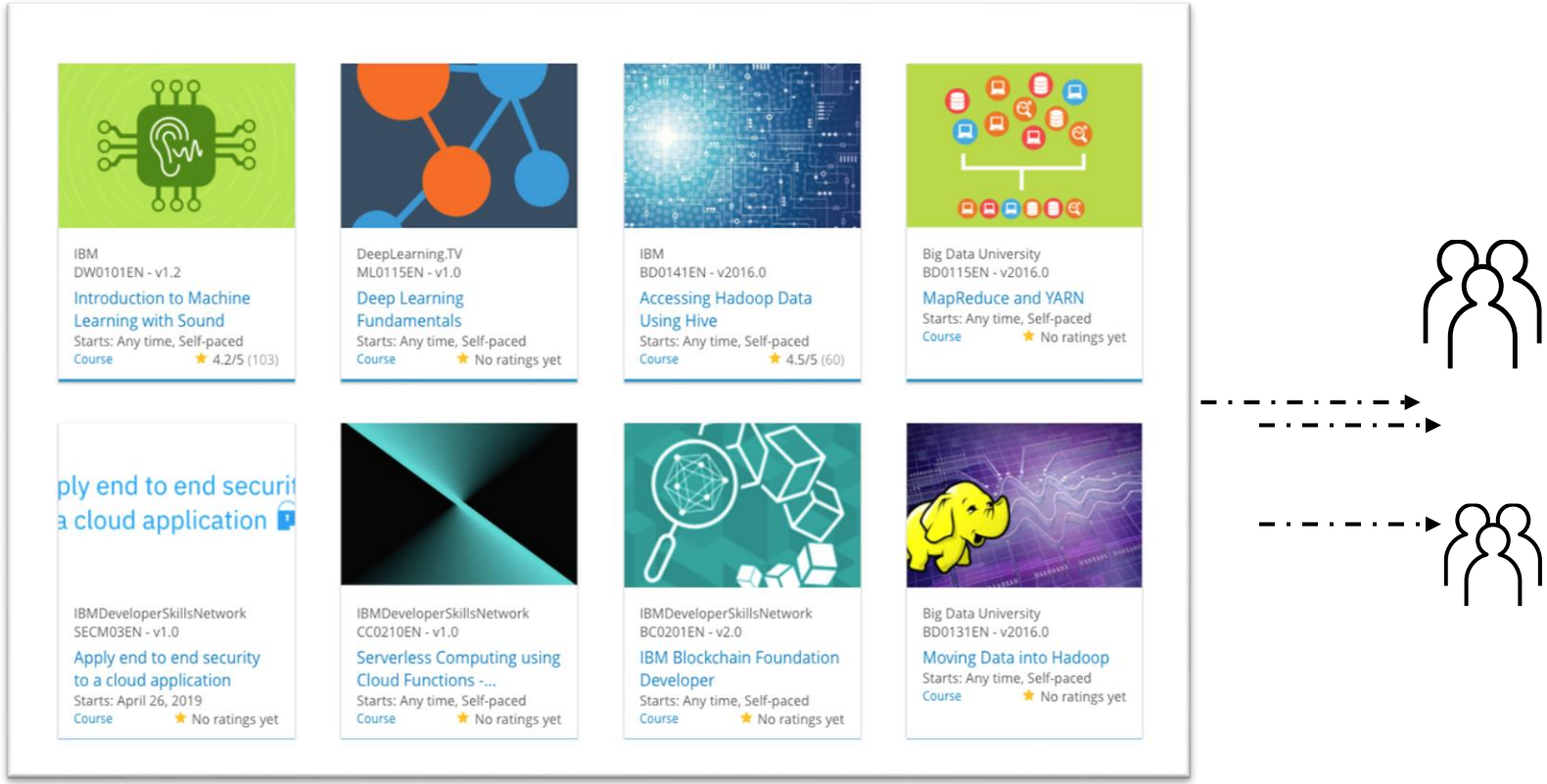
Build a Personalized Online Course Recommender System with Machine Learning

Created by: [redacted]
Date: [redacted]



Outline

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

Introduction

- **Project background and context**

The scope of the project is to build a recommender system based on the available data, using several approaches in order to provide the user with a course recommendation that he/she will most likely be able to complete and that fits his/her user profile based on a set of defined methods.

In the available dataset the courses rated by other users can be divided into two categories, courses rated 2.0 belong to the audited category, while courses rated 3.0 indicate courses with a completed status for that user.

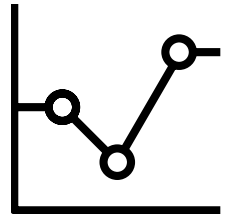
- **Problem states and hypotheses**

Find the most relevant courses for the user, rank them and give a recommendation to the user. All this is done in a way that the time and memory consumption is acceptable if we are talking about a dynamically changing data set and the user wants to get an online recommendation in an interactive way.

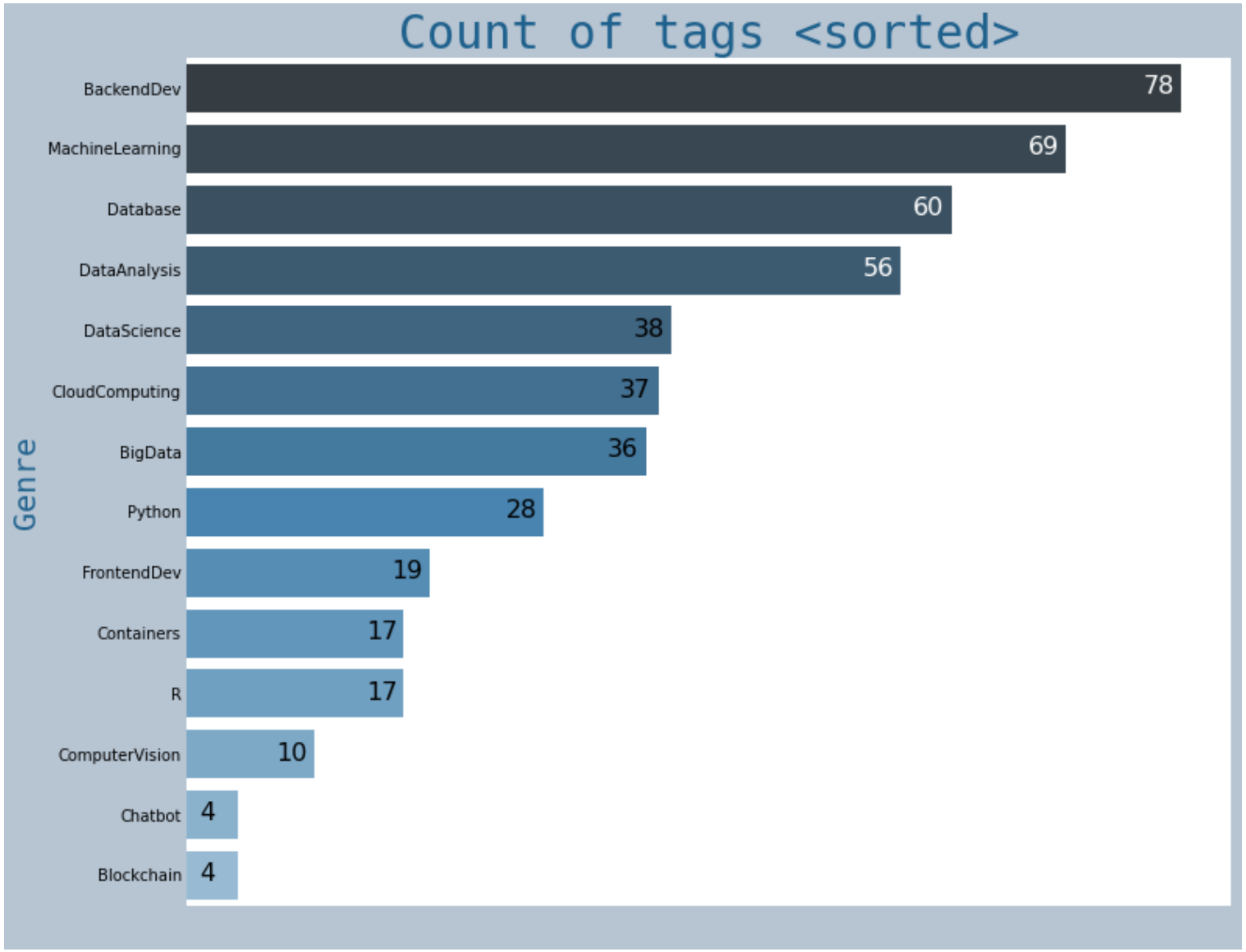
H_0 The null hypothesis, says that the more accurate the recommendation we want to give to the user, the more resources (technical and time) are required.

And H_1 says that different approaches will produce similar results.

