COMP474-6741 Project Assignment #1

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1 Competency Questions Part I

The competency questions focused on how the agent would be able to assess relations between the student class and the university class as well as testing various types of SPARQL queries. Including the first 3 that were mentioned in the handout, they are as follows:

1. What is course [SUBJECT][COURSE NUMBER], that is offered by [UNIVERSITY], about?
2. Which topics is [STUDENT FIRST NAME] [STUDENT LAST NAME] competent in?
3. Which subjects at [UNIVERSITY] teach [TOPIC]?
4. What are all the courses with a [SUBJECT] subject at [UNIVERSITY]?
5. How many students are enrolled in each course that is offered by [UNIVERSITY]?
6. What courses are worth [CREDITS] credits at [UNIVERSITY]?
7. What are the topics of [SUBJECT][COURSE NUMBER] at [UNIVERSITY]?
8. Which students have retaken the same course at least [COUNT]?
9. Which students failed [SUBJECT][COURSE NUMBER] at [UNIVERSITY]?
10. What are the [REQUIREMENT STATUS] readings' [TITLE] and [URL] in [SUBJECT] [COURSE NUMBER] offered by [UNIVERSITY] in lecture [NUMBER]?

2 Vocabulary

The vocabulary and schema of the knowledge base were modeled by following standard W3C technologies: RDF and RDFS, by utilizing existing vocabularies [1]: Dublin Core, DBpedia, foaf, owl, vcard, wikidata, xsd, and vivo and were extended using developed classes and properties [1][2][3][4][5][6][7][8][9][10]. Table 1 highlights the classes and properties used to model the information [2]. Existing vocabularies where utilized in the modeling of the schema for properties and classes wherever possible as they're well maintained, updated regularly, commonly used, and link the data to existing knowledge graphs.

[1] For more details regarding classes and properties used from existing vocabularies refer to figure 1 in the appendix.

[2] For more details regarding developed classes and properties refer to the schema.

Information	Class/Property
Universities	vivo:University
University name	rdfs:label
Link	owl:sameAs
Courses	vivo:Course
Course name	vivo:Title
Course subject	vivo:hasSubjectAre
Course number	vivo:identification
Course credits	vivo:CourseCredits
Course description	vivo:description
Course outline	focu:outline
Lectures	focu:lecture
Lecture number	bibo:number
Lecture name	vivo:Title
Lecture content	vivo:contains
Slides	focu:slide
Worksheets	focu:worksheet
Outline	focu:outline
Readings	focu:readings
Other material	focu:otherMaterial
Topics	focu:topic
Provenance information	focu:source
Students	focu:vivoStudent
Student name(first, last)	foaf:givenName, foaf:familyName
Student ID number	vivo:identification
Student email	foaf:mbox
Student completed courses	focu:completedCourse
Student competencies	focu:hasExpertise

Table 1: Information and Vocabulary

3 Knowledge Base Construction and Population

The data for courses was taken from Concordia open data website [11] and the data for universities was taken from DBpedia. As for other files (e.g., outline, slides, worksheets, ... of previous courses) local copies attained from course website and Moodle were used. To populate the knowledge base, for each information class: universities, courses, lectures, topics, and students a getRDF script was developed to generate related triples. The getRDF script for universities, courses, lectures, and students generates the triples automatically. To generate topics triples, course material (slides, worksheets, labs, and outline) were converted to plain text using pdfplumber library [12]. Next, DBpedia Spotlight is run over the converted documents for entity linking from which a list of entities and their DBpedia URI is extracted [13]. Lastly the aforementioned list is passed through a spaCy filter to extract named entities [14]. The filter is designed to select entities with specific POS tags obtained from spaCy glossary [15].

4 Knowledge Base Statistics

In addition, we provided queries and their output for statistics about our knowledge base, including the total number of triples, the total number of courseURIs, the number of distinct topics, and the number of topic/course instances:

triples	courseURIs	distinct_topics	topic_instances
309241	7154	329	817

5 Queries

For translating the competency questions into queries, the values that are surrounded by square braces are given values for the queries. These would be used as starting points for the queries, eventually these will be part of the user's input which will change depending on the request without having to rewrite the entire query. As for the return values, these depended on what the question was. In general, the question was analyzed to see which class would contain the desired values then using the input values to form a series of triples that would link to them. Example outputs of the queries are as follows, note that for some of the queries only a small sample of their output is shown and due to the random generated nature of the knowledge base, the outputs shown are for a certain instance of the knowledge base

5.1 Part I

NB— Implemented in Chatbot (✓)

courseName	courseNumber	title	courseDesc
COMP	474	Intelligent Systems	Rule-based exp...

Part I: Query 1: What is COMP 474, that is offered by Concordia University, about?

expertise
Heidelberg
Stuart Russell
Diffbot
...

Part I: Query 2: Which topics is Trenae Bryan competent in?

courseName	subjectArea	courseNum	frequency
Intelligent Systems	RELI	474	48
INTRO TO A.I.	SOCI	6721	4

Part I: Query 3: Which subjects at Concordia University teach DBpedia?

course	subjectCode	courseNum
SELECTED TOPICS IN SOFTWARE	COMP	749
Techniques in Symbolic Computation	COMP	367
Design and Analysis of Algorithms	COMP	465
...	...	...

