate will add that information by itself by accessing the longest possible sequences. It will remain idle if the default input gate is working fine and will start triggering if some inputs are neglected which has preference while considering all the older contexts.

Finally, we need to decide what we are going to output. This output will be based on our cell state but will be a filtered version. First, we run a sigmoid layer which decides what parts of the cell state we're going to output. Then, we put the cell state through bipolar sigmoid and multiply it by the output of the sigmoid gate, so that we only output the decided parts of the data. In addition to this, the output is added to the Preferential state line so that it can keep track of all the information passing through the PMM cell shown in Fig. 2.

Derivations of a PMM Cell:

ft =σ (Wf . [ht-1, xt] + bf)
it =σ (Wi . [ht-1, xt] + bi)
jt =σ (Wj . [ht-1, xt] + bj)
Ot =σ (Wo . [ht-1, xt] + bo)
ht=Ot+σσ (Ct)
mt= σ σ (Wm . [dt ,xt, Pt-1] + bo)
kt= ReLU (Wm . [dt ,xt, Pt-1] + bo)
dt = it * jt
Ct = ft * Ct-1 + dt + (mt * kt)
(σ) refers to sigmoidal activation
(σ σ) refers to bipolar sigmoidal activation
(ReLU) refers to Rectified Linear Unit Activation

©IJRASET: All Rights are Reserved

VII. TEST CODE SNIPPETS

Firstly, the PMM cell is built as a custom layer in Keras. Then it is used to create our system with many such cells to form different internal layers of the model. Default Class call in Keras syntax looks like Fig. 3 and sample usage of this cell to build a model is done like Fig. 4.

```
keras.layers.PMM(units, activation='bipolar_sigmoid', recurrent_activation='sigmoid', use_bias=True,
                 kernel_initializer='glorot_uniform', recurrent_initializer='orthogonal',
                 bias_initializer='zeros', unit_forget_bias=True, unit_preference_bias=True,
                 kernel_regularizer=None, recurrent_regularizer=None, bias_regularizer=None,
                 activity_regularizer=None, kernel_constraint=None, recurrent_constraint=None,
                 bias_constraint=None, dropout=0.0, recurrent_dropout=0.0, implementation=1,
                 return_sequences=False, return_state=False, go_backwards=False, stateful=False)
```

Fig. 3. PMM Cell as a Keras Layer

```
from keras.layers import Dense, Activation
from keras.layers import PMM
from keras.optimizers import RMSprop


model = Sequential()
model.add(PMM(256, input_shape=(maxlen, len(chars))))
model.add(Dense(len(chars)))
model.add(Activation('softmax'))

optimizer = RMSprop(lr=0.01)
model.compile(loss='categorical_crossentropy', optimizer=optimizer)


model.fit(x, y, batch_size=256,
          epochs=100,
          callbacks=[print_callback])
```

Fig. 4. Code snippet for Neural Network model design

VIII. WORKING OF THE SYSTEM

Initial stage of our system starts with the collection of survey data from the students in consideration. As mentioned in Section II, student information is collected via two dedicated tests. This information is used to build sentiment database of all the students using Neural networks. These sentiments will give dedicated weights for 40 subjects currently taken into consideration. These subjects can be increased as per the need of an institution. Then second phase of our model divides students in 20 types having 5-7 common subjects which is a continuous learning process achieved by PMM Model. For Example, a sample output can be a group of 25 students has 7 subjects in common namely, Mathematics, Physics, Football, Dance, English, Physical training and Acting. Then these students will learn the essential subjects as well as their preferred subjects and will become experts at an early age.

Such students will not only find easiness in studying a unique mix of subjects but will also have an upper hand on the students having traditional curriculum in their schools and colleges. Third phase of the system is related to the implementation of such complicated structure by the government at the national level. [7] As we have collected like-minded students, it will be easier for governments to make their respective classes under an institution. Government can also have 20 different institutions for 20 types of students as per the model. This can further help the students as now thousands of like-minded students selected from all over the country can study together and prosper with great speed.

IX. OUTPUT USAGE

This model can be used by schools in secondary education and by college in graduation and post-graduation. At school level, it will provide a curriculum as a combination of necessary and preferred subjects. In India, secondary education terminated at the 10th standard Board examinations. So, our system will provide a custom Board Exam syllabus for the students having the preferred curriculum. For example, a student who wants to be musician will have 3-4 core subjects such as mathematics, science/commerce, a

©IJRASET: All Rights are Reserved

local/foreign language and the 2 subjects from music background as the syllabus to be taught in secondary level and in the examination at 10th Board level.

At college level, we propose a new set of Degrees such as Bachelor of Preference, Master of Preference and Doctorate of Preference. All these degrees will be tailored to the needs of a set of students. There will be 20 types of these degree and each type will have a different syllabus. This syllabus will keep on improving monthly based on our deep learning outcomes. Each type will be the main syllabus of a university, so only 20 only such institutes are required for teaching a wide range of subjects.

X. CONCLUSIONS

The Model is still in beta phase but promises huge benefits for people of both educational and political background. It invents the use of PMM model for sentiment analysis. It also provides the needed change in primitive curriculums used in most of the educational institutions in the developing nations. Training of the model takes about 2 days to get the final output when tested on the dataset of 5 cities of India and ran through GeForce 1070 Ti processors.

In the continuation of this model, we will publish a stable release of the complete source code of this system as soon as possible. We hope it will ignite a spark in the minds of government officials along with deep learning enthusiasts with some new and unique combination of ideas proposed in the paper.

REFERENCES

[1] Felix A. Gers , Juan Antonio Pérez-Ortiz , Douglas Eck , Jürgen Schmidhuber, Learning Context Sensitive Languages with LSTM Trained with Kalman Filters, Proceedings of the International Conference on Artificial Neural Networks, p.655-660, August 28-30, 2002.