Exploratory Data Analysis



Course counts per genre



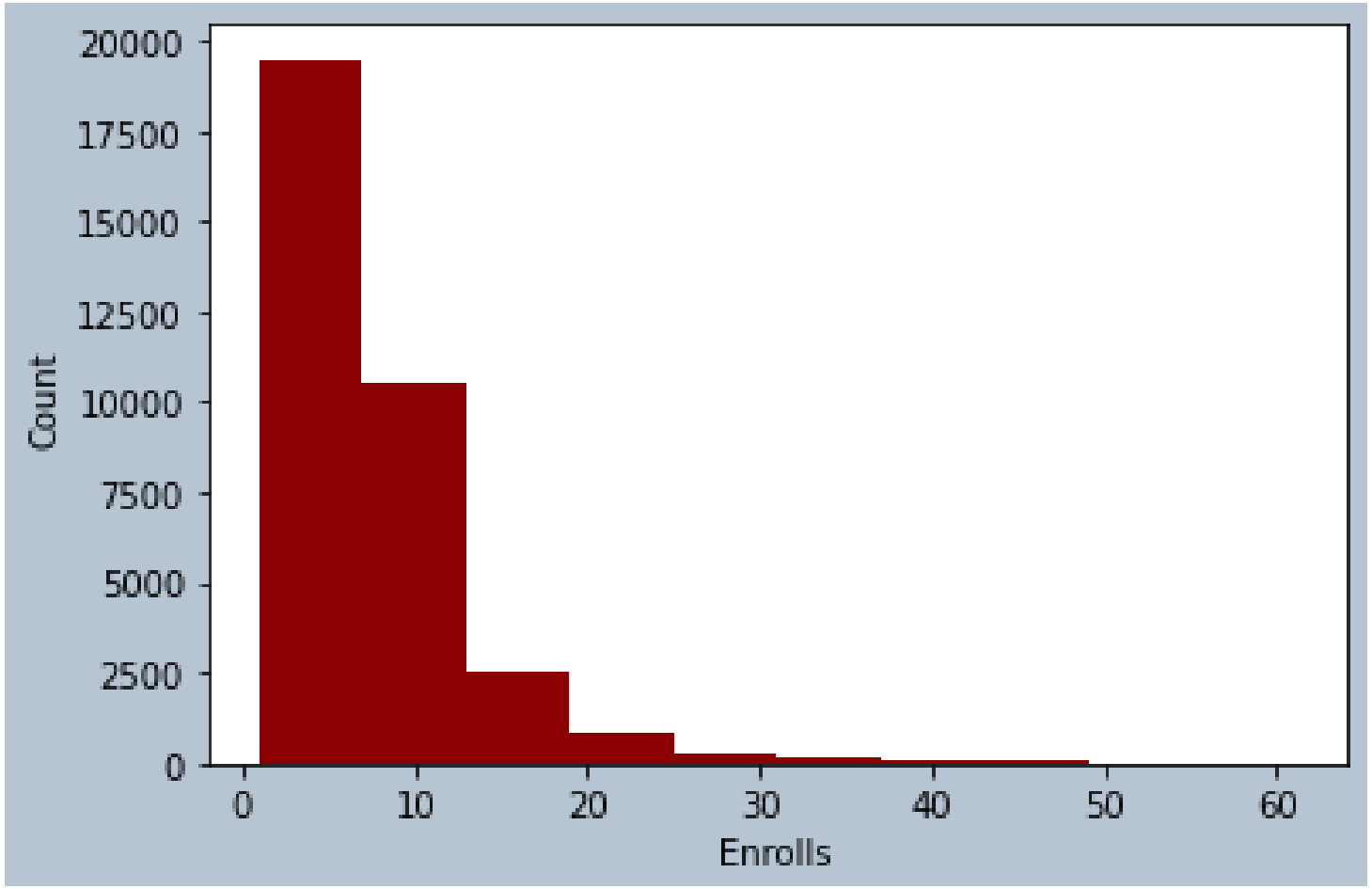
The graph shows the distribution of the number of courses within each category/genre.
It can be seen that most courses belong to the following genres:

- BackendDev
- MachineLearning
- Database
- DataAnalysis

While the number of courses in the very specific category is quite low:

- Chatbot
- Blockchain

Course enrollment distribution



The accompanying figure shows the distribution of the number of courses rated by users. That is, a course has either audited or completed status for a user.

It can be noted that for most users, this number is between 1 and 5, which means that the majority of users have audited or completed between 1-5 courses in total.

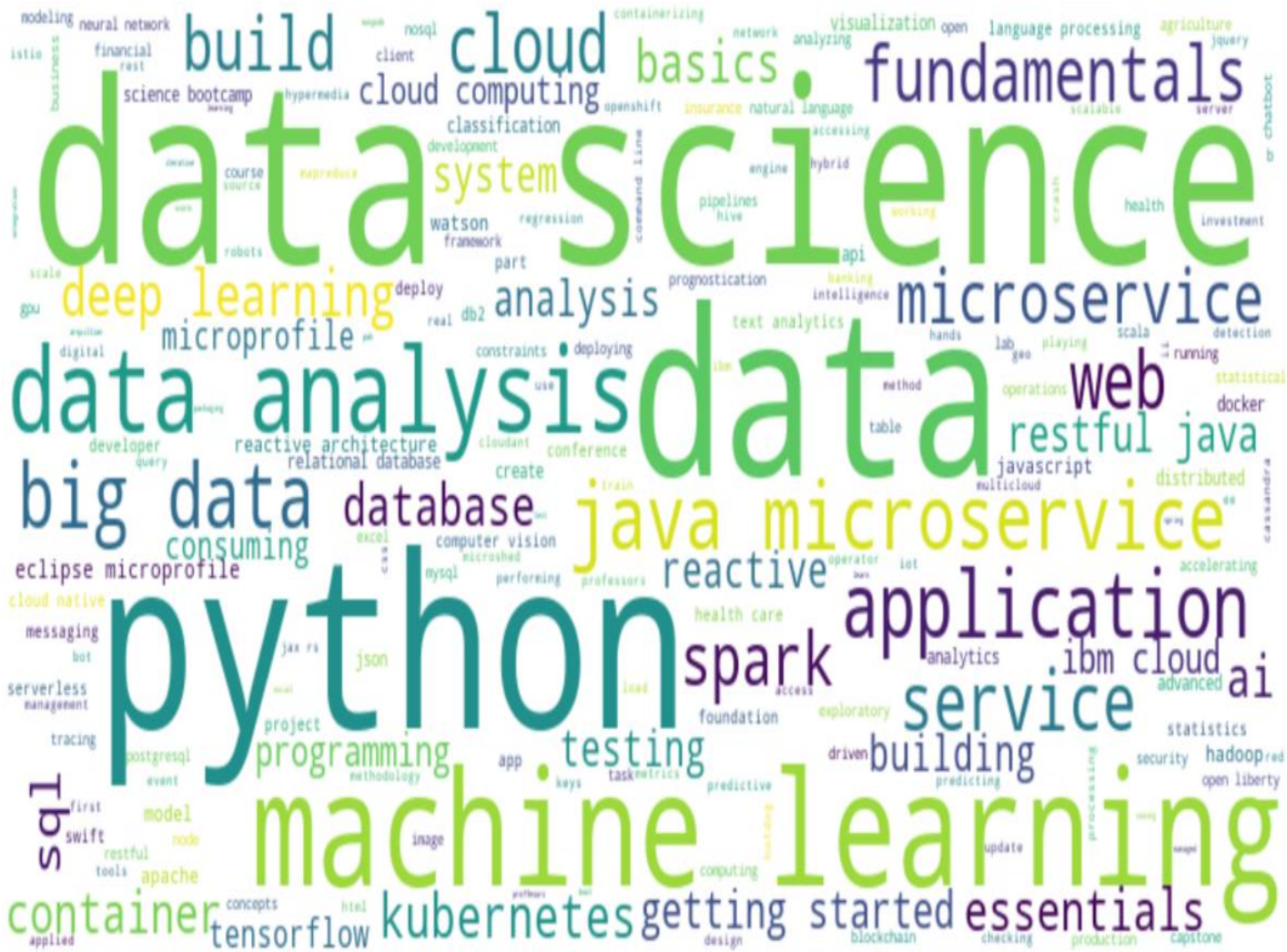
20 most popular courses

	TITLE	Ratings	Percentage_%
0	python for data science	14936	6.40
1	introduction to data science	14477	6.21
2	big data 101	13291	5.70
3	hadoop 101	10599	4.54
4	data analysis with python	8303	3.56
5	data science methodology	7719	3.31
6	machine learning with python	7644	3.28
7	spark fundamentals i	7551	3.24
8	data science hands on with open source tools	7199	3.09
9	blockchain essentials	6719	2.88
10	data visualization with python	6709	2.88
11	deep learning 101	6323	2.71
12	build your own chatbot	5512	2.36
13	r for data science	5237	2.24
14	statistics 101	5015	2.15
15	introduction to cloud	4983	2.14
16	docker essentials a developer introduction	4480	1.92
17	sql and relational databases 101	3697	1.58
18	mapreduce and yarn	3670	1.57
19	data privacy fundamentals	3624	1.55

It can be seen that the majority of users are mainly interested in machine learning and related courses on data processing.

Please note: the percentage of the top20 course enrollments 63.31% in total, which is a massive number considering the total number of unique values of 293 of courses.

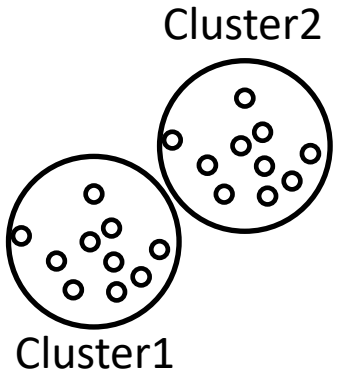
Word cloud of course titles



The idea behind word cloud is that the size of keywords varies based on their occurrence. The more times a word appears in the text set, the larger its size. In our case, the most frequently occurring words:

- python,
- data science,
- data and
- machine learning.