Part I: Query 4: What are all the courses with a COMP subject at Concordia University?

subject	catalog	count
ACCO	220	5
ACCO	230	4
ACCO	240	6
ACCO	310	4
...	...	...

Part I: Query 5: How many students are enrolled in each course that is offered by Concordia University?

title	subjectCode	courseNum	credit
NONLINEAR SYSTEMS	ENGR	6141	4.0
TUTORIAL IN INF SYS/...	ACCO	603	4.0
CAPSTONE AEROSPACE ...	AERO	490	4.0
...	...	...	...

Part I: Query 6: What courses are worth 4.0 credits at Concordia University?

expertise
Heidelberg
Stuart Russell
Diffbot
...

Part I: Query 7: What are the topics of COMP 474 at Concordia University?

subjectArea	catalog	firstName	lastName	studentID	nbTimesTaken
AHSC	330	Breia	Crowell	43248687	2
ANTH	270	Sanya	Ray	41103045	2
ANTH	345	Sinead	Thomas	47855211	2
...	...	...	...	...	...

Part I: Query 8: Which students have retaken the same course at least 2 times?

firstName	lastName	studentID	courseName	courseNumber	grade
Mariela	Morrow	43952942	SOCI	336	F

Part I: Query 9: Which students have failed SOCI 336 at Concordia University?

reqLabel	title	website
required	[Yu14,Chapters1,2]...	https://concordia...
supplemental	[Wor14](RDFPrimer)...	http://www.w3.org...
supplemental	[RN10,Chapter12]...	https://concordia...
supplemental	Graphdatabases...	https://www.youtube.

Part I: Query 10: What are the readings for COMP 474 offered by Concordia University in lecture 2?

5.2 Part II

5.2.1 Knowledge Base Population

NB— Not Implemented in Chatbot (✗)

subject	catalog	topicLabel	dbpediaURI	eventURI	resourceURI
COMP	474	Heidelberg	...Heidelberg	...	...
COMP	474	... Russell	..._Russell	...	...
...	...	...	...	...	...
COMP	6721	Centroid	.../Centroid	...	...
...	...	...	...	...	...

Part II: Query 1: For a course c, list all covered topics t, printing out their English labels and their DBpedia URI, together with the course event URI (e.g., 'lab3') and resource URI (e.g., 'slides10') where they appeared.

dbpediaURI	topicLabel	catalog	subject	topicCount
.../Concordia_University	Concordia	474	COMP	75
.../DBpedia	DBpedia	474	COMP	36
.../English_language	English language	474	COMP	24
...	...	...	...	...
.../Artificial_intelligence	AI	6721	COMP	18
.../Natural_language_processing	Natural Language ...	474	COMP	15
...	...	...	...	...

Part II: Query 2: For a given topic t (DBpedia URI), list all courses where they appear, together with a count, sorted by frequency

topicLabel	courseURI	eventURI	resourceURI
Data Publishing	...#courseID_005484	.../data#005484_Lecture05	.../slides05.pdf
Weak AI	...#courseID_040353	.../data#040353_Lecture01	.../slides01.pdf
...	...	...	...

Part II: Query 3: For a given topic t, list the precise course URI, course event URI and corresponding resource URI where the topic is covered (e.g., "NLP" is covered in COMP474 → Lecture 10 → Lab 10 → Lab Notes)

5.2.2 University Chatbot

NB— Implemented in Chatbot (✓)

Some of the queries coincide with existing queries in part I:

1. see queries 1-10 in part I
2. "What is the [course] about?" : see query 1 in part I
3. "Which topics are covered in [course event]?" : See below

topicLabel	resourceURI
XOR	/worksheet05.pdf
neuron	/worksheet05.pdf
Perceptron	/worksheet05.pdf
Delta	/worksheet05.pdf
Alison	/worksheet05.pdf

Part II: Query 4: Which topics are covered in worksheet 5 of COMP 6721?

4. "Which courses cover [Topic]?" : see query 3 in part I

6 Rasa Chatbot

For designing the chatbot, we used the competency questions that were associated with each query. That way, we can see where the chatbot should extract the variables. This is represented by the words surrounded by square brackets as seen in Section 1.The variables would be extracted using Rasa's entity system to pull the text from input and classify them. Once the variables are extracted and stored in the chatbot's memory, which is done using the slots, it would place those into the appropriate query. We provided structure of the queries to the bot in its custom action classes and it just needs to substitute the variables. Afterwards, the bot makes a request to the Fuseki server, that contains our Knowledge Base, with the completed query and receives a response from the server. To make the output more human-readable, as the response is in JSON format, we extract the values from it and lay it out as a text list which the chatbot will display onto the command terminal. As for dealing with exception cases, the bot has a few responses built in to handle them by replying to a message to communicate the issue with the user.

For the sample responses from the chatbot for the questions from the user, please see the appendix at the end. Note that for some of the responses, only a portion of it is shown.

