# Personalized Online Course Recommender System with Machine Learning

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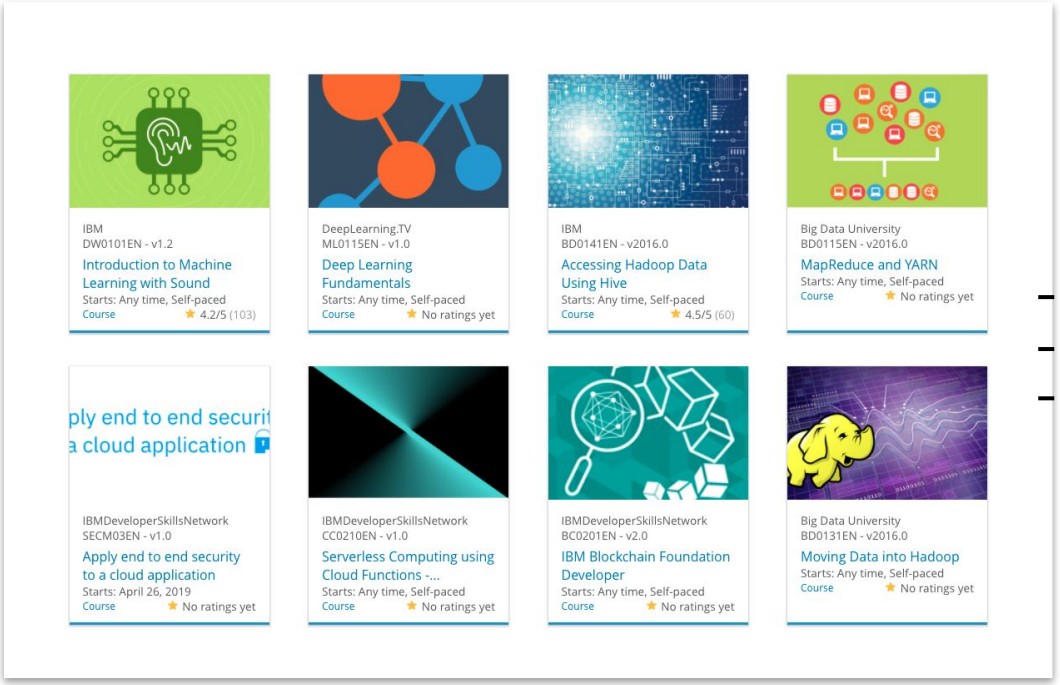


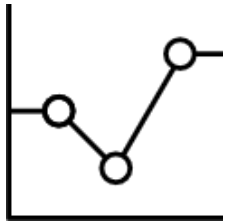
# Outline

- Introduction and Background
- Exploratory Data Analysis
- Content-based Recommender System using Unsupervised Learning
- Collaborative-filtering based Recommender System using Supervised learning
- Streamlit Course Recommendation System
- Conclusion

# Introduction

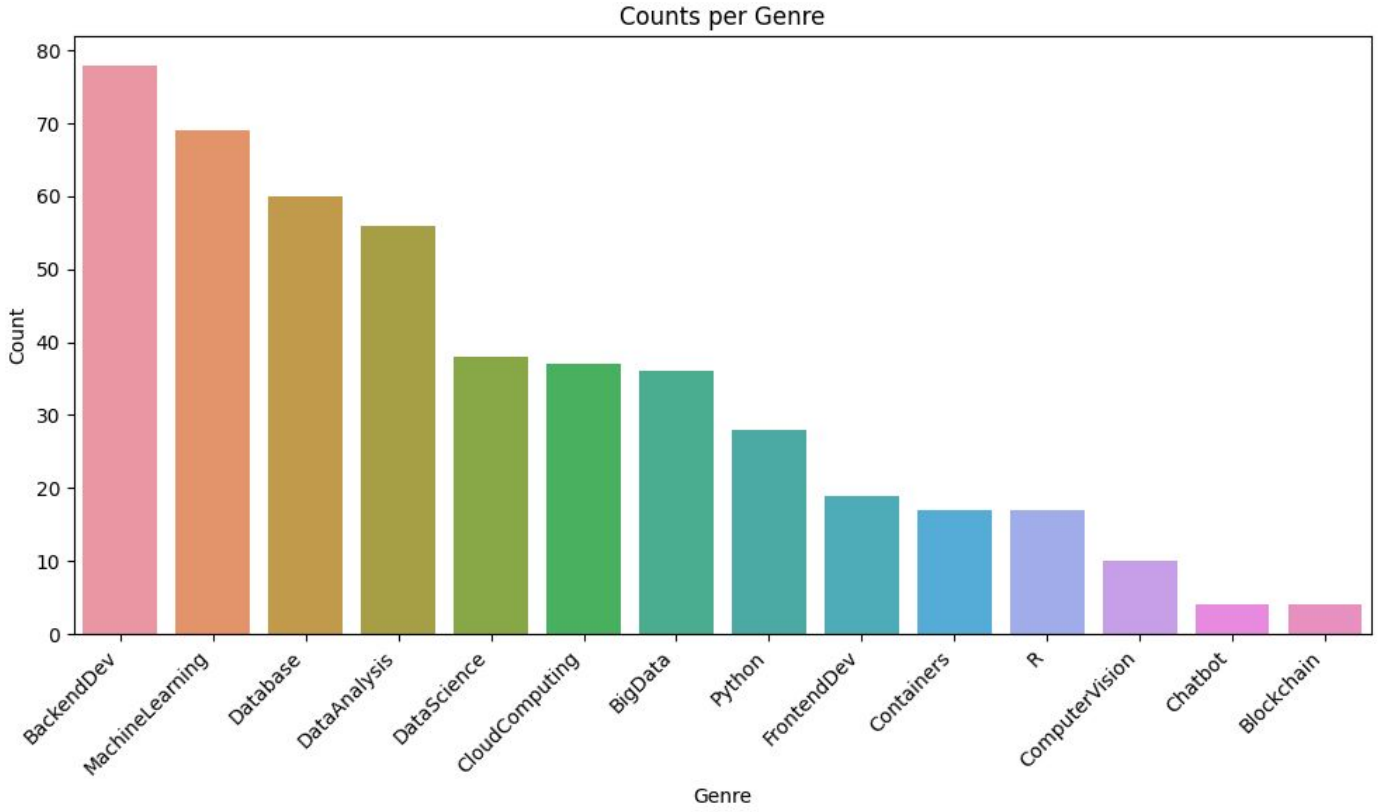
The goal of creating a personalized course recommendation system is to enhance the learning experience and outcomes for users by providing tailored and relevant suggestions for courses, educational resources, and learning paths based on their individual courses taken, interests, or learning path. This system aims to streamline the process of discovering and selecting suitable learning opportunities, ultimately helping users achieve their educational and personal development goals more effectively and efficiently.