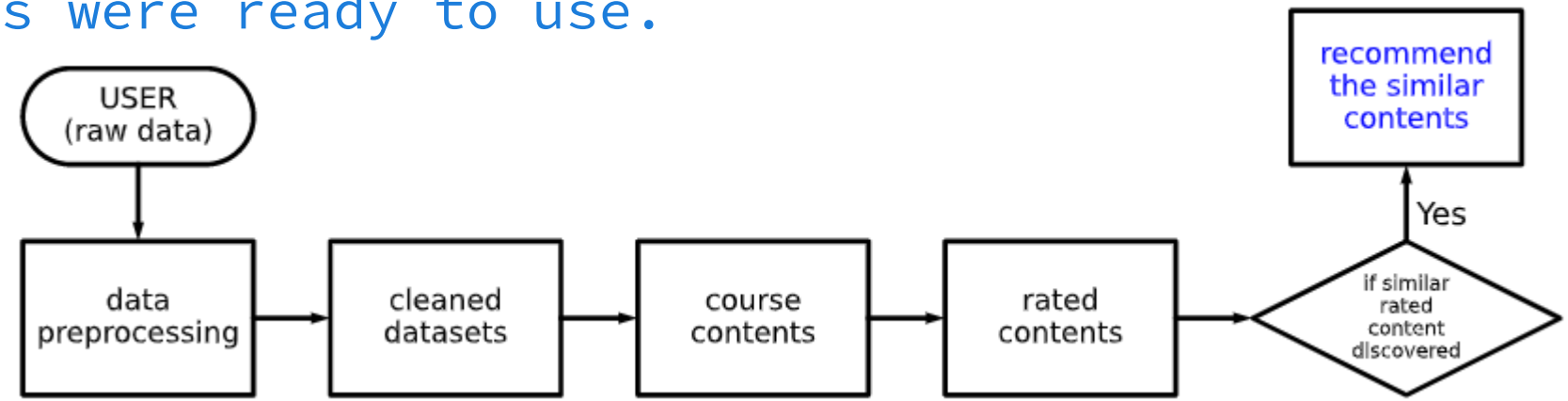
Content-based Recommender System using Unsupervised Learning



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

The below flowchart illustrates the implementation of content-based recommender system using user profile vectors and course genre vectors.

Based on the user-profile and course genre vectors a similarity matrix has been built, from which the entries where similarity was found, has been added into the recommendation set. After ranking, the recommendation contents were ready to use.



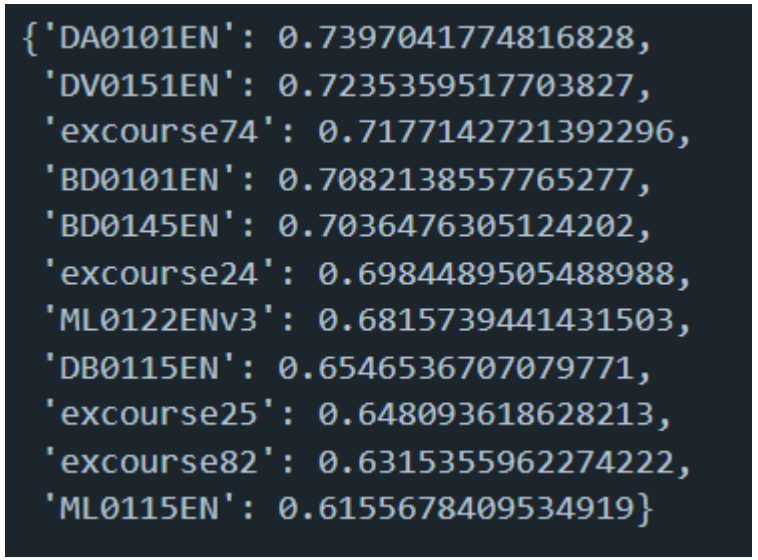
Evaluation results of user profile-based recommender system

By setting-up the hyper-parameter course similarity thresholds of 0.6 and recommendation limit 10. The results are the following:

I already defined in the function a hyperparameter to set a limit to the recommendation. Based on the limit, all users have the same volumen for new/unseen courses received.

The top10 courses are:

(COURSE_ID: SCORE)

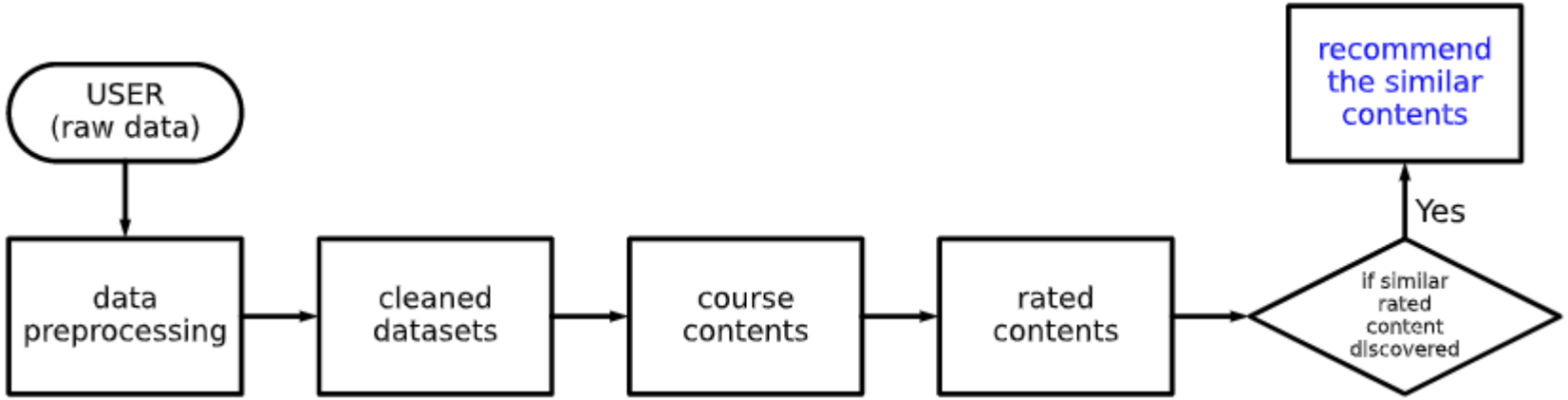


Flowchart of content-based recommender system using course similarity

The flowchart is the same as illustrated above.

In case Course similarity the basic idea is, that

here the recommendations are made based on the similar courses of users, where the frequency gets the main role.



Evaluation results of course similarity based recommender system

By setting-up the hyper-parameter course similarity thresholds of 0.6 the results are the following:

I already defined in the function a hyperparameter to set a limit to the recommendation. Based on the limit, all users have the same volumen for new/unseen courses received.

The top10 courses are:

COURSE_ID	REC_FREQUENCY
excourse22	579
excourse62	579
DS0110EN	562
excourse63	555
excourse65	555
excourse72	551
excourse68	550
excourse67	539
excourse74	539
BD0145EN	506

Flowchart of clustering-based recommender system

What is different in steps compared to the above processes that here once we have done wrangling, we need to find the best „k” hyperparameter, i.e. the count of clusters. Once we have that, we can do clustering on the dataframe to identify which user belongs to which cluster. Then we identified the users’ clusters, we can give recommendations to users based on their cluster’s characteristics, based on course ranking in that cluster.

Evaluation results of clustering-based recommender system

To set-up the hyper-parameter „k” (the best „k”) is the most important. Combined with course similarity thresholds of 0.9, enrollments > 10, and max. recommendation limit of 3 for each user. The result:

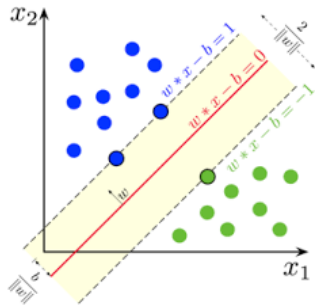
Average recommended courses per user:

The average recommended courses per user is 12 in case of a score treshold of 0.6.

The top10 courses are:

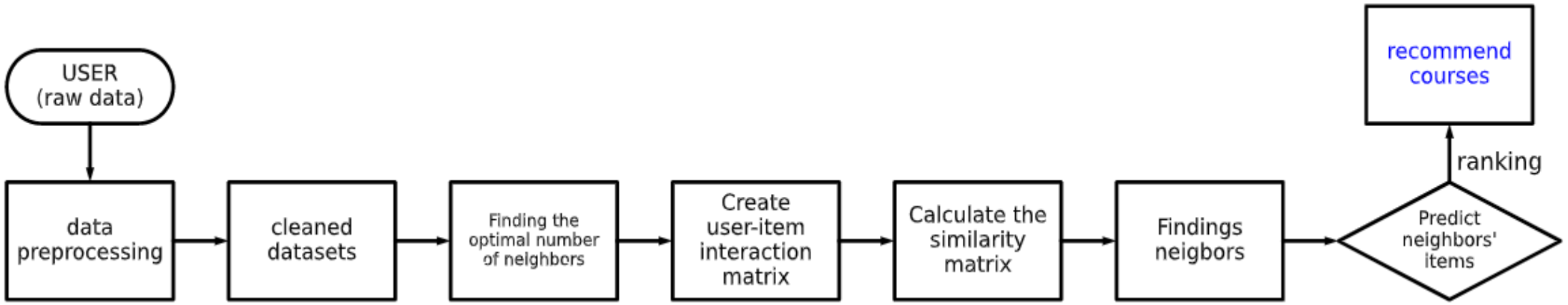
COURSE_ID	REC_FREQUENCY
DS0101EN	374
PY0101EN	362
BD0101EN	301
BD0111EN	257
DS0103EN	248
BD0211EN	183
ML0101ENv3	166
DA0101EN	154
DV0101EN	145
BC0101EN	141