7 References

[1] "RDF 1.1 Concepts and Abstract Syntax." [Online]. Available: https://www.w3.org/TR/rdf11-concepts/. [Accessed: Mar. 22, 2022]

[2] "RDF Schema 1.1." [Online]. Available: https://www.w3.org/TR/rdf-schema/. [Accessed: Mar. 22, 2022]

[3] "DCMI Schemas." [Online]. Available: https://www.dublincore.org/schemas/. [Accessed: Mar. 22, 2022]

[4] "Home," DBpedia Association. [Online]. Available: https://www.dbpedia.org/. [Accessed: Mar. 22, 2022]

[5] "FOAF Vocabulary Specification." [Online]. Available: http://xmlns.com/foaf/spec/. [Accessed: Mar. 22, 2022]

[6] "OWL Web Ontology Language Overview." [Online]. Available: https://www.w3.org/TR/owl-features/. [Accessed: Mar. 22, 2022]

[7] "vCard Ontology - for describing People and Organizations." [Online]. Available: https://www.w3.org/TR/vcard-rdf/. [Accessed: Mar. 22, 2022]

[8] "Wikidata." [Online]. Available: https://www.wikidata.org/wiki/Wikidata:Main_Page. [Accessed: Mar. 22, 2022]

[9] "W3C XML Schema Definition Language (XSD) 1.1 Part 1: Structures." [Online]. Available: https://www.w3.org/TR/xmlschema11-1/. [Accessed: Mar. 22, 2022]

[10] "Linked Open Vocabularies (LOV)." [Online]. Available: https://lov.linkeddata.es/dataset/lov/vocabs/vivo. [Accessed: Mar. 22, 2022]

[11] "Opendata - Administrative module." [Online]. Available: https://opendata.concordia.ca/datasets/. [Accessed: Mar. 22, 2022]

[12] "pdfplumber." https://github.com/jsvine/pdfplumber/ [accessed Apr. 11, 2022].

[13] "DBpedia Spotlight - Shedding light on the web of documents." https://www.dbpedia-spotlight.org/ [accessed Apr. 11, 2022].

[14] "spaCy · Industrial-strength Natural Language Processing in Python." https://spacy.io/ [accessed Apr. 11, 2022].

[15] M. Honnibal, I. Montani, S. Van Landeghem, and A. Boyd, spaCy: Industrial-strength Natural Language Processing in Python. 2020. Accessed: Apr. 11, 2022. [Online]. Available: https://github.com/explosion/spaCy/blob/d4196a62f198f0ec32239b238f32421bbb6eb942/spacy/glossary.py

[15] "DBpedia Spotlight - Shedding light on the web of documents." https://www.dbpedia-spotlight.org/ [accessed Apr. 11, 2022].

8 Appendix

See next page

9 Graph

See final page

Appendix

Topic 1.1

```
Your input ->  What is COMP 474, that is offered by Concordia University, about?
No problem, the description for COMP 474 at Concordia University says:
Rule-based expert systems, blackboard architecture, and agent-based. Knowledge
acquisition and representation. Uncertainty and conflict resolution. Reasoning and
explanation. Design of intelligent systems. Project. Lectures: three hours per week.
Laboratory: two hours per week.
Prerequisite: COMP 352 or COEN 352.
```

Topic 1.2

```
Your input ->  Which topics is Trenae Bryan competent in?
Sure thing, Trenae Bryan is competent in the following topics:
     expertise
---  ----------------------------------
  0  Heidelberg
  1  Stuart Russell
  2  Diffbot
  3  Harper Collins
  4  Wikipedia
  5  API
  6  Oracle Spatial
  7  GeoNames
  8  ConceptNet
  9  Semantic Networks
 10  AI Winter
 11  Layer Cake
 12  Apple
 13  Alfred Lennon
 14  Berlin
 15  Sameer
 16  Microsoft
 17  The Glass Palace
 18  A11
 19  London
 20  Peter Norvig
 21  YAGO
 22  IRI
 23  Mona Lisa
 24  Neo4J
 25  Concordia
 26  Sir George Williams University
 27  Concordia University
 28  Concordia University
 29  CONCORDIA UNIVERSITY
 30  DBpedia
 31  DBpedia Spotlight
 32  DBPedia
 33  Winograd
 34  Terry Winograd
 35  French
 36  PHP
 37  A12
 38  IBM
 39  Rumelhart
 40  AI
 41  Intelligent Systems
 42  A Notes
 43  RDF
 44  Resource Description Framework (RDF)
 45  FOAF
 46  Discovery
 47  Liyang
 48  TBox
 49  Computer Science
 50  RDF/XML
 51  WordNet
 52  Léonard de Vinci
 53  Leonardo da Vinci
 54  SHRDLU
 55  Liverpool
 56  le titre
 57  Natural Language Processing (NLP)
 58  NLP
 59  natural language processing (NLP)
 60  Amazon
```

```
Prentice Hall
WWW
English language
English
XOR
RDF Schema
RDF schema
ttl
Jena
Canada
RDF triple
RDF Triple
Github
GitHub
UIMA
Recommender Systems
Knowledge Worker
Gene Ontology
Microsoft Tay
ML
Machine Learning
Amazon Alexa
Alexa
Deep Learning
Microsoft Cortana
Jeopardy!
Stanford
ELIZA
Steve Jobs
MIT
LOD
Dublin Core
McGill
McGill College
McGill University
McGill University
KNN
kNN
Concor
2D
Learning Curve
Naïve Bayes
Naive Bayes Classification
British
Enron
inference
DL
James Pustejovsky
Guantanamo Bay
Unsupervised
Unsupervised learning
Arthur
NSF
Pros & Cons
Chapter 7
CIA
Time complexity
Cambridge Analytica
Alison
Manhattan distance
False Positive
PDS
Elasticsearch
NuBus
Moodle
Newsgroup
TF-IDF
CAESAR
Christopher
Hamlet
Cambridge University Press
AP
Alag
BRUTUS
Tempest
John Berryman
Boolean model
IDF
Anthony Julius
CLEOPATRA
GUMO
Doug Turnbull
Prabhakar Raghavan
This week
Lego
EU
The Next Web
```

```
148  TED
149  Congress
150  thesauri
151  ACM
152  David Wood
153  TBL
154  The Artist
155  Morgan
156  loc
157  LOC
158  Unicode
159  Christian
160  Schema.org
161  Nexus
162  Uniform Resource Locator
163  ISO
164  Dewey Decimal
165  Luke
166  X5
167  Data Publishing
168  PE
169  Amsterdam
170  Milan
171  RT
172  Q5
173  RDB
174  BabelNet
175  James
176  OPE
177  Eötvös Loránd University
178  CSV
179  Springer International Publishing
180  IG
181  MusicBrainz
182  Tim Berners-Lee
183  LOD Datasets
184  Open Graph Protocol
185  Paris Hilton
186  API key
187  Quebec
188  NextProt
189  Loyola College
190  fuseki
191  Fuseki
192  Wordpress.com
193  Mexico
194  POST
195  National Cancer Institute
196  MAX
197  Amazon AWS
198  UniProt
199  QL
200  AVG
201  N-Quads
202  TriG
203  Web Ontology Language (OWL)
204  Paris
205  META tags
206  Mtl Blog
207  OpenCalais
208  JDK
209  xf
```