# Exploratory Data Analysis



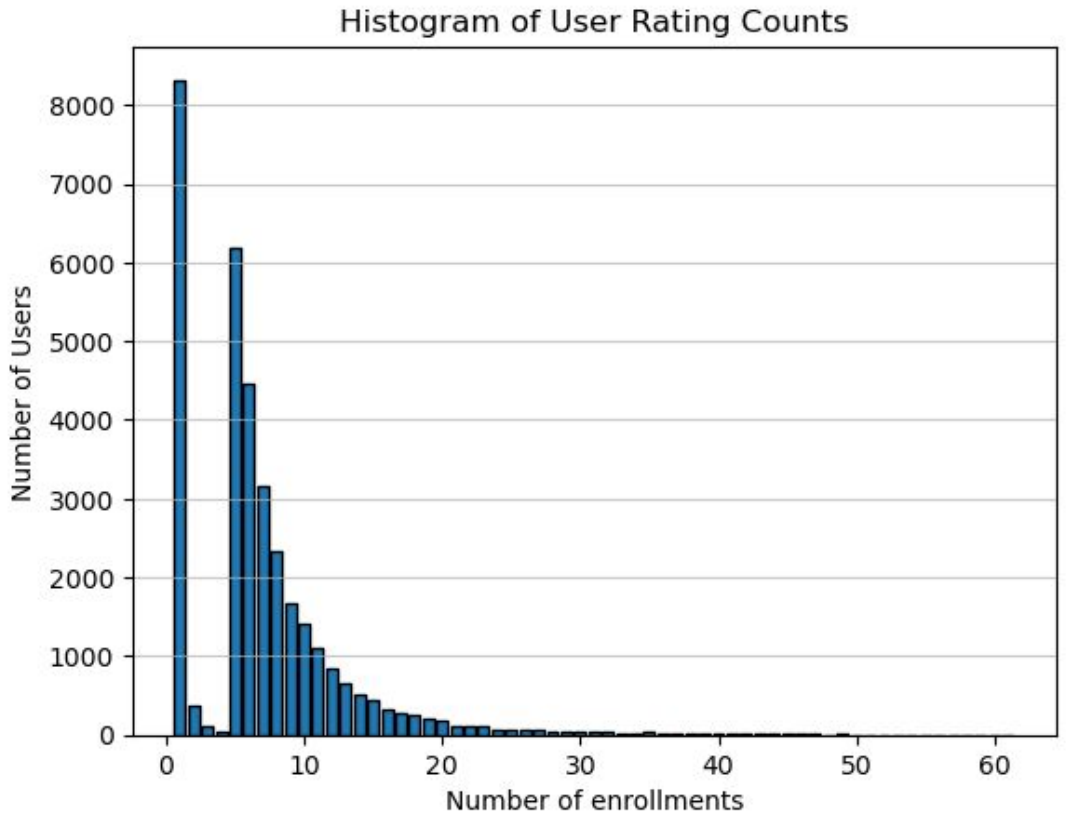
# Course counts per genre

- The bar chart illustrates the distribution of course genres based on their respective counts. Each bar corresponds to a genre, with its height indicating the number of courses within that genre.
- The chart's horizontal axis represents genres, sorted by count, while the vertical axis represents the course count.
- Visually comparing the heights of bars allows easy identification of popular and less represented genres. This visual insight can be valuable for educators and learners seeking to explore specific course genres.



# Course enrollment distribution

- The histogram titled "Histogram of User Rating Counts" displays the relationship between the number of users and the corresponding number of enrollments.
- The X-axis represents the range of user rating counts, while the Y-axis represents the frequency of enrollments falling within each rating count range.
- The chart offers a visual overview of how user ratings correspond to enrollment numbers. This information can aid in understanding the distribution of enrollments based on user ratings, providing insights into the popularity and engagement levels of various courses.

