

# Personalization Engine Neural Network

## Group

Group member's name

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## Introduction and Motivation (Thrishal)

### Intro

Everyone learns differently. There is no one effective method in teaching someone as what works for one person may not work for another. However, traditional education has yet to address the issue of personalizing a student's learning journey and ensuring that they are actually learning. Typically, teachers would give their instruction at a pace that matches the "average" student, not too difficult but not too easy. Of course, every teacher is different in their instruction as well, and they can't always change their teaching style for every single student that may struggle.

### Motivation

It's hard for teachers to adapt to every type of student, just as it is hard for a student to adapt to every form of instruction. With the help of a personalized engine that could determine a person's optimal learning style and then tailor a unique learning experience for them, we could fix this issue that has plagued educational institutions for years. Every student would be able to learn in a way that best works for them, which in turn will truly help them learn, understand, and apply things they weren't able to with traditional instruction. Not only that, an engine like this could also help teachers quickly determine the best way to teach their students.

## Related Works(Dharsan)

[https://pdf.sciencedirectassets.com/280203/1-s2.0-S1877050919X00198/1-s2.0-S18770509193213\[...\].29t&ua=0f155a55515b500a555d57&rr=81492e032991ad6e&cc=us](https://pdf.sciencedirectassets.com/280203/1-s2.0-S1877050919X00198/1-s2.0-S18770509193213[...].29t&ua=0f155a55515b500a555d57&rr=81492e032991ad6e&cc=us)

<https://github.com/hclon/Learning-Styles-prediction.git>

Personalized Learning Behavior Evaluation Method Based on Deep Neural Network-  
<https://www.hindawi.com/journals/sp/2022/9993271/>

Intelligent Psychology Teaching System Based on Adaptive Neural Network-  
<https://www.hindawi.com/journals/abb/2022/6248095/>

Personalized Learning in Virtual Learning Environments Using Students' Behavior Analysis  
<https://www.mdpi.com/2227-7102/13/5/457>

<https://iopscience.iop.org/article/10.1088/1742-6596/1997/1/012001/pdf>

## Background and Problem Statement(Jay Huang)

The number of users in online learning platforms has increased dramatically in recent years. However, the shortcomings of learning online still exist. Unlike face-to-face lectures, learners in most online lectures can barely interact with lecturers, which makes it difficult to identify the learner's learning style and adjust material covered in lecture. This project aims to solve this problem by using a neural network to predict the user's learning style. Then, push personalized material to the user. For example, pushing a step by step tutorial to hands-on learning style users and a formal proof to theorem-based learning style users.

## Goals and Scope (Thrishal)

### Goals

We would like to ultimately create a neural network (i.e. personalization engine) that would allow us to determine a person's learning style, and then use that to tailor a unique learning path and experience for them. We want to go beyond just classifying students as "visual", "auditory", "read/write", and "kinesthetic" learners and giving them general ideas of how they can best learn. Ideally, we can take into account things like study habits (e.g., how often they study? do they procrastinate?), personality of the individual, and more metric to provide as unique an experience as possible.

Building a questionnaire based/Feedback based signup form to learn about the feature or learning styles of the user would be better start for time being and later on using instantaneous and dynamic learning concepts, predicting the style of the user would be a better vision to look forward.

For the time being, building a predictive model (non neural network) with classical machine learning algorithms that can accurately predict a person's learning type based on a variety of metrics is the plan.

### **Scope**

As this project is quite the undertaking, especially since it delves heavily on theory, we will primarily focus on creating a predictive model that can accurately determine a person's learning style. This is a classification task so it won't be too difficult. For the time being, we will stick to the existing learning styles mentioned above (visual, audio, read/write, kinesthetic) to classify people.

The initial predictive model will not be a neural network due to the resources and time required to build one. We will build a neural network model once we have confirmed that our initial model works. This will allow us to save time while testing out different methods and ideas.

A recommendation system model would probably be a great starting point as it would essentially be able to provide suggestions to users based on their past activity, similar to how youtube and its algorithm works.