Topic 1.3

```
Your input ->  Which subjects at Concordia University teach DBpedia?
Okay, the following courses at Concordia University that teach DBpedia are:
    courseName           subjectArea      courseNum    frequency
--  -------------------  -------------  -----------  -----------
 0  Intelligent Systems  COMP                   474           48
 1  INTRO TO A.I.        COMP                  6721
```

Topic 1.4

```
Your input ->  What are all the courses with a COMP subject at Concordia Universit
Okay, the following courses at Concordia University that have COMP as the subject are:
      title                                                    subject      courseNum
---  -----------------------------------------------------------  ---------  -----------
  0  SELECTED TOPICS IN SOFTWARE                                 COMP               749
  1  Techniques in Symbolic Computation                          COMP               367
```

2	Design and Analysis of Algorithms	COMP	465
3	PATTERN RECOGNITION	COMP	6731
4	COMPUTER VISION	COMP	425
5	Project and Report	COMP	6971
6	Introduction to Software Engineering	COMP	354
7	ADV. ANALYSIS OF ALOGARITHMS	COMP	7651
8	MACHINE LEARNING	COMP	6321
9	COMPUTER ARCHITECTURE	COMP	5261
10	Image Processing	COMP	478
11	NUMERIC ANALY/NONLINEAR EQUA	COMP	6361
12	Introduction to Theoretical Computer Science	COMP	335
13	ALGORITHM DESIGN TECHNIQUES	COMP	6651
14	Artificial Intelligence	COMP	472
15	Computer Science Project I	COMP	490
16	Data Analytics	COMP	333
17	MASTER S RESEARCH AND THESIS	COMP	7941
18	Computer Science Project II	COMP	492
19	PARALLEL ALGORITHMS+ARCHIT E	COMP	7241
20	PROJECT AND REPORT	COMP	6971
21	INTRO/KNOWLEDGE-BASE SYSTEMS	COMP	6591
22	ADV TOPICS MICROPROC SYSTEMS	COMP	427
23	Data Communication and Computer Networks	COMP	445
24	DOCTORAL RESEARCH AND THESIS	COMP	8901
25	SELECT TOP-DIGITAL SYSTEMS	COMP	729
26	Compiler Design	COMP	442
27	DISTRIBUTED SYSTEM DESIGN	COMP	6231
28	COMPUTER NETWORKS + PROTOCOL	COMP	6461
29	DISCRETE STR.+FORMAL LANG.	COMP	5361
30	TOOLS+TECHNIQUES / SW ENGR.	COMP	5541
31	SEL TOPICS-INFORMATION MANA	COMP	759
32	ADVANCED GAME DEVELOPMENT	COMP	6331
33	COMPUTER VISION	COMP	6341
34	Animation for Computer Games	COMP	477
35	Parallel Programming	COMP	428
36	TOPICS IN COMPUTER SCIENCE	COMP	499
37	ADVANCED PROGRAM DESIGN, C++	COMP	345
38	Computer Graphics	COMP	371
39	SEL TOPICS-COMP APPLICATIONS	COMP	779
40	MASTER S RESEARCH AND THESIS	COMP	7921
41	NATURAL LANGUAGE ANALYSIS	COMP	6751
42	SCIENTIFIC COMPUTATION	COMP	6351
43	COMP.ANAL.NATURAL LANG.TEST	COMP	690
44	Computer Architecture	COMP	326
45	INTELLIGENT SYSTEMS	COMP	6741
46	Multicore Programming	COMP	426
47	Image Processing	COMP	6771
48	ADV IMAGE PROC	COMP	7781
49	APPL./SYMBOLIC+ALGEB.COMPU N	COMP	6611
50	Object-Oriented Programming II	COMP	249
51	ADVANCED PROGRAMMING	COMP	5421
52	Program and Problem Solving	COMP	6481
53	OPERATING SYSTEMS	COMP	5461
54	Fundamentals of Programming	COMP	218
55	Computer Science Industrial Experience Reflective Learning I	COMP	108
56	DOCTORAL RESEARCH AND THESIS	COMP	890
57	GRADUATE SEMINAR-COMP.SC.	COMP	6961
58	FOUNDATIONS/SEMANTIC WEB	COMP	6531
59	COMPARAT.STUDY/PROGRAM.LANG.	COMP	6411
60	Honours Seminar	COMP	495
61	Object-Oriented Programming I	COMP	248
62	PRINCIPLES/DATA STRUCTURES	COMP	5511
63	Operating Systems	COMP	346
64	PROGRAM G + PROBLEM SOLVING	COMP	5481
65	TOPICS IN COMP. SCIENCE II	COMP	791
66	Advanced Game Development	COMP	476
67	ADV.DATABASE TECH. AND APPL.	COMP	6521
68	COMBINATORIAL ALGORITHMS	COMP	6661
69	THEORY OF COMPUTATION	COMP	6641
70	Intelligent Systems	COMP	474
71	COMBINATORICS	COMP	339
72	COMP. ORGANIZ N+ASSEMB.LANG.	COMP	5201
73	PARALLEL PROGRAMMING	COMP	6281
74	MASTER S RESEARCH AND THESIS	COMP	792
75	Bioinformatics Databases and Systems	COMP	6821
76	INFO. RETRIEVAL & WEB SEARCH	COMP	6791
77	Machine Learning	COMP	432
78	Probability and Statistics for Computer Science	COMP	233
79	SEL TOP - NUMERICAL COMPUTAT	COMP	769
80	DB SYSTEMS PRINCIPLES	COMP	7531
81	TOPICS/COMPUTER SCIENCE II	COMP	790
82	Digital Geometric Modelling	COMP	6381
83	ANIMATION FOR COMPUTER GAMES	COMP	6311
84	SEL TOP-THEORETICAL COMP SCI	COMP	739
85	Pattern Recognition	COMP	473
86	Computer Science Industrial Experience Reflective Learning II	COMP	208
87	FILES AND DATABASES	COMP	5531
88	ELEMENTARY NUMERICAL METHODS	COMP	5611