Collaborative-filtering Recommender System using Supervised Learning



Flowchart of KNN based recommender system

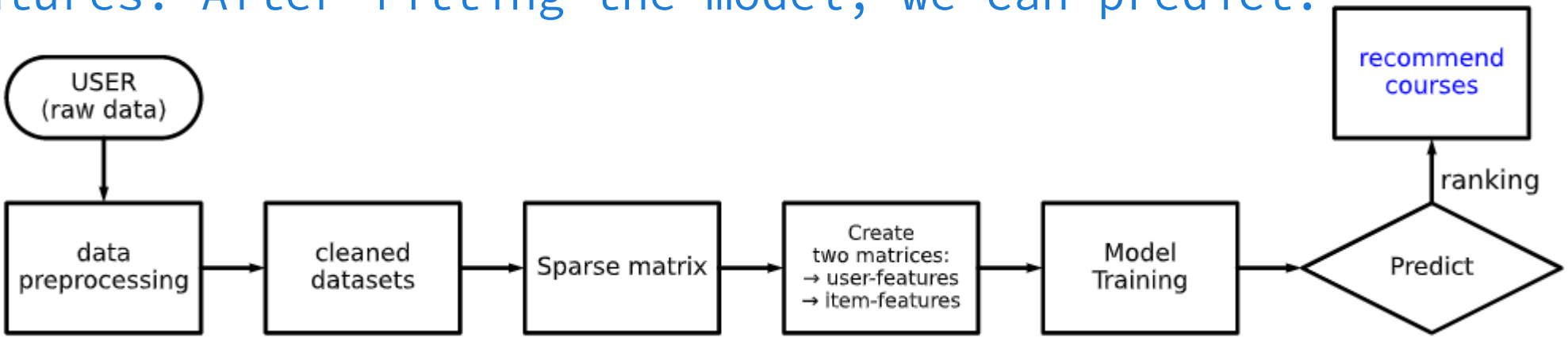
KNN is a pretty straightforward algorithm, although a memory-efficient one. The key is to find the balance between the available IT resources and accuracy. The process itself similar to clustering, here we define the number of neighbors of the (test) user, then we do the prediction based on neighbors' items, after ranking the recommendation is ready to use.



Flowchart of NMF based recommender system

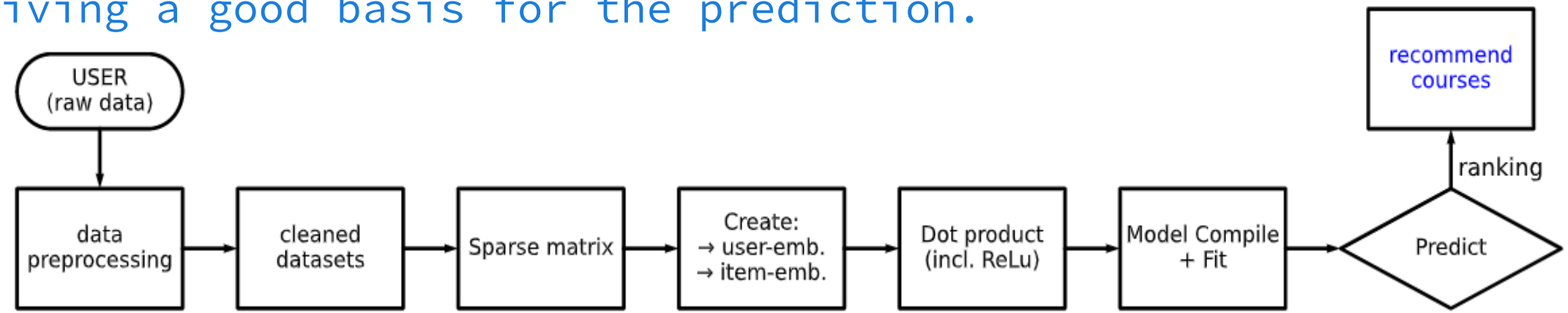
NMF or Non-negative matrix factorization is a dimensionality reduction algorithm, which decomposes a big sparse matrix into two smaller and dense matrices.

NMF can be one solution to big matrix issues. The main idea is to decompose the big and sparse user-interaction into two smaller dense matrices, one represents the transformed user features and another represents the transformed item features. After fitting the model, we can predict.

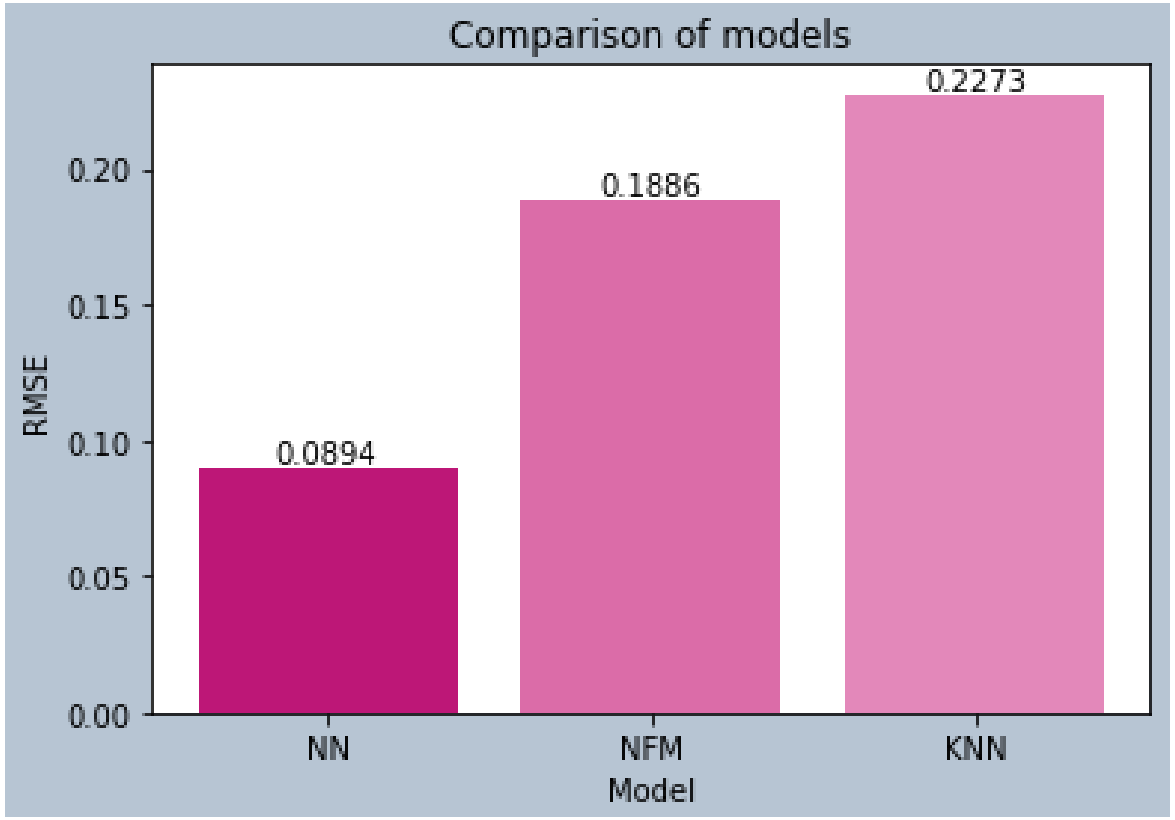


Flowchart of Neural Network Embedding based recommender system

Working with Neural Networks – in this case with Tensorflow (keras), using the user embedding layer and item embedding layer two dataframes can made: user embedding and item embedding. (In both the embedding size as hyperparameter in NN is a key, beacuse the number of feature depends on it. I used 16, but in streamlit application I let the user set this hyper parameter in a given range). With the dot product of user_emb and item_emb, a merged dataframe will be created giving a good basis for the prediction.



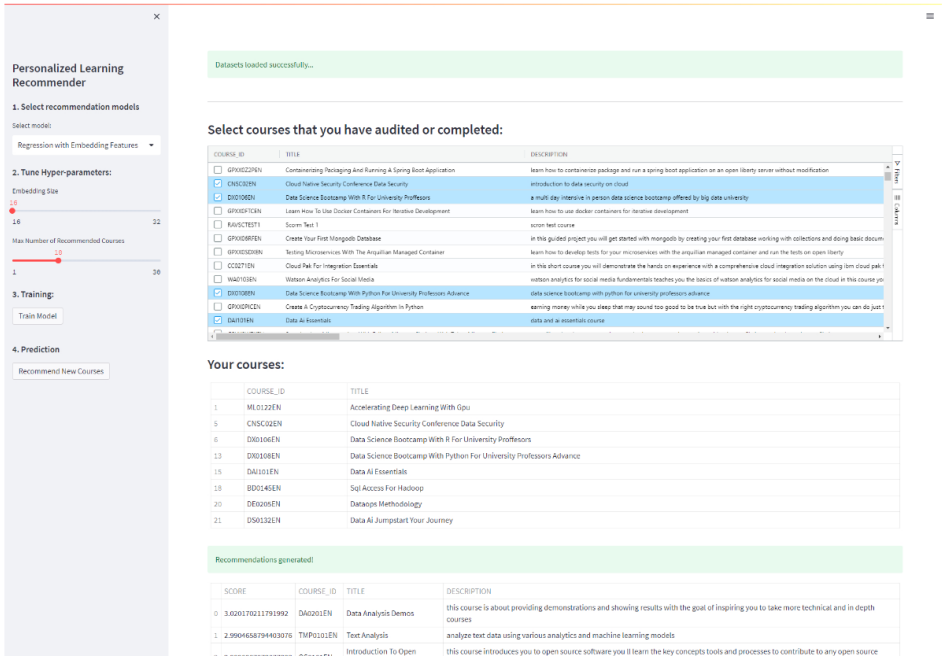
Compare the performance of collaborative-filtering models



