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# ABSTRACT

Rainfall is one of the major source of freshwater for all the organism around the world. Rainfall prediction model provides the information regarding various climatological variables on the amount of rainfall.

In recent days, Deep Learning enabled the self-learning data labels which allows to create a data-driven model for a time series dataset. It allows to make the anomaly/change detection from the time series data and also predicts the future event's data with respect to the events occurred in the past.

This project deals with obtaining models of the rainfall precipitation by using Deep Learning Architectures (LSTM and ANN) and determining the better architecture with RMSE of LSTM and RMSE of ANN claiming that for any time series dataset, Deep Learning models will be effective and efficient for the modellers.

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# LIST OF ABBREVATIONS

| ABBREVATION | EXPANSION |
| --- | --- |
| ANN | ARTIFICIAL NEURAL NETWORK |
| LSTM | LONG SHORT TERM MEMORY |
| AVG | AVERAGE |

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# CHAPTER 1

# INTRODUCTIO

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## 1.1 INTRODUCTION

Rainfall Prediction is one of the most challenging tasks. Though already many algorithms have being proposed but still accurate prediction of rainfall is very difficult. In an agricultural country like India, the success or failure of the crops and water scarcity in any year is always viewed with greatest concern. A small fluctuation in the seasonal rainfall can have devastating impacts on agriculture sector. Accurate rainfall prediction has a potential benefit of preventing causalities and damages caused by natural disasters. Under certain circumstances such as flood and drought, highly accurate rainfall prediction is useful for agriculture management and disaster prevention. In this paper, various algorithms have been analyzed. Data mining techniques are efficiently used in rainfall prediction.

## 1.2 NEURAL NETWORK

Generally, a Neural Network (NN) contains a compilation of artificial neurons which are unified to execute some computation on input data and produces output forms. In deep learning, these layered portrayals are learned through models called neural network (NN), organized in exacting layers stacked on top of one another. The term neural organization is a reference to neurobiology, yet albeit a portion of the focal ideas in deep learning were created to some degree by drawing motivation from our comprehension of the mind, deep-learning models are not modelling of the cerebrum. There's no proof that the mind executes anything like the learning instruments utilized in current deep-learning models. You may run over pop-science articles broadcasting that deep learning works like the cerebrum or was designed according to the mind, yet that isn't the situation. It would be mistaking and counterproductive for newcomers to the field to consider deep learning being in any capacity identified with neurobiology; you needn't bother with that cover of "much

the same as our personalities" persona and secret, and you should fail to remember anything you may have found out about speculative connections between deep learning and science. For our motivations, deep learning is a numerical system for learning portrayals from information.

Deep learning has arrived at a degree of public consideration and industry speculation at no other time found throughout the entire existence of Artificial Intelligence, yet it isn't the primary effective type of machine learning. It's protected to say that a large portion of the machine-learning calculations utilized in the business today aren't deep learning calculations. Deep learning isn't generally the correct apparatus for the work—at times there isn't sufficient information for deep learning to be pertinent, and in some cases the issue is better tackled by an alternate calculation. In the event that deep learning is your first contact with machine learning, at that point you may end up in a circumstance where the sum total of what you have is the deep-learning hammer, and each machine-learning issue begins to resemble a nail.

### 1.3 ENSEMBLE LEARNING

In statistics and machine learning, ensemble methods use multiple learning algorithms to obtain better predictive performance than could be obtained from any of the constituent learning algorithms alone. Unlike a statistical ensemble in statistical mechanics, which is usually infinite, a machine learning ensemble consists of only a concrete finite set of alternative models, but typically allows for much more flexible structure to exist among those alternatives.

An ensemble is itself a supervised learning algorithm, because it can be trained and then used to make predictions. The trained ensemble, therefore, represents a single hypothesis. This hypothesis, however, is not necessarily contained within the hypothesis space of the models from which it is built. Thus, ensembles can be shown to have more flexibility in the functions they can represent. This flexibility can, in theory, enable them to over-fit the training data more than a single model would, but in practice, some ensemble techniques (especially bagging) tend to reduce problems related to over-fitting of the training data. Empirically, ensembles tend to yield better results when there is a significant diversity among the models.

combine. Although perhaps non-intuitive, more random algorithms (like random decision trees) can be used to produce a stronger ensemble than very deliberate algorithms (like entropy-reducing decision trees). Using a variety of strong learning algorithms.

### 1.4 MACHINE LEARNING

Machine Learning combines computer science, mathematics, and statistics. Statistics is essential for drawing inferences from the data. Mathematics is useful for developing machine learning models and finally, computer science is used for implementing algorithms. However, simply building models is not enough. You must also optimize and tune the model appropriately so that it provides you with accurate results. Optimization techniques involve tuning the hyperparameters to reach an optimum result. The world today is evolving and so are the needs and requirements of people. Furthermore, we are witnessing a fourth industrial revolution of data. In order to derive meaningful insights from this data and learn from the way in which people and the system interface with the data, we need computational algorithms that can churn the data and provide us with results that would benefit us in various ways. Machine Learning has revolutionized industries like medicine, healthcare, banking, and several other industries. Therefore, Machine Learning has become an essential part of modern industry. Data is expanding exponentially and in order to harness the power of this data, added by the massive increase in computation power, Machine Learning has added another dimension to the way we perceive information. Machine Learning is being utilized everywhere. The electronic devices you use, the applications that are part of your everyday life are powered by powerful machine learning algorithms. With an exponential increase in data, there is a need for having a system that can handle this massive load of data. Machine Learning models like Deep Learning allow the vast majority of data to be handled with an accurate generation of predictions. Machine Learning has revolutionized the way we perceive information and the various insights we can gain out of it. These machine learning algorithms use the patterns contained in the training data to perform classification and future predictions. Whenever any new input is introduced to the ML model, it applies its learned patterns over the new data to make future predictions.