89	Elementary Numerical Methods	COMP	361
90	Databases	COMP	353
91	Principles of Programming Languages	COMP	348
92	TOPICS/COMPUTER SCIENCE	COMP	691
93	System Hardware	COMP	228
94	INTRO TO A.I.	COMP	6721
95	Introduction to Game Development	COMP	376
96	Data Structures and Algorithms	COMP	352
97	BIOINFORMATICS ALGORITHMS	COMP	6811
98	ADVANCED COMPUTER GRAPHICS	COMP	6761
99	COMPILER DESIGN	COMP	6421
100	Information Retrieval and Web Search	COMP	479
101	COMP 6781 Statistical Natural Language Processing	COMP	6781
102	Introduction to Computing	COMP	201
103	TOPICS IN COMPUTER SCIENCE	COMP	498
104	Mathematics for Computer Science	COMP	232
105	LARGE-SCALE OPTIMIZATION	COMP	6631
106	SELECTED TOPICS IN SOFTWARE	COMP	749
107	Techniques in Symbolic Computation	COMP	367
108	Design and Analysis of Algorithms	COMP	465
109	PATTERN RECOGNITION	COMP	6731
110	COMPUTER VISION	COMP	425
111	Project and Report	COMP	6971
112	Introduction to Software Engineering	COMP	354
113	ADV. ANALYSIS OF ALOGARITHMS	COMP	7651
114	MACHINE LEARNING	COMP	6321
115	COMPUTER ARCHITECTURE	COMP	5261
116	Image Processing	COMP	478
117	NUMERIC ANALY/NONLINEAR EQUA	COMP	6361
118	Introduction to Theoretical Computer Science	COMP	335
119	ALGORITHM DESIGN TECHNIQUES	COMP	6651
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126	PROJECT AND REPORT	COMP	6971
127	INTRO/KNOWLEDGE-BASE SYSTEMS	COMP	6591
128	ADV TOPICS MICROPROC SYSTEMS	COMP	427
129	Data Communication and Computer Networks	COMP	445
130	DOCTORAL RESEARCH AND THESIS	COMP	8901
131	SELECT TOP-DIGITAL SYSTEMS	COMP	729
132	Compiler Design	COMP	442
133	DISTRIBUTED SYSTEM DESIGN	COMP	6231
134	COMPUTER NETWORKS + PROTOCOL	COMP	6461
135	DISCRETE STR.+FORMAL LANG.	COMP	5361
136	TOOLS+TECHNIQUES / SW ENGR.	COMP	5541
137	SEL TOPICS-INFORMATION MANA	COMP	759
138	ADVANCED GAME DEVELOPMENT	COMP	6331
139	COMPUTER VISION	COMP	6341
140	Animation for Computer Games	COMP	477
141	Parallel Programming	COMP	428
142	TOPICS IN COMPUTER SCIENCE	COMP	499
143	ADVANCED PROGRAM DESIGN, C++	COMP	345
144	Computer Graphics	COMP	371
145	SEL TOPICS-COMP APPLICATIONS	COMP	779
146	MASTER S RESEARCH AND THESIS	COMP	7921
147	NATURAL LANGUAGE ANALYSIS	COMP	6751
148	SCIENTIFIC COMPUTATION	COMP	6351
149	COMP.ANAL.NATURAL LANG.TEST	COMP	690
150	Computer Architecture	COMP	326
151	INTELLIGENT SYSTEMS	COMP	6741
152	Multicore Programming	COMP	426
153	Image Processing	COMP	6771
154	ADV IMAGE PROC	COMP	7781
155	APPL./SYMBOLIC+ALGEB.COMPU N	COMP	6611
156	Object-Oriented Programming II	COMP	249
157	ADVANCED PROGRAMMING	COMP	5421
158	Program and Problem Solving	COMP	6481
159	OPERATING SYSTEMS	COMP	5461
160	Fundamentals of Programming	COMP	218
161	Computer Science Industrial Experience Reflective Learning I	COMP	108
162	DOCTORAL RESEARCH AND THESIS	COMP	890
163	GRADUATE SEMINAR-COMP.SC.	COMP	6961
164	FOUNDATIONS/SEMANTIC WEB	COMP	6531
165	COMPARAT.STUDY/PROGRAM.LANG.	COMP	6411
166	Honours Seminar	COMP	495
167	Object-Oriented Programming I	COMP	248
168	PRINCIPLES/DATA STRUCTURES	COMP	5511
169	Operating Systems	COMP	346
170	PROGRAM G + PROBLEM SOLVING	COMP	5481
171	TOPICS IN COMP. SCIENCE II	COMP	791
172	Advanced Game Development	COMP	476
173	ADV.DATABASE TECH. AND APPL.	COMP	6521
174	COMBINATORIAL ALGORITHMS	COMP	6661
175	THEORY OF COMPUTATION	COMP	6641