[2] ASamy Bengio , Oriol Vinyals , Navdeep Jaitly , Noam Shazeer, Scheduled sampling for sequence prediction with recurrent Neural networks, Proceedings of the 28th International Conference on Neural Information Processing Systems, p.1171-1179, December 07-12, 2015, Montreal, Canada.

[3] Yi Tay , Luu Anh Tuan , Siu Cheung Hui, Dyadic Memory Networks for Aspect-based Sentiment Analysis, Proceedings of the 2017 ACM on Conference on Information and Knowledge Management, November 06-10, 2017, Singapore, Singapore.

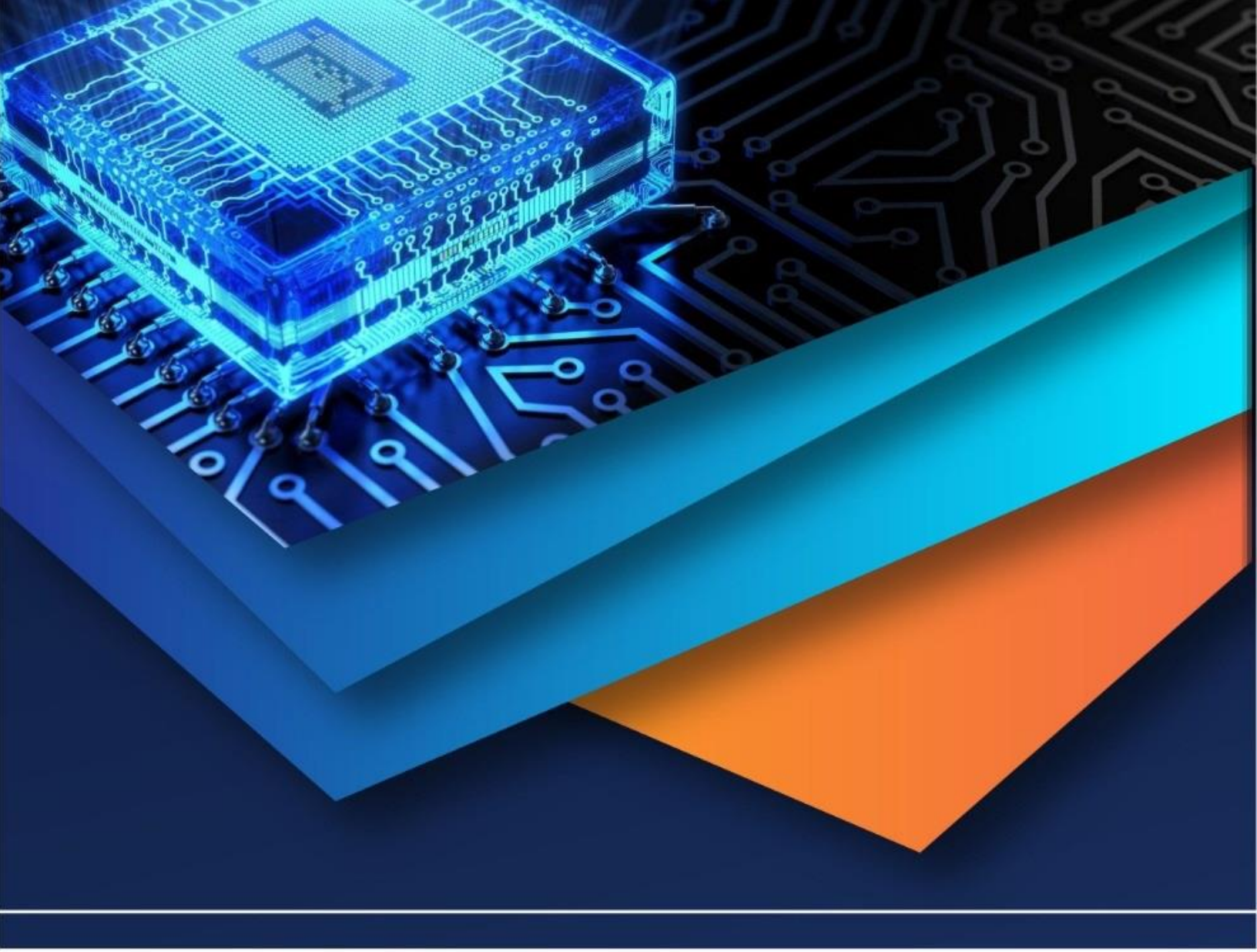
[4] Rie Johnson , Tong Zhang, Supervised and semi-supervised text categorization using LSTM for region embeddings, Proceedings of the 33rd International Conference on International Conference on Machine Learning, June 19-24, 2016, New York, NY, USA.

[5] Martin Wöllmer , Björn Schuller, Enhancing spontaneous speech recognition with BLSTM features, Proceedings of the 5th international conference on Advances in nonlinear speech processing, November 07-09, 2011, Las Palmas de Gran Canaria, Spain.

[6] Hang Li , Zhengdong Lu, Deep Learning for Information Retrieval, Proceedings of the 39th International ACM SIGIR conference on Research and Development in Information Retrieval, July 17-21, 2016, Pisa, Italy.

[7] Gautam, Mohan & Singh, Sunny & Fartyal, Gopal & Tiwari, Ankit & Singh Arya, Kuldeep. (2016). Education System in Modern India. International Journal of Scientific Research And Education. 10.18535/ijsre/v4i01.16.

©IJRASET: All Rights are Reserved



10.22214/IJRASET

45.98

IMPACT FACTOR: 7.129

IMPACT FACTOR: 7.429

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Call : 08813907089 (24*7 Support on Whatsapp)