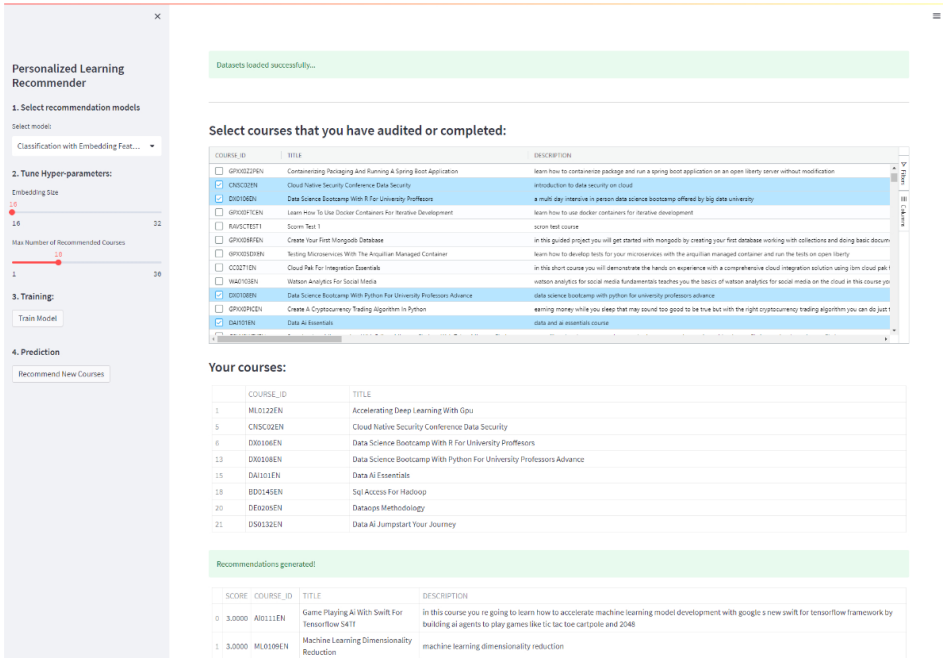
The last three models' RMSE visualized. As we can see, the more complex a model, the higher its accuracy. Until now the NN has the highest accuracy, i.e. the lowest RMSE.

Optional: Build a course recommender system app with Streamlit

Streamlit app screenshot1



Streamlit app screenshot2



All models' recommendation have been tested and can be seen in appendices.

Conclusions

- The first conclusion must be that we confirmed our Hypothesis H_0 and we can reject H_1 ,i.e. the more complex a model, the higher its accuracy.
- It is also important to note that we need to find the balance between the capacity of resources available (IT tools, memory, time, etc..) and model's accuracy.
- Another important message shall be, that using the appropriate model – based on a problem – is a key. You will see in the annex my screenshot of each model's prediction/recommendation to the test user (me), and you will realize, that different models may recommend total different courses. That sounds logical, because on one hand if we create a recommendation e.g. based on similar user (users similar to test user), then test user will receive courses based on them. But on the other hand if we run a clustering based recommendation, the clusters may find other common aspects between the data points, and other users' data will be the basis of prediction and the result will be a total different course recommendation with a better RMSE.
- Lastly; choosing a model depends on the problem. E.g. in case of classification with embedding features you can calculate accuracy, recall and precision, and f1_score. Comparing the models, you need to know which metrics to select to compare the models, what is better for you to solve the problem. E.g. is your dataset balanced or imbalanced?

Appendix

I have built the streamlit app for all models, the next pages represents the course recommendations to test user by each model:

- "Course Similarity"
- "User Profile"
- "Clustering"
- "Clustering with PCA"
- "KNN"
- "NMF"
- "Neural Network"
- "Regression with Embedding Features"
- "Classification with Embedding Features„

You will realize, that different models may have different recommendations.

Please note, I used a test user with the same course selection in all models, and I randomly set 2.0 and 3.0 values for that courses with numpy in the background.py file, so the application works well.

Personalized Learning Recommender

1. Select recommendation models

Select model:

Course Similarity

2. Tune Hyper-parameters:

Top courses

10

0 100

Course Similarity Threshold %

50

0 100

3. Training:

Train Model

4. Prediction

Recommend New Courses

Datasets loaded successfully...

Select courses that you have audited or completed:

COURSE_ID	TITLE	DESCRIPTION
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 f
WA0103EN	Watson Analytics For Social Media	watson analytics for social media fundamentals teaches you the basics of watson analytics for social media on the cloud in this course yo
DX0108EN	Data Science Bootcamp With Python For University Professors Advance	data science bootcamp with python for university professors advance
GPXX0PICEN	Create A Cryptocurrency Trading Algorithm In Python	earning money while you sleep that may sound too good to be true but with the right cryptocurrency trading algorithm you can do just t
DAI101EN	Data Ai Essentials	data and ai essentials course
GPXX0W7KEN	Securing Java Microservices With Eclipse Microprofile Json Web Token Microprofile Jwt	you will explore how to control user and role access to microservices with microprofile json web token microprofile jwt
GPXX0QR3EN	Enabling Distributed Tracing In Microservices With Zipkin	explore how to enable and customize tracing of jax rs and non jax rs methods by using microprofile opentracing and the zipkin tracing sy
BD0145EN	Sql Access For Hadoop	big sql is another tool to work with your hadoop data big sql provides a common and familiar syntax for those that are already using sql
HCC105EN	Hybrid Cloud Conference Ai Pipelines Lab	hybrid cloud conference ai pipelines lab
DE0205EN	Dataops Methodology	data ops course
DS0132EN	Data Ai Jumpstart Your Journey	introduce you to data and ai
OS0101EN	Introduction To Open Source	this course introduces you to open source software you ll learn the key concepts tools and processes to contribute to any open source pr

Your courses:

	COURSE_ID	TITLE
1	ML0122EN	Accelerating Deep Learning With Gpu
5	CNSC02EN	Cloud Native Security Conference Data Security
6	DX0106EN	Data Science Bootcamp With R For University Proffesors
13	DX0108EN	Data Science Bootcamp With Python For University Professors Advance
15	DAI101EN	Data Ai Essentials
18	BD0145EN	Sql Access For Hadoop
20	DE0205EN	Dataops Methodology
21	DS0132EN	Data Ai Jumpstart Your Journey

Recommendations generated!

	SCORE	TITLE	DESCRIPTION
0	0.9798	Data Science Bootcamp With Python For University Professors	data science bootcamp with python for university professors
1	0.9476	Data Science Bootcamp	a multi day intensive in person data science bootcamp offered by big data university
2	0.8000	Data Science Bootcamp With Python	data science bootcamp with python
3	0.7036	Foundations For Big Data Analysis With Sql	in this course you ll get a big picture view of using sql for big data starting with an overview of data database systems and the common querying language sql then you ll learn the characteristics of big data and sql tools for working on big data platforms you ll also install an exercise environment virtual machine to be used through the specialization courses and you ll have an opportunity to do some initial exploration of databases and tables in that environment by the end of the course you will be able to distinguish operational from analytic databases and understand how these are applied in big data understand how database and table design provides structures for working with data appreciate how differences in volume and variety of data affects your choice of an appropriate database system recognize the features and benefits of sql dialects designed to work with big data systems for storage and analysis and explore databases and tables in a big data platform
4	0.6816	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
5	0.6235	Big Data 101	how big is big and why does big matter and what does apache hadoop have to do with it in this course you will see the big data big picture and you will learn the terminology used in big data discussions
6	0.6065	Data Science With Open Data	data science with open data
7	0.5439	Introduction To Data Science	the art of uncovering the insights and trends in data has been around since ancient times the ancient egyptians used census data to increase efficiency in tax collection and they accurately predicted the flooding of the nile river every year since then people working in data science have carved out a unique and distinct field for the work they do this field is data science in this course we will meet some data science practitioners and we will get an overview of what data science is today
8	0.5439	Introduction To Big Data	interested in increasing your knowledge of the big data landscape this course is for those new to data science and interested in understanding why the big data era has come to be it is for those who want to become conversant with the terminology and the core concepts behind big data problems applications and systems it is for those who want to start thinking about how big data might be useful in their business or career it provides an introduction to one of the most common frameworks hadoop that has made big data analysis easier and more accessible increasing the potential for data to transform our world at the end of this course you will be able to describe the big data landscape including examples of real world big data problems including the three key sources of big data people organizations and sensors explain the v s of big data volume velocity variety veracity valence and value and why each impacts data collection monitoring storage analysis and reporting get value out of big data by using a 5 step process to structure your analysis identify what are and what are not big data problems and be able to recast big data problems as data science questions provide an explanation of the architectural components and programming models used for scalable big data analysis summarize the features and value of core hadoop stack components including the yarn resource and job management system the hdfs file system and the mapreduce programming model install and run a program using hadoop this course is for those new to data science no prior programming experience is needed although the ability to install applications and utilize a virtual machine is necessary to complete the hands on assignments
9	0.5424	A Crash Course In Data Science	by now you have definitely heard about data science and big data in this one week class we will provide a crash course in what these terms mean and how they play a role in successful organizations this class is for anyone who wants to learn what all the data science action is about including those who will eventually need to manage data scientists the goal is to get you up to speed as quickly as possible on data science without all the fluff we ve designed this course to be as convenient as possible without sacrificing any of the essentials this is a focused course designed to rapidly get you up to speed on the field of data science our goal was to make this as convenient as possible for you without sacrificing any essential content we ve left the technical information aside so that you can focus on managing your team and moving it forward after completing this course you will know 1 how to describe the role data science plays in various contexts 2 how statistics machine learning and software engineering play a role in data science 3 how to describe the structure of a data science project 4 know the key terms and tools used by data scientists 5 how to identify a successful and an unsuccessful data science project 3 the role of a data science manager

Personalized Learning Recommender

1. Select recommendation models

Select model:

User Profile

2. Tune Hyper-parameters:

User Profile Similarity Threshold %

60

0 100

Max Number of Recommended Courses

10

1 30

3. Training:

Train Model

4. Prediction

Recommend New Courses

Datasets loaded successfully...

