

# DATA DRIVEN APPRAISALS USING WIDE & DEEP LEARNING NEURAL NETWORK

<sup>1</sup>SHRANKHLA PANDEY, <sup>2</sup>SHIKHAR PANDEY

<sup>1,2</sup>Dell Technologies

E-mail: <sup>1</sup>shrankhla.pandey@emc.com, <sup>2</sup>shikhar.pandey@emc.com

**Abstract** - The employee appraisal system has been into action from the time of Second World War. Been into existence for more than 75 years and still functions on word of mouth. With the Artificial Intelligence impacting our lives at all levels, why entrust the growth of our career, promotions, awards and recognition to an outdated system. This paper proposes a solution towards more objective, rational decision making to help the employee, working whether in a Startup or a Multi-National Corporation taste the evenhanded and inerrant pace of one's profession.

**Index terms** - Appraisal, Recommender System, Artificial Intelligence, Machine Learning, Neural Network, Deep and Wide Neural Networks.

## I. INTRODUCTION

### About the ePAS:

The ePAS was developed to:

- Help managers evaluate employee job performance,
- Help an individual to keep track of his growth,
- Help him set his eyes on the near and far goals.

Although Employee Performance Appraisal Systems began as simple methods of income justification, one of the major motivations behind the ePAS these days is to develop a fair system of pay and promotions.

### How the current ePAS works?

By definition ePAS is to be an objective, rational and accurate process.

On the contrary, in one of his papers Clinton O. Longenecker wrote, "Whenever I evaluate one of my people, I stop and think about the impact the ramifications of my decisions on my relationship with the guy and his future here. Whether it's being politically minded, or using managerial direction, or fine tuning the guy's ratings, but in the end I've got to live with him, and I'm not going to rate a guy without thinking about the fallout."

### Constraints to the current system:

- Overwhelming to managers with many employees.
- Relies on human assessment, subject to errors and biases.
- Appraisals came out to be emotional process and emotional variability gets dragged inadvertently.

## II. SOLUTION

Like the conventional ePAS, our new system would require the employee to fill in the appraisal form against the accomplishments he made in the defined timeline. He identify and mention his strengths. Set

up goals for a fixed timeline, say a quarter or a year. Lookup his development opportunities. Takes into consideration his IDP (Individual Development Plan). It goes to the manager for authentication. Once authenticated, to grade the employee, based on these inputs he fills in, comes Machine Learning in picture. Our new system, the AIPAS (Artificially Intelligent Performance Appraisal System), will learn about the inputs and their corresponding grades granted by their respective executives. The AIPAS is to give out the grades, ranked in order of their probability of accuracy. Out of these recommended grades, executives are free to choose the most relevant grade to rate the employee. This would make the appraisal system transparent and factual.

## III. SYSTEM IMPLEMENTATION

The implementation of the apps recommendation pipeline consists of three stages:

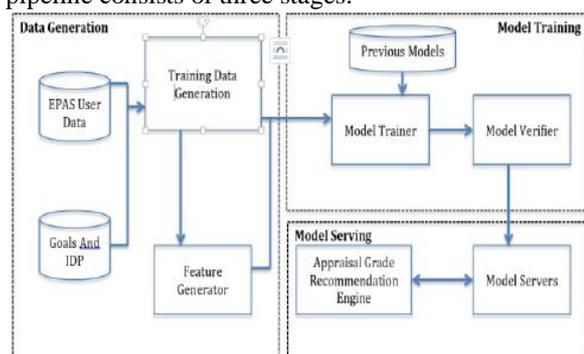


Fig.1: Pipeline Diagram of the System

### Data generation:

The data generation starts by streaming down and collecting the data from multiple sources. Here in the proposed work we are considering:

- The employee appraisal user data,
- The employee goals &
- The development plans data.

To define the features, data is passed on to a Feature Extractor and Feature Generator. These features characterize an employee's self-appraisal form and do the further.

**Model training:**

This module deals with the implementation of the training model for the recommendation weight calculation. Once the model is trained it is passed to learning model verifier for the accuracy and confidence testing.

**Model serving:**

After receiving the trained model the serving module will calculate and generate recommendations for the employee for whom the assessment is being evaluated.

**IV. OVERVIEW**

A query, which can include various employee and contextual features, is generated when a manager reviews. The AIPAS returns a list of grades on which executive can perform certain actions.

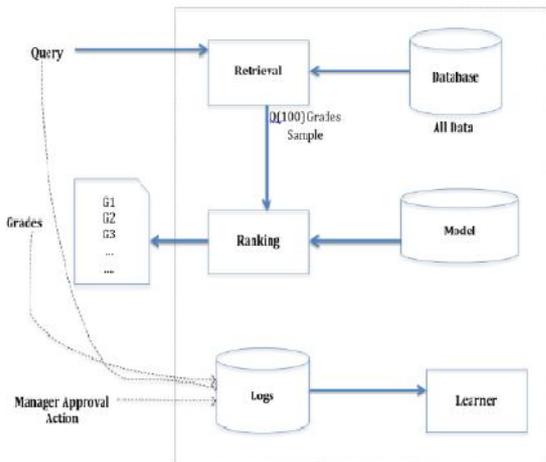


Fig.2: Overview of the System

These executive actions, along with the queries and impressions, are recorded in the logs as the training data for the learner. Since there are over 120000 ePAS instances in the database, it is intractable to exhaustively score every ePAS for every query within the serving latency requirements (often O(4) milliseconds). Therefore, the first step upon receiving a query is retrieval. The retrieval system returns a short list of items that best match the query using various signals, usually a combination of machine-learned models and human-defined rules. After reducing the candidate pool, the ranking system rank all items by their scores. The scores are usually  $P(y|x)$ , the probability of a user action label  $y$  given the features  $x$ .

**V. THE FLOWCHART**

The flow of the proposed solution starts with a query, which can be the Employee ID for whom the appraisal review is in process, the retrieval system will fetch the pre-computed recommendations for the query. The retrieval system fetches the data from the database where the output of the model is stored. The recommendations retrieved for an employee are then ranked to suggest the grades in descending order. The log database collects the query history; grades retrieved and manager approval action logs to re-train the learner model.

**VI. BEHIND THE SCENES**

The spectrum of Wide & Deep models:

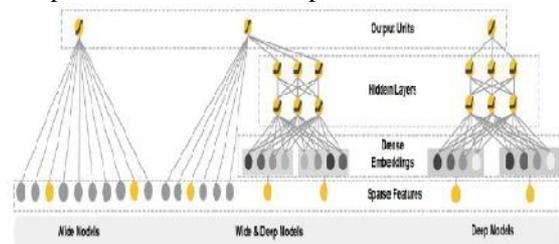


Fig.3: Wide and Deep Models

- By jointly training a wide linear model (for memorization) alongside a deep neural network (for generalization), one can combine the strengths of both. At Google, it is called Wide & Deep Learning.
- The Wide & Deep learning framework for jointly training feed-forward neural networks with embedding and linear model with feature transformations for systems with sparse inputs.
- The implementation and evaluation of the Wide & Deep recommender system productionized on GooglePlay, a mobile app store with over one billion active users and over one million apps.

**CONCLUSION**

With involvement of Machine Learning in employee appraisal system, the appreciations, promotions and awards & recognition can be made data driven, and hence free of social influence and human error. The deep and wide learning neural network gives us the best of both worlds of generalization and memorization.

**REFERENCES**

[1] Longenecker et al. 1987  
 [2] Whatishumanresouce.com  
 [3] Wide & Deep Learning: Better Together with TensorFlow by Heng-Tze Cheng