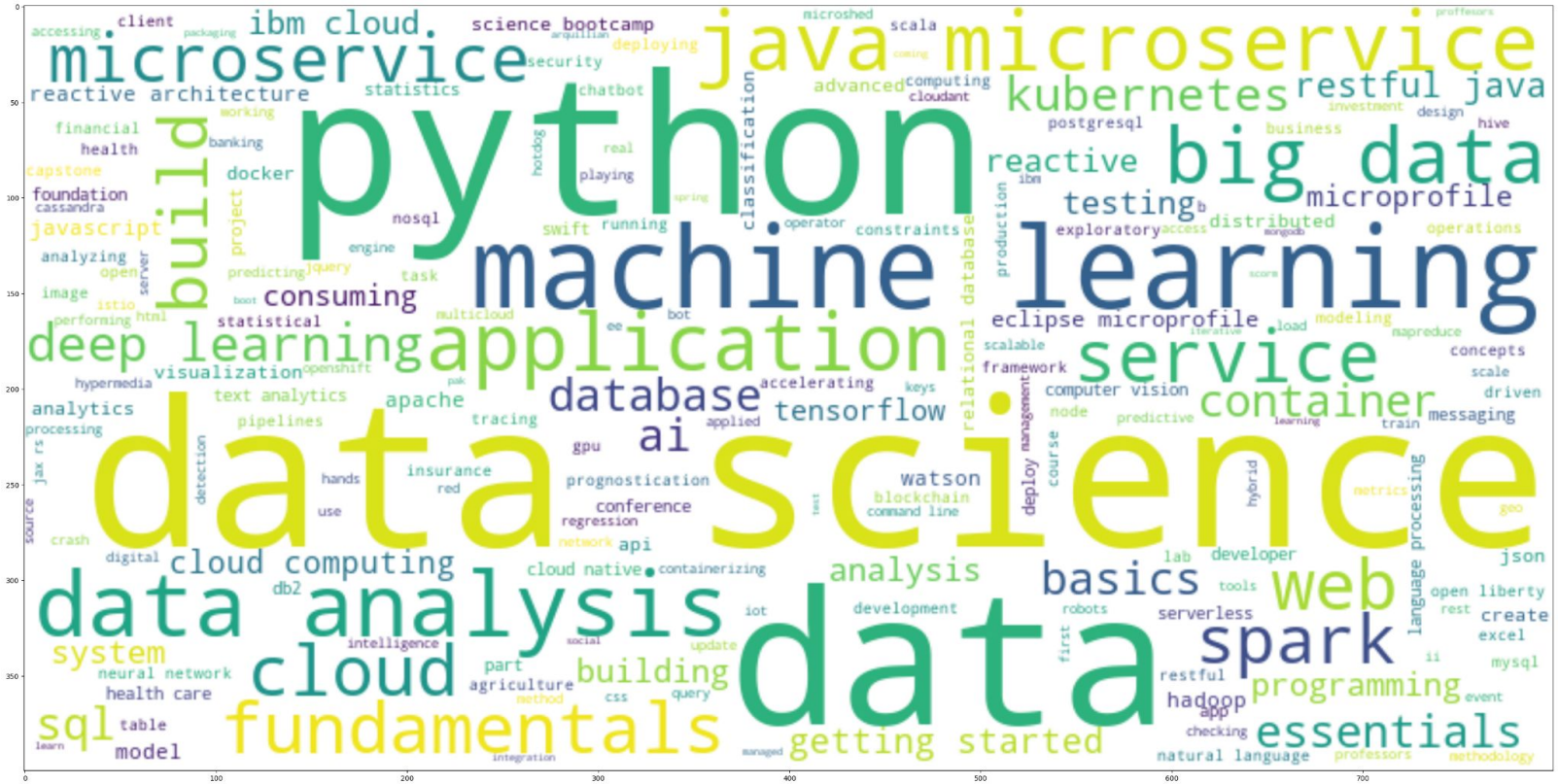


# 20 most popular courses

- The provided list presents the top 20 courses, along with their respective titles and the corresponding number of enrollments. These enrollments offer insights into the popularity and demand for each course. The course "Python for Data Science" leads the list with the highest enrollment count, followed closely by "Introduction to Data Science" and "Big Data 101."
- These statistics provide valuable information about the preferences of learners and help course providers understand which topics attract the most interest. This data aids educators, institutions, and learners in making informed decisions about which courses to explore or offer, based on enrollment trends and user engagement.

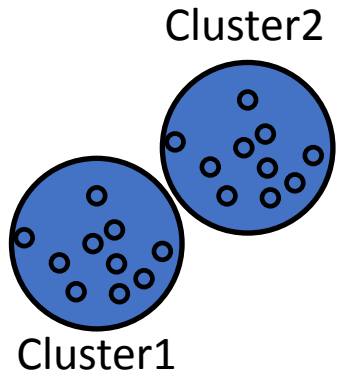
| | TITLE | rating_count |
|---|---|---|
| 0 | python for data science | 14936 |
| 1 | introduction to data science | 14477 |
| 2 | big data 101 | 13291 |
| 3 | hadoop 101 | 10599 |
| 4 | data analysis with python | 8303 |
| 5 | data science methodology | 7719 |
| 6 | machine learning with python | 7644 |
| 7 | spark fundamentals i | 7551 |
| 8 | data science hands on with open source tools | 7199 |
| 9 | blockchain essentials | 6719 |
| 10 | data visualization with python | 6709 |
| 11 | deep learning 101 | 6323 |
| 12 | build your own chatbot | 5512 |
| 13 | r for data science | 5237 |
| 14 | statistics 101 | 5015 |
| 15 | introduction to cloud | 4983 |
| 16 | docker essentials a developer introduction | 4480 |
| 17 | sql and relational databases 101 | 3697 |
| 18 | mapreduce and yarn | 3670 |
| 19 | data privacy fundamentals | 3624 |

# Word cloud of course titles




The generated word cloud captures the essence of the most popular words associated with the content or topics of courses. In the word cloud, words are displayed in varying sizes and orientations based on their frequency of occurrence in course titles or descriptions. Larger and more prominent words indicate higher prevalence. By visually emphasizing frequently occurring words, the word cloud highlights key areas of interest and focus within the course offerings. This tool provides a visually engaging and intuitive way to identify overarching themes and trends that can guide educational content development and help users discover courses aligned with their interests.

# Content-based Recommender System using Unsupervised Learning

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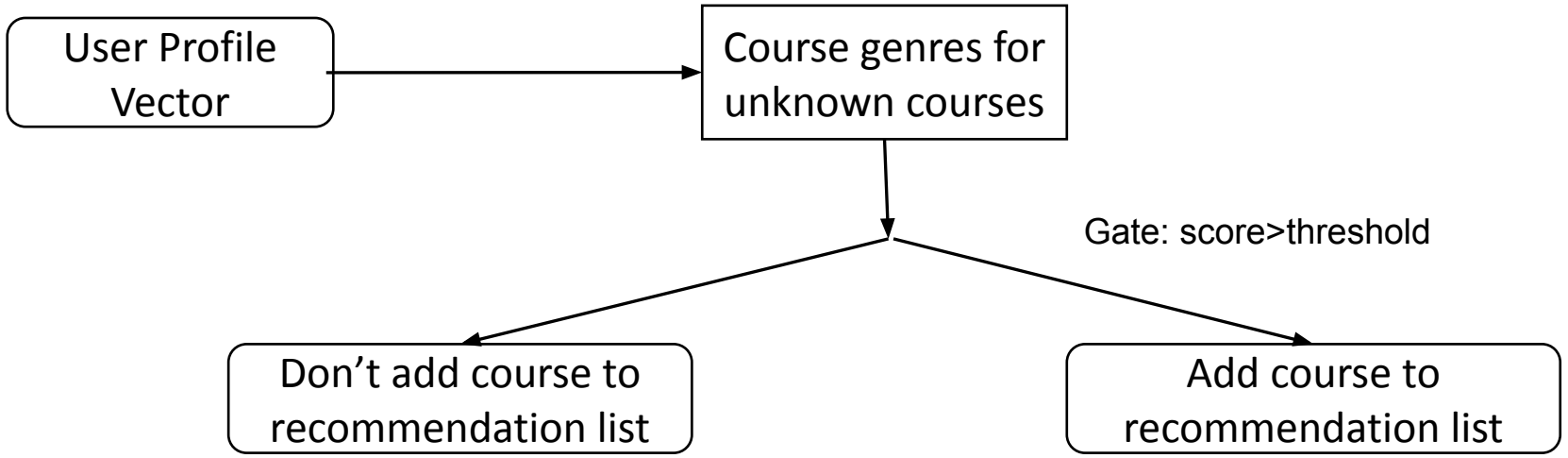
# Flowchart of content-based recommender system using user profile and course genres



# Evaluation results of user profile-based recommender system

Hyperparameters:

- Score_threshold = 10.0

On average, how many new/unseen courses have been recommended per user:

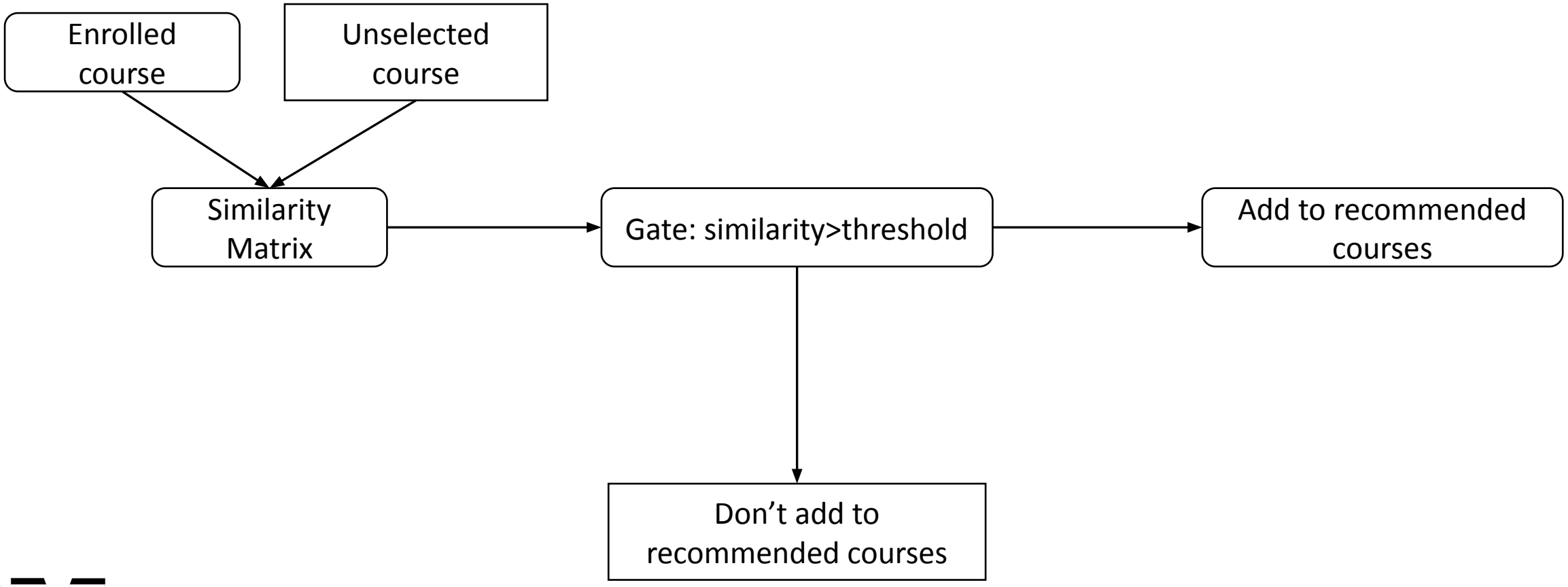
```
1 res_df['SCORE'].mean()
```

```
array([18.62679972])
```

| | Course | Count |
|---|---|---|
| 0 | TA0106EN | 608 |
| 1 | GPXX0IBEN | 548 |
| 2 | excourse22 | 547 |
| 3 | excourse21 | 547 |
| 4 | ML0122EN | 544 |
| 5 | GPXX0TY1EN | 533 |
| 6 | excourse04 | 533 |
| 7 | excourse06 | 533 |
| 8 | excourse31 | 524 |
| 9 | excourse73 | 516 |

Top 10 recommended courses across all users

# Flowchart of content-based recommender system using course similarity



# Evaluation results of course similarity based recommender system

Hyperparameters:

- Sim_threshold = 0.6

```python
# Call the function to generate recommendations for all users
users, courses, sim_scores = generate_recommendations_for_all()

# Calculate the average number of new/unseen courses recommended to each user
new_courses_counts = [len(recommended_courses) for recommended_courses in courses]
average_new_courses = sum(new_courses_counts) / len(new_courses_counts)

print(f"On average, {average_new_courses:.2f} new/unseen courses have been recommer
```

```
On average, 0.99 new/unseen courses have been recommended to each user.
```

```
Top-10 most frequently recommended courses:
Course: excourse62, Frequency: 257
Course: excourse22, Frequency: 257
Course: WA0103EN, Frequency: 101
Course: TA0105, Frequency: 41
Course: DS0110EN, Frequency: 38
Course: excourse46, Frequency: 24
Course: excourse47, Frequency: 24
Course: excourse63, Frequency: 23
Course: excourse65, Frequency: 23
Course: TMP0101EN, Frequency: 17
```

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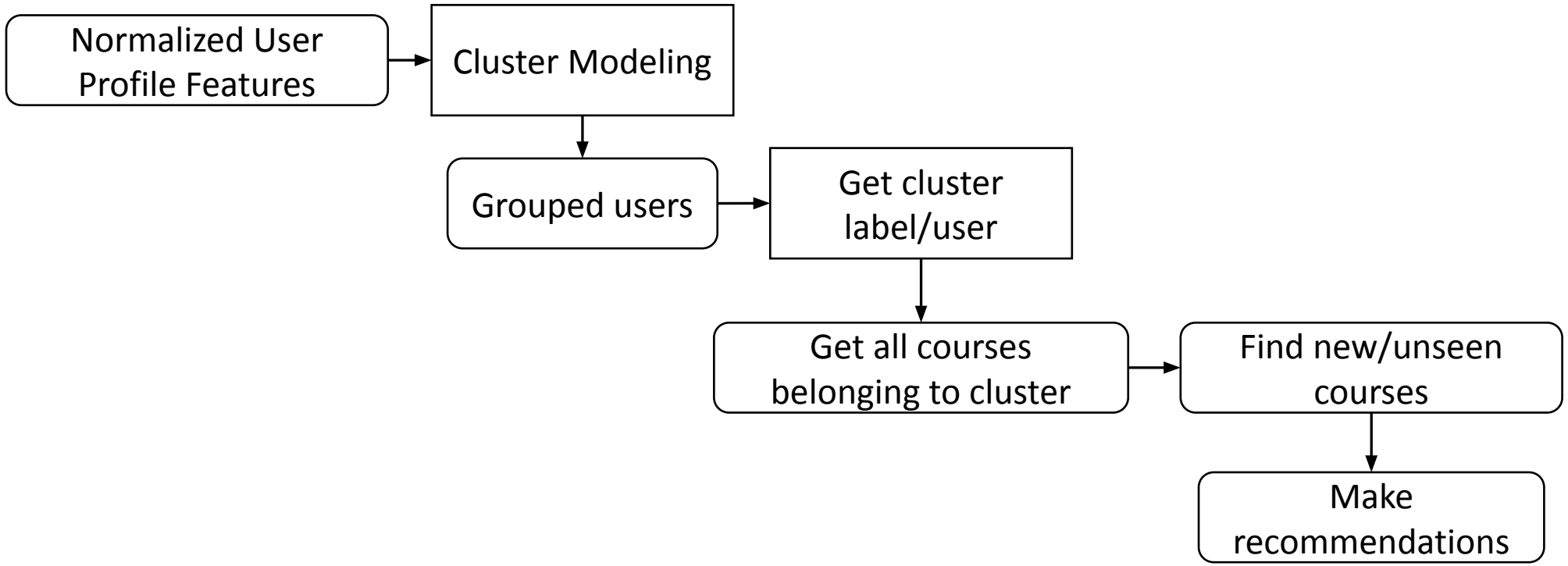
# Flowchart of clustering-based recommender system

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# Evaluation results of clustering-based recommender system

Hyperparameters:

- no_clusters = 20

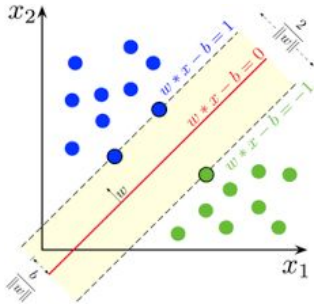
On average, how many new/unseen courses have been recommended per user (in the test user dataset):