Select courses that you have audited or completed:

	COURSE_ID	TITLE	DESCRIPTION
☐	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 f
☐	WA0103EN	Watson Analytics For Social Media	watson analytics for social media fundamentals teaches you the basics of watson analytics for social media on the cloud in this course yo
☑	DX0108EN	Data Science Bootcamp With Python For University Professors Advance	data science bootcamp with python for university professors advance
☐	GPXX0PICEN	Create A Cryptocurrency Trading Algorithm In Python	earning money while you sleep that may sound too good to be true but with the right cryptocurrency trading algorithm you can do just t
☑	DAI101EN	Data Ai Essentials	data and ai essentials course
☐	GPXX0W7KEN	Securing Java Microservices With Eclipse Microprofile Json Web Token Microprofile Jwt	you will explore how to control user and role access to microservices with microprofile json web token microprofile jwt
☐	GPXX0QR3EN	Enabling Distributed Tracing In Microservices With Zipkin	explore how to enable and customize tracing of jax rs and non jax rs methods by using microprofile opentracing and the zipkin tracing sy
☑	BD0145EN	Sql Access For Hadoop	big sql is another tool to work with your hadoop data big sql provides a common and familiar syntax for those that are already using sql
☐	HCC105EN	Hybrid Cloud Conference Ai Pipelines Lab	hybrid cloud conference ai pipelines lab
☑	DE0205EN	Dataops Methodology	data ops course
☑	DS0132EN	Data Ai Jumpstart Your Journey	introduce you to data and ai
☐	OS0101EN	Introduction To Open Source	this course introduces you to open source software you ll learn the key concepts tools and processes to contribute to any open source pr
☐	DS0201EN	End To End Data Science On Cloudpak For Data	end to end data science on cloudpak for data

Filters

Columns

Your courses:

	COURSE_ID	TITLE
1	ML0122EN	Accelerating Deep Learning With Gpu
5	CNSC02EN	Cloud Native Security Conference Data Security
6	DX0106EN	Data Science Bootcamp With R For University Proffesors
13	DX0108EN	Data Science Bootcamp With Python For University Professors Advance
15	DAI101EN	Data Ai Essentials
18	BD0145EN	Sql Access For Hadoop
20	DE0205EN	Dataops Methodology
21	DS0132EN	Data Ai Jumpstart Your Journey

Recommendations generated!

	SCORE	COURSE_ID	TITLE	DESCRIPTION
0	0.9806	BD0145EN	Sql Access For Hadoop	big sql is another tool to work with your hadoop data big sql provides a common and familiar syntax for those that are already using sql with their relational data to work with their big data there is no learning curve here big sql is about applying sql to your existing data ,ãi there are no proprietary storage formats this course will help you understand the big sql architecture and show the different methods for working with big sql the course will list and explain the big sql data types and show how to create big sql schemas and table the course will also cover the different file formats supported by big sql such as parquet and orc in the lab exercises you will get a chance to learn how to connect to the big sql server and load in some sample data then you will see how easy it is to use big sql to work with the data
1	0.9806	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
2	0.9806	CNSC02EN	Cloud Native Security Conference Data Security	introduction to data security on cloud
3	0.9806	DAI101EN	Data Ai Essentials	data and ai essentials course
4	0.9806	DE0205EN	Dataops Methodology	data ops course
5	0.9806	DS0132EN	Data Ai Jumpstart Your Journey	introduce you to data and ai
6	0.9806	DX0106EN	Data Science Bootcamp With R For University Proffesors	a multi day intensive in person data science bootcamp offered by big data university
7	0.9806	DX0108EN	Data Science Bootcamp With Python For University Professors Advance	data science bootcamp with python for university professors advance
8	0.9806	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
9	0.9806	GPXX0FTCEN	Learn How To Use Docker Containers For Iterative Development	learn how to use docker containers for iterative development

Personalized Learning Recommender

1. Select recommendation models

Select model:

Clustering

2. Tune Hyper-parameters:

Max number of clusters

10

2 20

Threshold for enrollments

50

1 100

Max Number of Recommended Courses

10

1 30

3. Training:

Train Model

4. Prediction

Recommend New Courses

Datasets loaded successfully...

Select courses that you have audited or completed:

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☐	GPXX0PICEN	Create A Cryptocurrency Trading Algorithm In Python	earning money while you sleep that may sound too good to be true but with the right cryptocurrency trading algorithm you can do just t
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☐	GPXX0W7KEN	Securing Java Microservices With Eclipse Microprofile Json Web Token Microprofile Jwt	you will explore how to control user and role access to microservices with microprofile json web token microprofile jwt
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☑	BD0145EN	Sql Access For Hadoop	big sql is another tool to work with your hadoop data big sql provides a common and familiar syntax for those that are already using sql
☐	HCC105EN	Hybrid Cloud Conference Ai Pipelines Lab	hybrid cloud conference ai pipelines lab
☑	DE0205EN	Dataops Methodology	data ops course
☑	DS0132EN	Data Ai Jumpstart Your Journey	introduce you to data and ai
☐	OS0101EN	Introduction To Open Source	this course introduces you to open source software you ll learn the key concepts tools and processes to contribute to any open source pr
☐	DS0201EN	End To End Data Science On Cloudpak For Data	end to end data science on cloudpak for data

Filters

Columns

Your courses:

	COURSE_ID	TITLE
1	ML0122EN	Accelerating Deep Learning With Gpu
5	CNSC02EN	Cloud Native Security Conference Data Security
6	DX0106EN	Data Science Bootcamp With R For University Proffesors
13	DX0108EN	Data Science Bootcamp With Python For University Professors Advance
15	DAI101EN	Data Ai Essentials
18	BD0145EN	Sql Access For Hadoop
20	DE0205EN	Dataops Methodology
21	DS0132EN	Data Ai Jumpstart Your Journey

Recommendations generated!

	ENROLLMENTS	COURSE_ID	TITLE	DESCRIPTION
0	13509	PY0101EN	Python For Data Science	this beginner friendly python course will take you from zero to programming in python in a matter of hours you ll be able to write your own python scripts and perform basic hands on data analysis using our jupyter based lab environment
1	13166	DS0101EN	Introduction To Data Science	the art of uncovering the insights and trends in data has been around since ancient times the ancient egyptians used census data to increase efficiency in tax collection and they accurately predicted the flooding of the nile river every year since then people working in data science have carved out a unique and distinct field for the work they do this field is data science in this course we will meet some data science practitioners and we will get an overview of what data science is today
2	11399	BD0101EN	Big Data 101	how big is big and why does big matter and what does apache hadoop have to do with it in this course you will see the big data big picture and you will learn the terminology used in big data discussions
3	8517	BD0111EN	Hadoop 101	this free apache hadoop course introduces you to big data concepts and teaches you how to perform distributed processing of large data sets with hadoop
4	7312	DA0101EN	Data Analysis With Python	in this course you will learn about data acquisition how to obtain basic insight from a dataset data
5	6901	ML0101ENv3	Machine Learning With Python	machine learning can be an incredibly beneficial tool to uncover hidden insights and predict future trends this free machine learning with python course will give you all the tools you need to get started with supervised and unsupervised learning
6	6643	DS0103EN	Data Science Methodology	grab you lab coat beakers and pocket calculator,wait what wrong path fast forward and get in line with emerging data science methodologies that are in use and are making waves or rather predicting and determining which wave is coming and which one has just passed
7	6216	DS0105EN	Data Science Hands On With Open Source Tools	what tools do data scientists use in this course you ll learn how to use the most popular data science tools including jupyter notebooks rstudio ide apache zeppelin and more
8	6013	BC0101EN	Blockchain Essentials	understand blockchain technology and how it can solve business problems learn the basics of developing applications with chaincode
9	5804	DV0101EN	Data Visualization With Python	data visualization is the graphical representation of data in order to interactively and efficiently convey insights to clients customers and stakeholders in general it is a way to summarize your findings and display it in a form that facilitates interpretation and can help in identifying patterns or trends in this data visualization with python course you ll learn how to create interesting graphics and charts and customize them to make them more effective and more pleasing to your audience

Personalized Learning Recommender

1. Select recommendation models

Select model:

Clustering with PCA

2. Tune Hyper-parameters:

Set PCA threshold %

80

10 90

Max number of clusters

10

2 20

Threshold for enrollments

50

1 100

Max Number of Recommended Courses

10

1 30

3. Training:

Train Model

4. Prediction

Recommend New Courses

Datasets loaded successfully...

Select courses that you have audited or completed:

	COURSE_ID	TITLE	DESCRIPTION
☐	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 t
☐	WA0103EN	Watson Analytics For Social Media	watson analytics for social media fundamentals teaches you the basics of watson analytics for social media on the cloud in this course yo
☑	DX0108EN	Data Science Bootcamp With Python For University Professors Advance	data science bootcamp with python for university professors advance
☐	GPXX0PICEN	Create A Cryptocurrency Trading Algorithm In Python	earning money while you sleep that may sound too good to be true but with the right cryptocurrency trading algorithm you can do just t
☑	DAI101EN	Data Ai Essentials	data and ai essentials course
☐	GPXX0W7KEN	Securing Java Microservices With Eclipse Microprofile Json Web Token Microprofile Jwt	you will explore how to control user and role access to microservices with microprofile json web token microprofile jwt
☐	GPXX0QR3EN	Enabling Distributed Tracing In Microservices With Zipkin	explore how to enable and customize tracing of jax rs and non jax rs methods by using microprofile opentracing and the zipkin tracing sy
☑	BD0145EN	Sql Access For Hadoop	big sql is another tool to work with your hadoop data big sql provides a common and familiar syntax for those that are already using sql
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☑	DE0205EN	Dataops Methodology	data ops course
☑	DS0132EN	Data Ai Jumpstart Your Journey	introduce you to data and ai
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21	DS0132EN	Data Ai Jumpstart Your Journey

Recommendations generated!