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176  Intelligent Systems                                          COMP              474
177  COMBINATORICS                                                COMP              339
178  COMP. ORGANIZ N+ASSEMB.LANG.                                 COMP             5201
179  PARALLEL PROGRAMMING                                         COMP             6281
180  MASTER S RESEARCH AND THESIS                                 COMP              792
181  Bioinformatics Databases and Systems                         COMP             6821
182  INFO. RETRIEVAL & WEB SEARCH                                 COMP             6791
183  Machine Learning                                             COMP              432
184  Probability and Statistics for Computer Science              COMP              233
185  SEL TOP - NUMERICAL COMPUTAT                                 COMP              769
186  DB SYSTEMS PRINCIPLES                                        COMP             7531
187  TOPICS/COMPUTER SCIENCE II                                   COMP              790
188  Digital Geometric Modelling                                  COMP             6381
189  ANIMATION FOR COMPUTER GAMES                                 COMP             6311
190  SEL TOP-THEORETICAL COMP SCI                                 COMP              739
191  Pattern Recognition                                          COMP              473
192  Computer Science Industrial Experience Reflective Learning II COMP             208
193  FILES AND DATABASES                                          COMP             5531
194  ELEMENTARY NUMERICAL METHODS                                 COMP             5611
195  Elementary Numerical Methods                                 COMP              361
196  Databases                                                    COMP              353
197  Principles of Programming Languages                          COMP              348
198  TOPICS/COMPUTER SCIENCE                                      COMP              691
199  System Hardware                                              COMP              228
200  INTRO TO A.I.                                                COMP             6721
201  Introduction to Game Development                             COMP              376
202  Data Structures and Algorithms                               COMP              352
203  BIOINFORMATICS ALGORITHMS                                    COMP             6811
204  ADVANCED COMPUTER GRAPHICS                                   COMP             6761
205  COMPILER DESIGN                                              COMP             6421
206  Information Retrieval and Web Search                         COMP              479
207  COMP 6781 Statistical Natural Language Processing            COMP             6781
208  Introduction to Computing                                    COMP              201
209  TOPICS IN COMPUTER SCIENCE                                   COMP              498
210  Mathematics for Computer Science                             COMP              232
211  LARGE-SCALE OPTIMIZATION                                     COMP             6631
```

Topic 1.5

```
Your input ->  How many students are enrolled in each course that is offered by Concordia University?
Here's the list of placeholder courses offered by Concordia University and the number of students enrolled in each one:
     subject    catalog      count
--  ---------  ---------  -------
 0  ACCO       220              5
 1  ACCO       230              4
 2  ACCO       240              6
 3  ACCO       310              4
 4  ACCO       320              4
 5  ACCO       330              3
 6  ACCO       340              6
 7  ACCO       350              1
 8  ACCO       355              6
 9  ACCO       360              3
10  ACCO       365              6
11  ACCO       400              5
12  ACCO       420              4
13  ACCO       425              6
14  ACCO       430              3
15  ACCO       435              4
16  ACCO       440              8
17  ACCO       450              3
18  ACCO       455              5
19  ACCO       465              7
20  ACCO       470              2
21  ACCO       471              2
22  ACCO       495              2
23  ACCO       590              4
24  ACCO       595              6
25  ACCO       600             17
26  ACCO       601              4
27  ACCO       602             11
28  ACCO       603              5
29  ACCO       604              3
30  ACCO       605              8
31  ACCO       606              5
32  ACCO       607              2
33  ACCO       608              7
34  ACCO       609              4
35  ACCO       631              6
36  ACCO       631T             2
37  ACCO       635              5
38  ACCO       635T             3
39  ACCO       643X             6
```