5.733

What are the most frequently recommended courses? Return the top-10 commonly recommended courses

| | |
|---|---|
| DS0103EN | 579 |
| DA0101EN | 532 |
| BD0111EN | 456 |
| DS0101EN | 444 |
| BD0101EN | 428 |
| PY0101EN | 386 |
| DS0105EN | 319 |
| ML0101ENv3 | 299 |
| BC0101EN | 296 |
| ML0115EN | 286 |

# Collaborative-filtering Recommender System using Supervised Learning



# Flowchart of KNN based recommender system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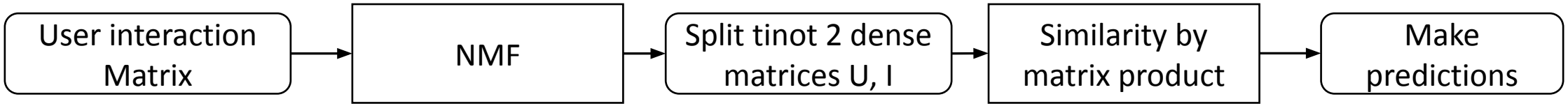
# Flowchart of NMF based recommender system

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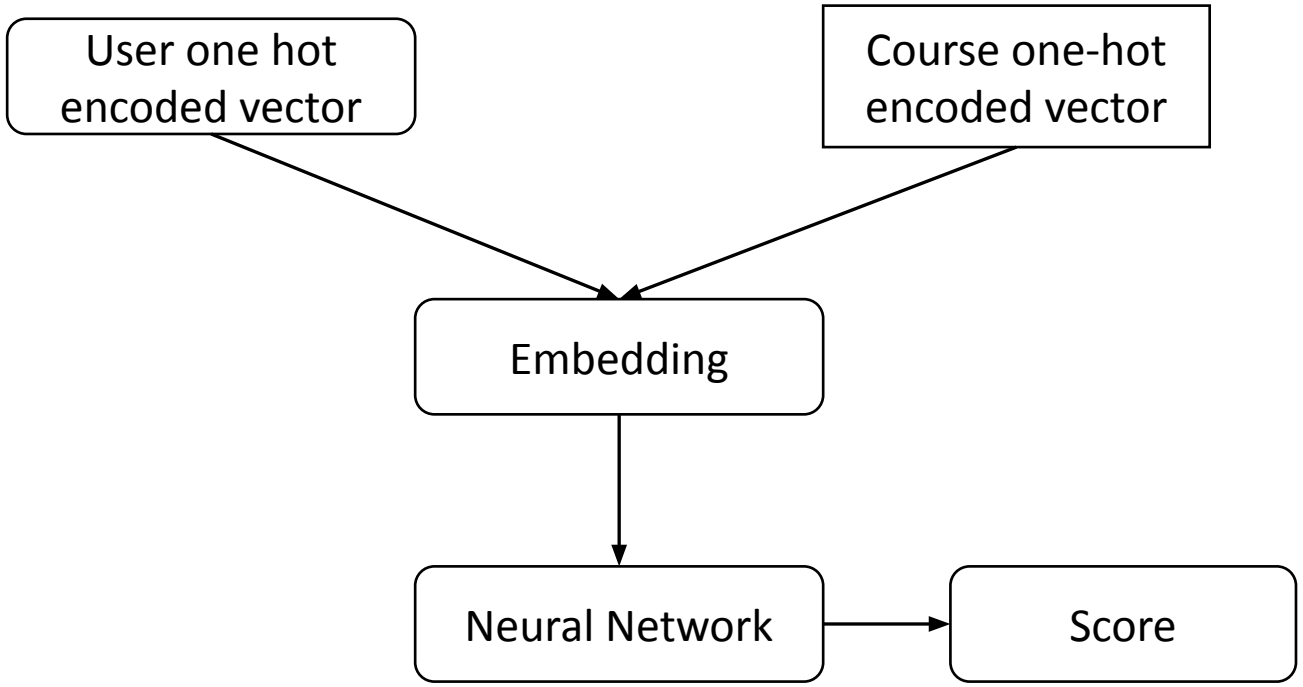
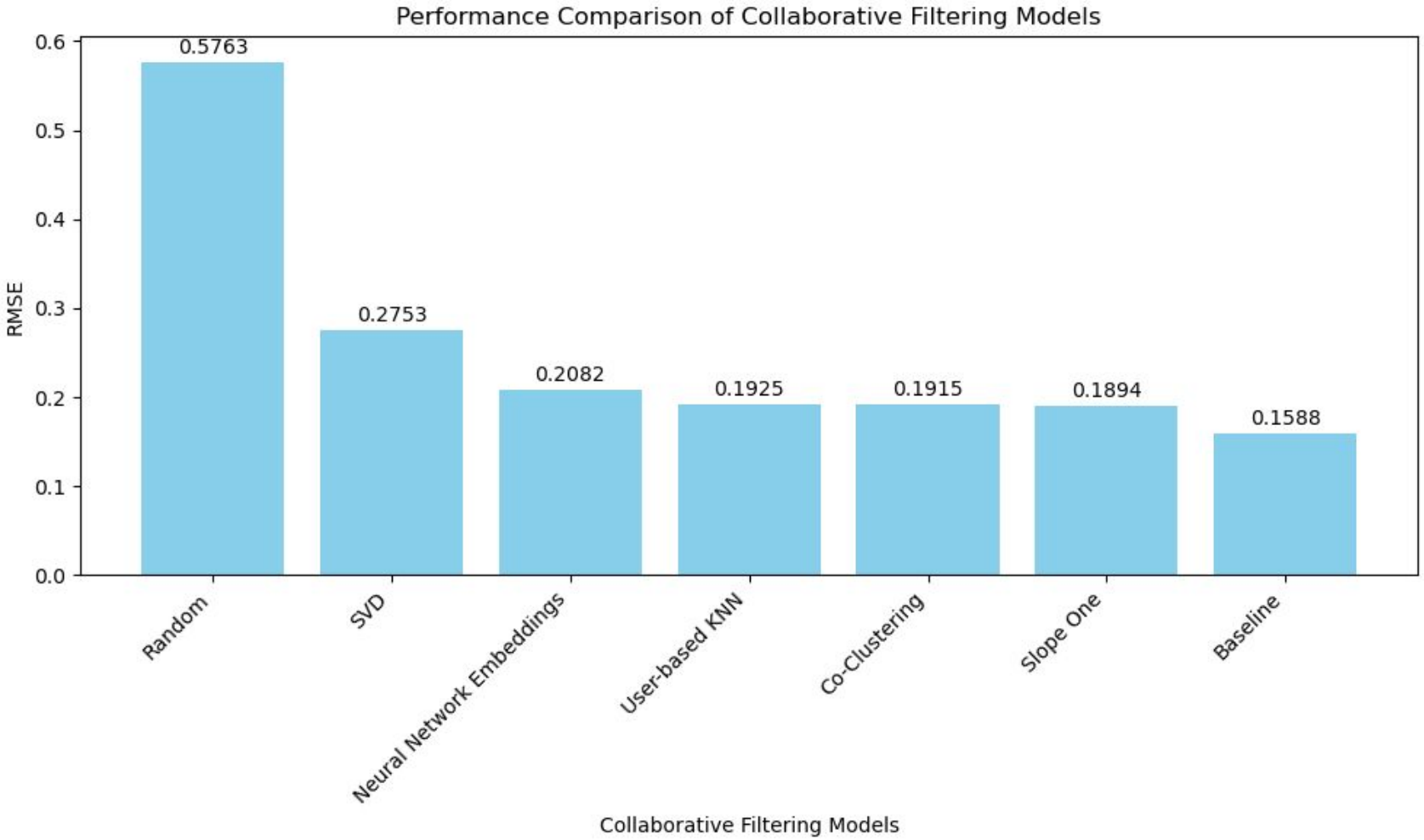
# Flowchart of Neural Network Embedding based recommender system