	ENROLLMENTS	COURSE_ID	TITLE	DESCRIPTION
0	13424	PY0101EN	Python For Data Science	this beginner friendly python course will take you from zero to programming in python in a matter of hours you ll be able to write your own python scripts and perform basic hands on data analysis using our jupyter based lab environment
1	13091	DS0101EN	Introduction To Data Science	the art of uncovering the insights and trends in data has been around since ancient times the ancient egyptians used census data to increase efficiency in tax collection and they accurately predicted the flooding of the nile river every year since then people working in data science have carved out a unique and distinct field for the work they do this field is data science in this course we will meet some data science practitioners and we will get an overview of what data science is today
2	11265	BD0101EN	Big Data 101	how big is big and why does big matter and what does apache hadoop have to do with it in this course you will see the big data big picture and you will learn the terminology used in big data discussions
3	8362	BD0111EN	Hadoop 101	this free apache hadoop course introduces you to big data concepts and teaches you how to perform distributed processing of large data sets with hadoop
4	7254	DA0101EN	Data Analysis With Python	in this course you will learn about data acquisition how to obtain basic insight from a dataset data
5	6864	ML0101ENv3	Machine Learning With Python	machine learning can be an incredibly beneficial tool to uncover hidden insights and predict future trends this free machine learning with python course will give you all the tools you need to get started with supervised and unsupervised learning
6	6577	DS0103EN	Data Science Methodology	grab you lab coat beakers and pocket calculator,wait what wrong path fast forward and get in line with emerging data science methodologies that are in use and are making waves or rather predicting and determining which wave is coming and which one has just passed
7	6159	DS0105EN	Data Science Hands On With Open Source Tools	what tools do data scientists use in this course you ll learn how to use the most popular data science tools including jupyter notebooks rstudio ide apache zeppelin and more
8	5968	BC0101EN	Blockchain Essentials	understand blockchain technology and how it can solve business problems learn the basics of developing applications with chaincode
9	5750	DV0101EN	Data Visualization With Python	data visualization is the graphical representation of data in order to interactively and efficiently convey insights to clients customers and stakeholders in general it is a way to summarize your findings and display it in a form that facilitates interpretation and can help in identifying patterns or trends in this data visualization with python course you ll learn how to create interesting graphics and charts and customize them to make them more effective and more pleasing to your audience

Personalized Learning Recommender

1. Select recommendation models

Select model:

KNN

2. Tune Hyper-parameters:

N Neighbors

12

1 50

3. Training:

Train Model

4. Prediction

Recommend New Courses

Datasets loaded successfully...

Select courses that you have audited or completed:

	COURSE_ID	TITLE	DESCRIPTION
☐	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 t
☐	WA0103EN	Watson Analytics For Social Media	watson analytics for social media fundamentals teaches you the basics of watson analytics for social media on the cloud in this course yo
☑	DX0108EN	Data Science Bootcamp With Python For University Professors Advance	data science bootcamp with python for university professors advance
☐	GPXX0PICEN	Create A Cryptocurrency Trading Algorithm In Python	earning money while you sleep that may sound too good to be true but with the right cryptocurrency trading algorithm you can do just t
☑	DAI101EN	Data Ai Essentials	data and ai essentials course
☐	GPXX0W7KEN	Securing Java Microservices With Eclipse Microprofile Json Web Token Microprofile Jwt	you will explore how to control user and role access to microservices with microprofile json web token microprofile jwt
☐	GPXX0QR3EN	Enabling Distributed Tracing In Microservices With Zipkin	explore how to enable and customize tracing of jax rs and non jax rs methods by using microprofile opentracing and the zipkin tracing sy
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☑	DS0132EN	Data Ai Jumpstart Your Journey	introduce you to data and ai
☐	OS0101EN	Introduction To Open Source	this course introduces you to open source software you ll learn the key concepts tools and processes to contribute to any open source pr
☐	DS0201EN	End To End Data Science On Cloudpak For Data	end to end data science on cloudpak for data

Filters

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18	BD0145EN	Sql Access For Hadoop
20	DE0205EN	Dataops Methodology
21	DS0132EN	Data Ai Jumpstart Your Journey

Recommendations generated!

	SCORE	COURSE_ID	TITLE	DESCRIPTION
0	12	CNSC02EN	Cloud Native Security Conference Data Security	introduction to data security on cloud
1	12	DAI101EN	Data Ai Essentials	data and ai essentials course
2	12	DX0106EN	Data Science Bootcamp With R For University Proffesors	a multi day intensive in person data science bootcamp offered by big data university
3	11	BD0145EN	Sql Access For Hadoop	big sql is another tool to work with your hadoop data big sql provides a common and familiar syntax for those that are already using sql with their relational data to work with their big data there is no learning curve here big sql is about applying sql to your existing data ,äì there are no proprietary storage formats this course will help you understand the big sql architecture and show the different methods for working with big sql the course will list and explain the big sql data types and show how to create big sql schemas and table the course will also cover the different file formats supported by big sql such as parquet and orc in the lab exercises you will get a chance to learn how to connect to the big sql server and load in some sample data then you will see how easy it is to use big sql to work with the data
4	11	DE0205EN	Dataops Methodology	data ops course
5	11	DS0132EN	Data Ai Jumpstart Your Journey	introduce you to data and ai
6	11	DX0108EN	Data Science Bootcamp With Python For University Professors Advance	data science bootcamp with python for university professors advance
7	11	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 time on the cloud these chips are specifically designed to support the training of neural networks as well as the use of trained networks inference accelerated hardware has recently been proven to significantly reduce training time but the problem is that your data might be sensitiveand you may not feel comfortable uploading it on a public cloud preferring to analyze it on premise in this case you need to use an in house system with gpu support one solution is to use ibm s power systems with nvidia gpu and power ai the power ai platform supports popular machine learning libraries and dependencies including tensorflow caffe torch and theano in this course you ll understand what gpu based accelerated hardware is and how it can benefit your deep learning scaling needs you ll also deploy deep learning networks on gpu accelerated hardware for several problems including the classification of images and videos

Personalized Learning Recommender

1. Select recommendation models

Select model:

NMF

2. Tune Hyper-parameters:

N components

2

2 10

3. Training:

Train Model

4. Prediction

Recommend New Courses

Datasets loaded successfully...

Select courses that you have audited or completed:

	COURSE_ID	TITLE	DESCRIPTION
☐	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 t
☐	WA0103EN	Watson Analytics For Social Media	watson analytics for social media fundamentals teaches you the basics of watson analytics for social media on the cloud in this course yo
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☐	GPXX0PICEN	Create A Cryptocurrency Trading Algorithm In Python	earning money while you sleep that may sound too good to be true but with the right cryptocurrency trading algorithm you can do just t
☑	DAI101EN	Data Ai Essentials	data and ai essentials course
☐	GPXX0W7KEN	Securing Java Microservices With Eclipse Microprofile Json Web Token Microprofile Jwt	you will explore how to control user and role access to microservices with microprofile json web token microprofile jwt
☐	GPXX0QR3EN	Enabling Distributed Tracing In Microservices With Zipkin	explore how to enable and customize tracing of jax rs and non jax rs methods by using microprofile opentracing and the zipkin tracing sy
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☐	HCC105EN	Hybrid Cloud Conference Ai Pipelines Lab	hybrid cloud conference ai pipelines lab
☑	DE0205EN	Dataops Methodology	data ops course
☑	DS0132EN	Data Ai Jumpstart Your Journey	introduce you to data and ai
☐	OS0101EN	Introduction To Open Source	this course introduces you to open source software you ll learn the key concepts tools and processes to contribute to any open source pr

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Your courses:

	COURSE_ID	TITLE
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15	DAI101EN	Data Ai Essentials
18	BD0145EN	Sql Access For Hadoop
20	DE0205EN	Dataops Methodology
21	DS0132EN	Data Ai Jumpstart Your Journey

Recommendations generated!

	SCORE	COURSE_ID	TITLE	DESCRIPTION
0	5.1799	BD0101EN	Big Data 101	how big is big and why does big matter and what does apache hadoop have to do with it in this course you will see the big data big picture and you will learn the terminology used in big data discussions
1	4.8502	BD0111EN	Hadoop 101	this free apache hadoop course introduces you to big data concepts and teaches you how to perform distributed processing of large data sets with hadoop
2	3.7204	BD0211EN	Spark Fundamentals I	ignite your interest in spark with an introduction to the core concepts that make this general processor an essential tool set for working with big data
3	3.5866	DS0101EN	Introduction To Data Science	the art of uncovering the insights and trends in data has been around since ancient times the ancient egyptians used census data to increase efficiency in tax collection and they accurately predicted the flooding of the nile river every year since then people working in data science have carved out a unique and distinct field for the work they do this field is data science in this course we will meet some data science practitioners and we will get an overview of what data science is today
4	3.5370	PY0101EN	Python For Data Science	this beginner friendly python course will take you from zero to programming in python in a matter of hours you ll be able to write your own python scripts and perform basic hands on data analysis using our jupyter based lab environment

Personalized Learning Recommender

1. Select recommendation models

Select model:

Neural Network

2. Tune Hyper-parameters:

Embedding Size

16

16 32

Max Number of Recommended Courses

10

1 30

3. Training:

Train Model

4. Prediction

Recommend New Courses

Datasets loaded successfully...