```
40  ACCO       650             2
41  ACCO       650T           11
42  ACCO       651             4
43  ACCO       651T            6
44  ACCO       652             5
45  ACCO       652T            3
46  ACCO       653             4
47  ACCO       653T            5
48  ACCO       654             5
49  ACCO       654T           10
50  ACCO       655             3
51  ACCO       655T            4
52  ACCO       656             6
53  ACCO       656T            5
54  ACCO       657             3
55  ACCO       657T            8
56  ACCO       658             7
57  ACCO       658T            1
58  ACCO       659             4
59  ACCO       659T            3
60  ACCO       672             8
61  ACCO       681             3
62  ACCO       682             3
63  ACCO       685             5
64  ACCO       690B            5
65  ACCO       691             6
66  ACCO       692             6
67  ACCO       695             6
68  ACTT       201             8
69  ACTT       202             6
70  ACTT       209             9
71  ACTT       210             9
72  ACTT       211             7
73  ACTT       231             9
74  ACTT       298             3
75  ACTT       299             2
76  ACTT       321             8
77  ACTT       325            10
78  ACTT       331             5
79  ACTT       332             6
80  ACTT       355             2
81  ACTT       358            18
82  ACTT       360            11
83  ACTT       370             5
84  ACTT       372             3
85  ACTT       398             7
86  ACTT       399             5
87  ACTT       432             7
88  ACTT       433             9
89  ACTT       434             9
90  ACTT       435             9
91  ACTT       436            11
92  ACTT       437             7
93  ACTT       438             9
94  ACTT       440            10
95  ACTT       450             9
96  ACTT       455             7
97  ACTT       458             5
98  ACTT       460            10
99  ACTT       461             5
```

Topic 1.6