# Compare the performance of collaborative-filtering models



# Build a course recommender system app with Streamlit

## Personalized Learning Recommender

**1. Select recommendation models**

Select model:

Course Similarity

**2. Tune Hyper-parameters:**

Top courses

10

0 100

Course Similarity Threshold %

60

0 100

**3. Prediction**

Recommend New Courses

Datasets loaded successfully...

### Select courses that you have audited or completed:

| | COURSE_ID | TITLE | DESCRIPTION |
|---|---|---|---|
| ☑ | ML0201EN | Robots Are Coming Build Iot Apps With Watson Swift And Node Red | have fun with iot and learn along the way if you re a swift developer and want to learn more about iot and watson ai services in the cloud raspberry pi and node red you ve found the right place you ll build iot apps to read temperature data take pictures with a raspcam use ai to recognize the objects in those pictures and program an irobot create 2 r |
| ☑ | ML0122EN | Accelerating Deep Learning With Gpu | training complex deep learning models with large datasets takes along time in this course you will learn how to use accelerated gpu hardware to overcome the scalability problem in deep learning you can use accelerated hardware such as google s tensor processing unit tpu or nvidia gpu to accelerate your convolutional neural network computations |
| ☑ | GPXX0ZG0EN | Consuming Restful Services Using The Reactive Jax Rs Client | learn how to use a reactive jax rs client to asynchronously invoke restful microservices over http |
| ☑ | RP0105EN | Analyzing Big Data In R Using Apache Spark | apache spark is a popular cluster computing framework used for performing large scale data analysis sparkr provides a distributed data frame api that enables structured data processing with a syntax familiar to r users |
| ☑ | GPXX0Z2PEN | Containerizing Packaging And Running A Spring Boot Application | learn how to containerize package and run a spring boot application on an open liberty server without modification |
| ☑ | CNSC02EN | Cloud Native Security Conference Data Security | introduction to data security on cloud |
| ☑ | DX0106EN | Data Science Bootcamp With R For University Proffesors | a multi day intensive in person data science bootcamp offered by big data university |
| ☑ | GPXX0FTCEN | Learn How To Use Docker Containers For Iterative Development | learn how to use docker containers for iterative development |
| ☑ | RAVSCTEST1 | Scorm Test 1 | scron test course |
| ☑ | GPXX06RFEN | Create Your First Mongodb Database | in this guided project you will get started with mongodb by creating your first database working with collections and doing basic document management |
| ☑ | GPXX0SDXEN | Testing Microservices With The Arquillian Managed Container | learn how to develop tests for your microservices with the arquillian managed container and run the tests on open liberty |
| ☐ | CC0271EN | Cloud Pak For Integration Essentials | in this short course you will demonstrate the hands on experience with a comprehensive cloud integration solution using ibm cloud pak for integration that you received from attending the digital developer conference aiops integration |

### Your courses:

| | COURSE_ID | TITLE |
|---|---|---|
| 0 | ML0201EN | Robots Are Coming Build Iot Apps With Watson Swift And Node Red |
| 1 | ML0122EN | Accelerating Deep Learning With Gpu |
| 2 | GPXX0ZG0EN | Consuming Restful Services Using The Reactive Jax Rs Client |
| 3 | RP0105EN | Analyzing Big Data In R Using Apache Spark |
| 4 | GPXX0Z2PEN | Containerizing Packaging And Running A Spring Boot Application |
| 5 | CNSC02EN | Cloud Native Security Conference Data Security |
| 6 | DX0106EN | Data Science Bootcamp With R For University Proffesors |
| 7 | GPXX0FTCEN | Learn How To Use Docker Containers For Iterative Development |
| 8 | RAVSCTEST1 | Scorm Test 1 |
| 9 | GPXX06RFEN | Create Your First Mongodb Database |
| 10 | GPXX0SDXEN | Testing Microservices With The Arquillian Managed Container |

Recommendations generated!

| | SCORE | TITLE | DESCRIPTION |
|---|---|---|---|
| 0 | 0.948 | Data Science Bootcamp | a multi day intensive in person data science bootcamp offered by big data university |
| 1 | 0.682 | Data Science Bootcamp With Python For University Professors | data science bootcamp with python for university professors |
| 2 | 0.682 | Accelerating Deep Learning With Gpus | training complex deep learning models with large datasets takes along time in this course you will learn how to use accelerated gpu hardware to overcome the scalability problem in deep learning |
| 3 | 0.669 | Data Science Bootcamp With Python For University Professors Advance | data science bootcamp with python for university professors advance |
| 4 | 0.650 | Data Science Bootcamp With Python | data science bootcamp with python |
| 5 | 0.606 | Data Science With Open Data | data science with open data |

## Personalized Learning Recommender

**1. Select recommendation models**

Select model:

User Profile

**2. Tune Hyper-parameters:**

Top courses

10

0 100

User Profile Similarity Threshold

0.10

0.00 1.00

**3. Prediction**

Recommend New Courses

| | | |
|---|---|---|
| 1 | ML0122EN | Accelerating Deep Learning With Gpu |
| 2 | GPXX0ZG0EN | Consuming Restful Services Using The Reactive Jax Rs Client |
| 3 | RP0105EN | Analyzing Big Data In R Using Apache Spark |
| 4 | GPXX0Z2PEN | Containerizing Packaging And Running A Spring Boot Application |
| 5 | CNSC02EN | Cloud Native Security Conference Data Security |
| 6 | DX0106EN | Data Science Bootcamp With R For University Proffesors |
| 7 | GPXX0FTCEN | Learn How To Use Docker Containers For Iterative Development |
| 8 | RAVSCTEST1 | Scorm Test 1 |
| 9 | GPXX06RFEN | Create Your First Mongodb Database |
| 10 | GPXX0SDXEN | Testing Microservices With The Arquillian Managed Container |

Recommendations generated!