Select courses that you have audited or completed:

	COURSE_ID	TITLE	DESCRIPTION
☐	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 t
☐	WA0103EN	Watson Analytics For Social Media	watson analytics for social media fundamentals teaches you the basics of watson analytics for social media on the cloud in this course yo
☑	DX0108EN	Data Science Bootcamp With Python For University Professors Advance	data science bootcamp with python for university professors advance
☐	GPXX0PICEN	Create A Cryptocurrency Trading Algorithm In Python	earning money while you sleep that may sound too good to be true but with the right cryptocurrency trading algorithm you can do just t
☑	DAI101EN	Data Ai Essentials	data and ai essentials course
☐	GPXX0W7KEN	Securing Java Microservices With Eclipse Microprofile Json Web Token Microprofile Jwt	you will explore how to control user and role access to microservices with microprofile json web token microprofile jwt
☐	GPXX0QR3EN	Enabling Distributed Tracing In Microservices With Zipkin	explore how to enable and customize tracing of jax rs and non jax rs methods by using microprofile opentracing and the zipkin tracing sy
☑	BD0145EN	Sql Access For Hadoop	big sql is another tool to work with your hadoop data big sql provides a common and familiar syntax for those that are already using sql
☐	HCC105EN	Hybrid Cloud Conference Ai Pipelines Lab	hybrid cloud conference ai pipelines lab
☑	DE0205EN	Dataops Methodology	data ops course
☑	DS0132EN	Data Ai Jumpstart Your Journey	introduce you to data and ai
☐	OS0101EN	Introduction To Open Source	this course introduces you to open source software you ll learn the key concepts tools and processes to contribute to any open source pr
☐	DS0201EN	End To End Data Science On Cloudpak For Data	end to end data science on cloudpak for data

Filters

Columns

Your courses:

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6	DX0106EN	Data Science Bootcamp With R For University Proffesors
13	DX0108EN	Data Science Bootcamp With Python For University Professors Advance
15	DAI101EN	Data Ai Essentials
18	BD0145EN	Sql Access For Hadoop
20	DE0205EN	Dataops Methodology
21	DS0132EN	Data Ai Jumpstart Your Journey

Recommendations generated!

	SCORE	COURSE_ID	TITLE	DESCRIPTION
0	0.9997254014015198	SC0101EN	Scala 101	the typesafe scala 101 for data science curricula is designed to give experienced data developers and data science the know¬≠how to confidently start programming in scala for data science tasks the course ensures they will have a solid understanding of the fundamentals of the language the tooling and the development process as well as a good appreciation of the more advanced features if students already have scala programming experience then this course could be a useful refresher yet no previous knowledge of scala is assumed
1	0.9996991157531738	CO0101EN	Docker Essentials A Developer Introduction	learn how to use containers for your applications create and run your first docker container then learn how to run containers in production and solve problems of orchestration such as high availability service discovery and reconciliation
2	0.9996849894523621	CC0103EN	Ibm Cloud Essentials V3	this course introduces you to the ibm cloud you will learn about the many offerings and services on ibm cloud that make it the most open and secure public cloud for developers and enterprises
3	0.9996740221977234	BD0141EN	Accessing Hadoop Data Using Hive	hive is a data warehousing tool built on top of hadoop learn how to easily query and analyze your big data projects with this free apache hive course
4	0.9995843172073364	CO0401EN	Beyond The Basics Istio And Ibm Cloud Kubernetes Service	start managing your microservices with istio on ibm cloud kubernetes service this course shows you how to better control traffic to services observe service health and secure the service mesh
5	0.9994185566902161	PHPM002EN	Php Web Application On A Lamp Stack	this tutorial walks you through the creation of an ubuntu linux virtual server with apache web server mysql database and php scripting
6	0.9993260679245	DA0101EN	Data Analysis With Python	in this course you will learn about data acquisition how to obtain basic insight from a dataset data
7	0.9993260679245	BC0101EN	Blockchain Essentials	understand blockchain technology and how it can solve business problems learn the basics of developing applications with chaincode
8	0.9993039965629578	CC0201EN	Introduction To Containers Kubernetes And Openshift V2	this course introduces the core concepts of containers and kubernetes and explains how containers differ from virtual machines it also covers the importance of containers in cloud computing as well as the emerging ecosystem of related technologies such as docker kubernetes openshift istio and knative
9	0.9986876249313354	CB0105ENv1	Node Red Basics To Bots	create cognitive web apps with node red to translate text analyze tone and send tweets build a chatbot with watson assistant formerly conversation and facebook messenger

Personalized Learning Recommender

1. Select recommendation models

Select model:

Regression with Embedding Features

2. Tune Hyper-parameters:

Embedding Size

16

16 32

Max Number of Recommended Courses

10

1 30

3. Training:

Train Model

4. Prediction

Recommend New Courses

Datasets loaded successfully...

Select courses that you have audited or completed:

	COURSE_ID	TITLE	DESCRIPTION
☐	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 docum
☐	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 t
☐	WA0103EN	Watson Analytics For Social Media	watson analytics for social media fundamentals teaches you the basics of watson analytics for social media on the cloud in this course yo
☑	DX0108EN	Data Science Bootcamp With Python For University Professors Advance	data science bootcamp with python for university professors advance
☐	GPXX0PICEN	Create A Cryptocurrency Trading Algorithm In Python	earning money while you sleep that may sound too good to be true but with the right cryptocurrency trading algorithm you can do just t
☑	DAI101EN	Data Ai Essentials	data and ai essentials course

▷ Filters

Columns

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5	CNSC02EN	Cloud Native Security Conference Data Security
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18	BD0145EN	Sql Access For Hadoop
20	DE0205EN	Dataops Methodology
21	DS0132EN	Data Ai Jumpstart Your Journey

Recommendations generated!

	SCORE	COURSE_ID	TITLE	DESCRIPTION
0	3.020170211791992	DA0201EN	Data Analysis Demos	this course is about providing demonstrations and showing results with the goal of inspiring you to take more technical and in depth courses
1	2.9904658794403076	TMP0101EN	Text Analysis	analyze text data using various analytics and machine learning models
2	2.9890987873077393	OS0101EN	Introduction To Open Source	this course introduces you to open source software you ll learn the key concepts tools and processes to contribute to any open source project
3	2.9875786304473877	DB0115EN	Db2 Fundamentals Ii	db2 fundamentals ii
4	2.987511396408081	PA0109EN	Using Clustering Methods For Investment Portfolio Analysis	using clustering methods for investment portfolio analysis
5	2.9863102436065674	ML0120ENv2	Deep Learning With Tensorflow	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
6	2.9854393005371094	SECM03EN	Apply End To End Security To A Cloud Application	this mini course walks you through key security services available in the ibm cloud,ñ¢ catalog and how to use them together an application that provides file sharing will put security concepts into practice
7	2.983865261077881	CB0201EN	Build Chatbots With Watson Assistant	in this course you ll explore the watson conversation service in depth you ll watch videos that explain conversational concepts and apply them to build a chatbot you will complete seven hands on labs culminating in the creation of your own fully functional chatbot
8	2.9824235439300537	ST0201EN	Statistics 201	statistics courses teaching basic statistical anlysis methods
9	2.9821510314941406	LB0103ENv1	Reactive Architecture Domain Driven Design	domain driven design is a technique commonly used to build reactive systems this course will introduce the core elements of domain driven design it will also explain how those elements relate to reactive systems

Personalized Learning Recommender

1. Select recommendation models

Select model:

Classification with Embedding Feat…

2. Tune Hyper-parameters:

Embedding Size

16

16 32

Max Number of Recommended Courses

10

1 30

3. Training:

Train Model

4. Prediction

Recommend New Courses

Datasets loaded successfully...

Select courses that you have audited or completed:

	COURSE_ID	TITLE	DESCRIPTION
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☑	DAI101EN	Data Ai Essentials	data and ai essentials course

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21	DS0132EN	Data Ai Jumpstart Your Journey

Recommendations generated!

	SCORE	COURSE_ID	TITLE	DESCRIPTION
0	3.0000	AI0111EN	Game Playing Ai With Swift For Tensorflow S4Tf	in this course you re going to learn how to accelerate machine learning model development with google s new swift for tensorflow framework by building ai agents to play games like tic tac toe cartpole and 2048
1	3.0000	ML0109EN	Machine Learning Dimensionality Reduction	machine learning dimensionality reduction
2	3.0000	ML0101ENv3	Machine Learning With Python	machine learning can be an incredibly beneficial tool to uncover hidden insights and predict future trends this free machine learning with python course will give you all the tools you need to get started with supervised and unsupervised learning
3	3.0000	LB0111EN	Reactive Architecture Cqrs Event Sourcing	reactive architecture cqrs event sourcing
4	3.0000	LB0109ENv1	Reactive Architecture Distributed Messaging Patterns	reactive architecture distributed messaging patterns
5	3.0000	LB0107ENv1	Reactive Architecture Building Scalable Systems	reactive architecture building scalable systems
6	3.0000	LB0105ENv1	Reactive Architecture Reactive Microservices	when we use the term reactive we are usually talking about reactive microservices but what is a microservice and how can we make it reactive this course will explore the difference between monoliths and microservices and show the journey to making a system reactive
7	3.0000	LB0103ENv1	Reactive Architecture Domain Driven Design	domain driven design is a technique commonly used to build reactive systems this course will introduce the core elements of domain driven design it will also explain how those elements relate to reactive systems
8	3.0000	LB0101ENv1	Reactive Architecture Introduction To Reactive Systems	this course teaches the core principles behind reactive architecture it introduces students to why we need reactive systems and what problems they are trying to solve it also contrasts reactive architectures with reactive programming showing how they relate and how they are different
9	3.0000	IT0101EN	Building Robots With Tjbot	learn how to program a simple robot tjbot to move its arm recognize objects flash a light speak and more you can build simple apps to control tjbot by using node js or even node red if you don t want to purchase the tjbot you use a simulator instead