Building a recommendation system based on the choices made(action) by the user and giving back the personalized engine(response) based on reinforcement q-learning is a future possibility by dynamically learning based on the actions taken by the user and instant learning concepts.

## **Work to be Performed**

### **Dataset**

Clickstream in MOOC environment. Still looking for a public clickstream dataset.

Joyce:

Platforms we can consider: Coursera, edX, Khan Academy etc.

For Cleaning and Preprocessing; extracting relevant features related to user behavior, and handling any missing or incomplete data points.

### **Model**

We will start with a machine learning model, then compare the result with that of a neural network. Once we build an accurate classification model, we can then proceed to setting up a recommendation system that would suggest different types of content based on the user's learning style and past activities.

Joyce: We can start with decision trees and random forests for initial classifications. We can ensure the model's robustness by using the cross-validation techniques.

## Results Expected

Suppose we are going to do a binary classification. We expect to achieve 60% accuracy on the test dataset at the first stage. Then, we continue to optimize the model at the second stage. At the end of this project, we expect to achieve 90% accuracy on the test dataset.

## Tools

Github  
Google colab  
Python

### Week1:Proposal

### Week2:

Have the first demo by Friday(10/20)

Task for this week:

1. find clickstream dataset in educational environment
2. Check following website:
3. hugging face
4. Kaggle
5. Asking GPT-4 to search datasets
6. Setup Github repository

UCI Machine Learning Repository, (<http://archive.ics.uci.edu/ml/index.php>)

Harvard University provides a data repository (<https://dataverse.harvard.edu/>)

Learning Analytics and Knowledge (LAK) conference (<https://www.solaresearch.org/events/lak/>)

[Learning Style Identification | IEEE DataPort \(ieee-dataport.org\)](#) (need to login to IEEE to access dataset)

[Learning Style \(VAK\) \(kaggle.com\)](#) (dataset I found on kaggle for learning styles).

Demo:

<https://www.kaggle.com/code/ahmedadell30/classification-of-learning-style-using-dl>

(link to colab notebook)

[https://colab.research.google.com/drive/1U342RtAlglFBcQFhpQzsR5RGNnU8NWjY?usp=share\\_link](https://colab.research.google.com/drive/1U342RtAlglFBcQFhpQzsR5RGNnU8NWjY?usp=share_link))

10/17minute::

For Friday's demo, we decided to modify an existing notebook from kaggle. Below is the link to the kaggle

notebook: <https://www.kaggle.com/code/ahmedadell30/classification-of-learning-style-using-dl>

. Notebook on colab will be created by Thrishal later on. Most of our future work will be done on colab notebook. There are some tasks for the next few days:

1. Presentation on Friday (Thrishal, Dharsan)
2. Modifications on demo

Please claim your task by replying the index of your favorable tasks in thread. e.g. "Jay, 1" means Jay claims task 1.

For people in presentation, I feel 3 is the maximum.

Multiple members can work on task 2. Task 2 is a potential task.

## Week 3

Github organization already set up, repository will be available soon. Jay will invite everyone to github organization.

Personalization Engine Neural Network Development Document is available:

<https://docs.google.com/document/d/1yX5gsUAXRSt1sEuwBw7Bp7nF6vADdyR5cpFgHtCQbFA/edit?usp=sharing>

10/24 minute:

1. We divided the project into parts, so you can choose the field you want to work on. There is a table in the development document. Please put your name on.(example is given). I will finalize the first version of the development document at the end of this week.
2. Personalization Engine Neural Network Development Document is available:<https://docs.google.com/document/d/1yX5gsUAXRSt1sEuwBw7Bp7nF6vADdyR5cpFgHtCQbFA/edit?usp=sharing>
3. Github organization already set up, repository will be available soon. Jay will invite everyone to github organization. Please leave your Github account in the thread, so that Jay can find you in Github.
4. Thrishal will continue to discuss with the vector database team about the format of input.