| | SCORE | TITLE | DESCRIPTION |
|---|---|---|---|
| 0 | 1.740 | Machine Learning For All | machine learning often called artificial intelligence or ai is one of the most exciting areas of technology at the moment we see daily news stories that herald new breakthroughs in facial recognition technology self driving cars or computers that can have a conversation just like a real person machine learning technology is set to revolutionise almost any area of human life and work and so will affect all our lives and so you are likely to want to find out more about it machine learning has a reputation for being one of the most complex areas of computer science requiring advanced mathematics and engineering skills to understand it while it is true that working as a machine learning engineer does involve a lot of mathematics and programming we believe that anyone can understand the basic concepts of machine learning and given the importance of this technology everyone should the big ai breakthroughs sound like science fiction but they come down to a simple idea the use of data to train statistical algorithms in this course you will learn to understand the basic idea of machine learning even if you don t have any background in math or programming not only that you will get hands on and use user friendly tools developed at goldsmiths university of london to actually do a machine learning project training a computer to recognise images this course is for a lot of different people it could be a good first step into a technical career in machine learning after all it is always better to start with the high level concepts before the technical details but it is also great if your role is non technical you might be a manager or other non technical role in a company that is considering using machine learning you really need to understand this technology and this course is a great place to get that understanding or you might just be following the news reports about ai and interested in finding out more about the hottest new technology of the moment whoever you are we are looking forward to guiding you through you first machine learning project nb this course is designed to introduce you to machine learning without needing any programming that means that we don t cover the programming based machine learning tools like python and tensorflow introduction to machine learning this course will provide you a foundational understanding of machine learning models logistic regression multilayer perceptrons convolutional neural networks natural language processing etc as well as demonstrate how these models can solve complex problems in a variety of industries from medical diagnostics to image recognition to text prediction in addition we have designed practice exercises that will give you hands on experience implementing these data science models on data sets these practice exercises will teach you how to implement machine learning algorithms with pytorch open source libraries used by leading tech companies in the machine learning field e g google nvidia cocacola ebay snapchat uber and many more |
| 1 | 1.410 | Cloud Computing Applications Part 2 Big Data And Applications In The Cloud | welcome to the cloud computing applications course the second part of a two course series designed to give you a comprehensive view on the world of cloud computing and big data in this second course we continue cloud computing applications by exploring how the cloud opens up data analytics of huge volumes of data that are static or streamed at high velocity and represent an enormous variety of information cloud applications and data analytics represent a disruptive change in the ways that society is informed by and uses information we start the first week by introducing some major systems for data analysis including spark and the major frameworks and distributions of analytics applications including hortonworks cloudera and mapr by the middle of week one we introduce the hdfs distributed and robust file system that is used in many applications like hadoop and finish week one by exploring the powerful mapreduce programming model and how distributed operating systems like yarn and mesos support a flexible and scalable environment for big data analytics in week two our course introduces large scale data storage and the difficulties and problems of consensus in enormous stores that use quantities of processors memories and disks we discuss eventual consistency acid and base and the consensus algorithms used in data centers including paxos and zookeeper our course presents distributed key value stores and in memory databases like redis used in data centers for performance next we present nosql databases we visit hbase the scalable low latency database that supports database operations in applications that use hadoop then again we show how spark sql can program sql queries on huge data we finish up week two with a presentation on distributed publish subscribe systems using kafka a distributed log messaging system that is finding wide use in connecting big data and streaming applications together to form complex systems week three moves to fast data real time streaming and introduces storm technology that is used widely in industries such as yahoo we continue with spark streaming lambda and kappa architectures and a presentation of the streaming ecosystem week four focuses on graph processing machine learning and deep learning we introduce the ideas of graph processing and present pregel giraph and spark graphx then we move to machine learning with examples from mahout and spark kmeans naive bayes and fpm are given as examples spark ml and mllib continue the theme of programmability and application construction the last topic we cover in week four introduces deep learning technologies including theano tensor flow cntk mxnet and caffe on spark |
| 2 | 1.320 | Excel Basics For Data Analysis | this course is designed to provide you with basic working knowledge for using excel spreadsheets for data analysis it covers some of the first steps for working with spreadsheets and their usage in the process of analyzing data it includes plenty of videos demos and examples for you to learn followed by step by step instructions for you to apply and practice on a live spreadsheet excel is an essential tool for working with data whether for business marketing data analytics or research this course is suitable for those aspiring to take up data analysis or data science as a profession as well as those who just want to use excel for data analysis in their own domains you will gain valuable experience in cleansing and wrangling data using functions and then analyze your data using techniques like filtering sorting and creating pivot tables this course starts with an introduction to spreadsheets like microsoft excel and google sheets and loading data from multiple formats with this introduction you will then learn to perform some basic level data wrangling and cleansing tasks and continue to expand your knowledge of analyzing data through the use of filtering sorting and using pivot tables within the spreadsheet by performing these tasks throughout the course it will give you an understanding of how spreadsheets can be used as a data analysis tool and understand its limitations there is a strong focus on practice and applied learning in this course with each lab you will gain hands on experience in manipulating data and begin to understand the important role of spreadsheets clean and analyze your data faster by understanding functions in the formatting of data you will then convert your data to a pivot table and learn its features to make your data organized and readable the final project enables you to show off your newly acquired data analysis skills by the end of this course you will have worked with several data sets and spreadsheets and demonstrated the basics of cleaning and analyzing data all without having to learn any code getting started with excel is made easy in this course it does not require any prior experience with spreadsheets or coding nor does it require downloads or installation of any software all you need is a device with a modern web browser and ability to create a microsoft account to access excel online at no cost however if you already have a desktop version of excel you can follow along quite easily as well |
| 3 | 1.140 | Cloud Virtualization Containers And Apis | welcome to the second course in the building cloud computing solutions at scale specialization in this course you will learn to design cloud native systems with the fundamental building blocks of cloud computing these building blocks include virtual machines and containers you will also learn how to build effective microservices using technologies like flask and kubernetes finally you will analyze successful patterns in operations including effective alerts load testing and kaizen this course is ideal for beginners as well as intermediate students interested in applying cloud computing to data science machine learning and data engineering students should have beginner level linux and intermediate level python skills for your project in this course you build a containerized flask application that is continuously deployed to a cloud platform amazon web services aws azure or google cloud platform gcp |
| 4 | 1.140 | Build Train And Deploy Ml Pipelines Using Bert | in the second course of the practical data science specialization you will learn to automate a natural language processing task by building an end to end machine learning pipeline using hugging face s highly optimized implementation of the state of the art bert algorithm with amazon sagemaker pipelines your pipeline will first transform the dataset into bert readable features and store the features in the amazon sagemaker feature store it will then fine tune a text classification model to the dataset using a hugging face pre trained model which has learned to understand the human language from millions of wikipedia documents finally your pipeline will evaluate the model s accuracy and only deploy the model if the accuracy exceeds a given threshold practical data science is geared towards handling massive datasets that do not fit in your local hardware and could originate from multiple sources one of the biggest benefits of developing and running data science projects in the cloud is the agility and elasticity that the cloud offers to scale up and out at a minimum cost the practical data science specialization helps you develop the practical skills to effectively deploy your data science projects and overcome challenges at each step of the ml workflow using amazon sagemaker this specialization is designed for data focused developers scientists and analysts familiar with the python and sql programming languages and want to learn how to build train and deploy scalable end to end ml pipelines both automated and human in the loop in the aws cloud |
| 5 | 1.140 | Convolutional Neural Networks In Tensorflow | if you are a software developer who wants to build scalable ai powered algorithms you need to understand how to use the tools to build them this course is part of the upcoming machine learning in tensorflow specialization and will teach you best practices for using tensorflow a popular open source framework for machine learning in course 2 of the deeplearning ai tensorflow specialization you will learn advanced techniques to improve the computer vision model you built in course 1 you will explore how to work with real world images in different shapes and sizes visualize the journey of an image through convolutions to understand how a computer “sees” information plot loss and accuracy and explore strategies to prevent overfitting including augmentation and dropout finally course 2 will introduce you to transfer learning and how learned features can be extracted from models the machine learning course and deep learning specialization from andrew ng teach the most important and foundational principles of machine learning and deep learning this new deeplearning ai tensorflow specialization teaches you how to use tensorflow to implement those principles so that you can start building and applying scalable models to real world problems to develop a deeper understanding of how neural networks work we recommend that you take the deep learning specialization |
| | | | as data collection has increased exponentially so has the need for people skilled at using and interacting with data to be able to think critically and provide insights to make better decisions and optimize their businesses this is a data scientist part mathematician part computer scientist and part trend spotter sas institute inc according to glassdoor being a data scientist is the best job in america with a median base salary of 110 000 and thousands of job openings at a time the skills necessary to be a good data scientist include being able to retrieve and work with data and to do that you need to be well versed in sql the standard language for communicating with database systems this course is designed to give you a primer in the fundamentals of sql and working with data so that you can begin analyzing it for data science purposes you will begin to ask the right questions and come up with good answers to deliver valuable insights for your organization this course starts with the basics and assumes you do not have any knowledge or skills |

