HashCode 11

<Inventory Management and Demand Prediction>

<re:4mula>

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Inventory Management and Demand Prediction

1. Our team will develop software for inventory management and demand prediction for Cisco's products stored in various storage facilities, using historical booking data.
2. The software aims to optimize the supply chain by ensuring efficient utilization of storage facilities and timely fulfillment of customer orders.
3. The software will predict demand for each product and assign appropriate storage facilities to optimize inventory management.
4. Our solution automates the entire process of inventory management and demand prediction, eliminating the need for manual intervention and reducing the chances of human error.

Solution Description

- **Web Scraping:** We will perform web scraping to clone Cisco's website and create a local copy of the product data.

- **Data Collection and Preprocessing:** We will collect user input for product demand and store it in a CSV file in our GitHub repository. We will then use GitHub CLI to pull the data and preprocess it by removing any missing or irrelevant data, transforming categorical variables, and encoding the data in a format suitable for machine learning models.

Solution Description continued...

- **Data Analysis and Prediction:** We will use a custom shell script with awk and grep and also python pandas to analyze and predict product demand using our own machine learning algorithm [4mula]. The script takes 7 input variables (given) and pre-orders products based on their predicted demand.

- **Data Integration and Deployment:** We will use Git push to upload the values of the 7 variables of all the products and provide the product which is in demand for that particular month/quarter. We will also add a sort filter, which has interactivity and works like a decision tree.

Solution Workflow

Step 1

Step 2

Step 3

Creating a .csv files filled with random values for the 7 variables.
Making a cisco website with interactive **css** and **js** where customers can shop for products and if someone orders some product, the probability for that product increases accordingly.

Creating **our own** ML algorithm [**re:4mula**] which optimizes Cisco's inventory management and demand prediction. By analyzing sales data, we predict demand and **pre-order** low stock items, improving supply chain efficiency and customer satisfaction.

We create a shell script to modify the main .csv file in **real-time** and upload changes to our GitHub repository. The data is used for our Cisco clone website, enabling real-time updates and efficient management of inventory and customer orders.

How our Machine Learning Model Works?

- Lets consider we have N products. The probability that someone will buy this specific product is 1/N.
- When someone places the order for this product, the probability of it increases by 1/(N+x). This x<<1 is the increment factor.
- If this is increased, to balance the probability to 1, the probabilities of the other products is reduced automatically. By what factor it is reduced is derived from the expression {1-[(1/N)+x]}/4.
- This is the function which we apply on the set of data everytime someone orders something from the website.
- After training our ML model [4mula] for some data, we can now see the results of our algorithm and it also sorts out all the products based on their demands.
- Now, this is how Reinforcement learning works. We will update the model and incorporate deep learning techniques into it to enhance its capabilities for reinforcement learning.

Tech stack and Requirements

- **Server (Hardware):** Laptop with Arch linux which will be used as the backend and where all the shell scripts are going to run.
- **Website and Web Scraping:** html, css and js. Github pages for displaying the webpage. Curl (gathering data) and Kubernetes for deploying, managing, and scaling web applications.
- **Text Processing:** awk and grep for manipulating the csv files (or rather pandas), github-cli for interacting with the repo of the website in real-time.
- **Processing:** We need to be able to transfer data from github to the server system, and also arrange it efficiently.
- **Processing 2, ML algorithm:** Deep learning and with our Own Reinforcement learning algorithm [4mula] using tensorflow for using historical sales data and training it to be able to predict the sales for the next month/quarter/year.

Feasibility

- **Target Audience:** We are developing this software for Cisco for minimizing the extra load on them.
- **How easy is it to use?:** They just need to run the installer script, which even installs the dependancies needed for using our software.
- This solution is really important because "*Unlike humans, computers do not make errors unless programmed incorrectly.*".
- We'll be ready to debug the code anytime someone reports an error.

References

- Cisco website (for creating replica).
- Documentation of Tensorflow, Kubernetes.
- Hyperplexed (youtube) for making interactive and effective webpages using html, css and js.
- 3blue1brown (youtube) for understanding how deep learning works.
- w3schools to learn how actual machine learning models work and how we can update our existing model [4mula] and create [re:4mula].