## Personalized Learning Recommender

**1. Select recommendation models**

Select model:

Clustering

**2. Tune Hyper-parameters:**

Top courses

10

0 100

Popularity Threshold

100

1 300

Number of clusters

29

1 50

**3. Prediction**

Recommend New Courses

Datasets loaded successfully...

### Select courses that you have audited or completed:

| COURSE ID | TITLE | DESCRIPTION |
|---|---|---|
| ML0201EN | Robots Are Coming Build Iot Apps With Watson Swift And Node Red | have fun with iot and learn along the way if you re a swift developer and want to learn more about iot and watson ai services in the cloud raspberry pi and node red you ve found the right place you ll build iot apps to read temperature data take pictures with a raspcam use ai to recognize the objects in those pictures and program an irobot create 2 r |
| ML0122EN | Accelerating Deep Learning With Gpu | training complex deep learning models with large datasets takes along time in this course you will learn how to use accelerated gpu hardware to overcome the scalability problem in deep learning you can use accelerated hardware such as google s tensor processing unit tpu or nvidia gpu to accelerate your convolutional neural network computations |
| GPXX0ZG0EN | Consuming Restful Services Using The Reactive Jax Rs Client | learn how to use a reactive jax rs client to asynchronously invoke restful microservices over http |
| RP0105EN | Analyzing Big Data In R Using Apache Spark | apache spark is a popular cluster computing framework used for performing large scale data analysis sparkr provides a distributed data frame api that enables structured data processing with a syntax familiar to r users |
| GPXX0Z2PEN | Containerizing Packaging And Running A Spring Boot Application | learn how to containerize package and run a spring boot application on an open liberty server without modification |
| CNSC02EN | Cloud Native Security Conference Data Security | introduction to data security on cloud |
| DX0106EN | Data Science Bootcamp With R For University Proffesors | a multi day intensive in person data science bootcamp offered by big data university |
| GPXX0FTCEN | Learn How To Use Docker Containers For Iterative Development | learn how to use docker containers for iterative development |
| RAVSCTEST1 | Scorm Test 1 | scron test course |
| GPXX06RFEN | Create Your First Mongodb Database | in this guided project you will get started with mongodb by creating your first database working with collections and doing basic document management |
| GPXX0SDXEN | Testing Microservices With The Arquillian Managed Container | learn how to develop tests for your microservices with the arquillian managed container and run the tests on open liberty |
| CC0271EN | Cloud Pak For Integration Essentials | in this short course you will demonstrate the hands on experience with a comprehensive cloud integration solution using ibm cloud pak for integration that you received from attending the digital developer conference aiops integration |

Filters

Columns

### Your courses:

| | COURSE_ID | TITLE |
|---|---|---|
| 0 | ML0201EN | Robots Are Coming Build Iot Apps With Watson Swift And Node Red |
| 1 | ML0122EN | Accelerating Deep Learning With Gpu |
| 2 | GPXX0ZG0EN | Consuming Restful Services Using The Reactive Jax Rs Client |
| 3 | RP0105EN | Analyzing Big Data In R Using Apache Spark |
| 4 | GPXX0Z2PEN | Containerizing Packaging And Running A Spring Boot Application |
| 5 | CNSC02EN | Cloud Native Security Conference Data Security |
| 6 | DX0106EN | Data Science Bootcamp With R For University Proffesors |
| 7 | GPXX0FTCEN | Learn How To Use Docker Containers For Iterative Development |
| 8 | RAVSCTEST1 | Scorm Test 1 |
| 9 | GPXX06RFEN | Create Your First Mongodb Database |
| 10 | GPXX0SDXEN | Testing Microservices With The Arquillian Managed Container |

Recommendations generated!

| | SCORE | TITLE | DESCRIPTION |
|---|---|---|---|
| 0 | 653.000 | Accelerating Deep Learning With Gpu | majority of data in the world are unlabeled and unstructured data for instance images sound and text data shallow neural networks cannot easily capture relevant structure in these kind of data but deep networks are capable of discovering hidden structures within¬†these data in this course you will use tensorflow library to apply deep learning on different data types to solve real world problems |
| 1 | 101.000 | Deep Learning 101 | deep learning 101 |

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# Conclusions

- Advanced Techniques Outperform:
  - Models like SVD, Co-Clustering, and Neural Network Embeddings consistently deliver superior accuracy compared to simpler methods.
- Matrix Factorization Enhances Accuracy:
  - Algorithms like SVD leverage matrix factorization to capture latent factors, revealing intricate user-item interactions and leading to improved predictions.
- Baseline Estimates Improve Predictions:
  - Models incorporating baseline estimates, such as the Baseline model, demonstrate noteworthy accuracy gains by accounting for user and item biases.
- Non-Linear Relationships Matter:
  - Neural Network Embeddings show promising results, emphasizing the significance of capturing non-linear relationships in collaborative filtering for accurate recommendations.
- Scalability vs. Accuracy Trade-off:
  - While more complex models offer heightened accuracy, scalability concerns may arise with large datasets. Choosing an appropriate model depends on dataset size and computational resources.