```
Your input ->  What courses are worth 4.0 credits at Concordia University?
Here's the list of courses offered by Concordia University that are worth 4.0 credits:
     title                                                  subject    courseNum      credit
--  -----------------------------------------------------  ---------  -----------  --------
 0  NONLINEAR SYSTEMS                                      ENGR       6141                4
 1  TUTORIAL IN INF SYS/INT.CONT                           ACCO       603                 4
 2  CAPSTONE AEROSPACE ENGINEERING DESIGN PROJECT          AERO       490                 4
 3  HEAT EXCHANGER DESIGN                                  MECH       6141                4
 4  Introduction to Flight and Aerospace System            AERO       201                 4
 5  SPEC MASTER'S LEVEL STUDIES                            SPEC       644                 4
 6  VLSI Circuit Design                                    COEN       451                 4
 7  PATTERN RECOGNITION                                    COMP       6731                4
 8  COMPUTER VISION                                        COMP       425                 4
 9  MICROTRANSDUCER PROCESS TECH                           ELEC       6251                4
10  ANALYTICAL METH ECOTOXICOLOG                           CHEM       618                 4
11  Building Information Modelling in Construction         BLDG       6241                4
12  Project and Report                                     COMP       6971                4
13  READING COURSE IN ALGEBRA                              MATH       697                 4
14  VIBR. PROB. IN ROTAT. MACH.                            MECH       6301                4
15  SYSTEMS REQMT. SPECIFICATION                           SOEN       6481                4
```

16	Corrosion and Oxidation of Metals	MECH	6571	4
17	Advanced Functions in R	GPDI	547	4
18	JOIN G PROC+NONDESTRUC.TEST.	MECH	6541	4
19	The Finite Element Method in Computational Fluid Dynamics	ENGR	6261	4
20	VLSI PROCESS TECHNOLOGY	ELEC	6241	4
21	MODEL./BLDG.+ENVIROM L ENGG.	CIVI	6601	4
22	SPEC DOCTORAL LEVEL STUDIES	SPEC	840	4
23	Distributed Systems	SOEN	423	4
24	ENGINEERING ANALYSIS	ENCS	6021	4
25	VIRTUAL SYSTEMS	MECH	6041	4
26	HEAT TRANSFER	BLDG	6541	4
27	ENGG.ASPECTS/SITE REMEDIA N.	CIVI	6491	4
28	ENG. FRACTURE MECH.+FATIGUE	MECH	6641	4
29	ADVANCED COLLOID AND INTERFACE SCIENCE AND ENGINEERING	CHME	6131	4
30	INTRO TO TRIBOLOGY	MECH	6431	4
31	SUSTAINABLE INFRASTRUCTURE	INSE	6311	4
32	Introduction to Software Engineering	COMP	354	4
33	ADV. ANALYSIS OF ALOGARITHMS	COMP	7651	4
34	BUSINESS ADVISORY SERVICES	ACCO	631	4
35	INTRODUCTION TO ANALOG VLSI	ELEC	6051	4
36	AUTONOMY FOR MOBILE ROBOTS	ENGR	6412	4
37	PROCESS DYNAMICS+CONTROL	MECH	6051	4
38	HYBRID ELECTRIC VEHICLE POWER SYSTEM DESIGN AND CONTROL	ELEC	6471	4
39	Taxation and Decision-Making	ACCO	655	4
40	LEAN MANUFACTURING	INDU	6241	4
41	ADV. CONCEPTS/QUALITY IMPR.	INDU	6341	4
42	MACHINE LEARNING	COMP	6321	4
43	Tutorial in Performance Management	ACCO	656T	4
44	SOLAR BUILDING MODELLING AND DESIGN	BLDG	6951	4
45	Image Processing	COMP	478	4
46	STRESS ANALYSIS/MECH DESIGN	MECH	6441	4
47	The Finite Element Method in Structural Mechanics	ENGR	6531	4
48	NUMERIC ANALY/NONLINEAR EQUA	COMP	6361	4
49	Facilities Planning and Warehouse Operations	INDU	6251	4
50	Financial Strategies and Decisions	ACCO	657	4
51	SVCS COM: FOUND, DSGN & IMPL	SOEN	6861	4
52	Tutorial in Capstone II Examination	ACCO	609	4
53	INDUSTRIALIZED BUILDING	BLDG	6641	4
54	INDOOR AIR QUAL.+ VENT.	BLDG	6751	4
55	VLSI CIRCUIT DESIGN	COEN	6511	4
56	AVIONIC SYSTEMS DESIGN	ENGR	7461	4
57	SELECTED TOP-INORGANIC CHEM	CHEM	647	4
58	DESIGN OF TRANSPORTATION TERMINALS	CIVI	7401	4
59	MEDICAL IMAGE PROCESSING	ELEC	6661	4
60	CONSTRUCTION PROCESSES	BLDG	6831	4
61	Tutorial in Performance Management	ACCO	606	4
62	ALGORITHM DESIGN TECHNIQUES	COMP	6651	4
63	KINETIC THEORY OF GASES	MECH	6101	4
64	MECHANICS+BIOL. TISSUES	MECH	6361	4
65	OCCUPATIONAL SAFETY ENG.	INDU	6421	4
66	PRIN. OF SLID ST NA.DEV	ELEC	6281	4
67	Artificial Intelligence	COMP	472	4
68	SCHEDULING THEORY	INDU	6231	4
69	DECISION ANALYSIS	BLDG	6581	4
70	INFO. THEORY + SOURCE CODING	ELEC	6151	4
71	PROJECT ACQUISITION+CONTROL	BLDG	7811	4
72	Tutorial in Taxation/Decision making	ACCO	605	4
73	TRANS. SYSTEMS ANALYSIS	CIVI	6401	4
74	SPECIAL TOPIC: CELL BIOLOGY	SPEC	843	4
75	INFORMATION TECHNOLOGY APPLICATIONS IN CONSTRUCTION	BLDG	7841	4
76	MICROWAVE ENGINEERING	ELEC	6391	4
77	DEVELOPMENT & GLOBAL ENGR.	ENCS	6821	4
78	INFORMATION SYSTEMS SECURITY CYBERCRIME INVESTIGATION	INSE	6610	4
79	MODAL ANALYSIS/MECH.SYSTEMS	MECH	6351	4
80	SPEC MASTER'S LEVEL STUDIES	SPEC	649	4
81	LOGISTICS NETWORK MODELS	INDU	6141	4
82	TWO-DIMEN'AL SIG & IMAGE PRO	ELEC	6641	4
83	SYSTEM RELIABILITY	INDU	6351	4
84	Embedded Systems and Software Design	COEN	421	4
85	OPT.NETWK: ARCH. & PROTOCOLS	ENCS	6811	4
86	TRUSTED COMPUTING	INSE	6650	4
87	PARALLEL ALGORITHMS+ARCHIT E	COMP	7241	4
88	Smart Grids and Control System Security	INSE	6640	4
89	DISCRETE OPTIMIZATION	INDU	6361	4
90	SOFTWARE RE-ENGINEERING	SOEN	6021	4
91	PLAN.+ DESIGN OF BRIDGES	CIVI	6101	4
92	EMBEDDED SYSTEM MODELLING	COEN	6341	4
93	LEAN ENTERPRISE	INDU	6221	4
94	SPEC MASTER'S LEVEL STUDIES	SPEC	652	4
95	WIRELESS NETWORK SECURITY	INSE	6190	4
96	SELECTED TOP:ECOTOXICOLOGY I	BIOL	572	4
97	ADVANCED MATERIALS	MECH	6501	4
98	BUILDING ILLUMINATION	BLDG	6731	4
99	COMP.AIDED BUILD. DESIGN	BLDG	6591	4

Topic 1.7

```
Your input ->  What are the topics of COMP 474 at Concordia University?
      label
---  ----------------------------------
  0  Heidelberg
  1  Stuart Russell
  2  Diffbot
  3  Harper Collins
  4  Wikipedia
  5  API
  6  Oracle Spatial
  7  GeoNames
  8  ConceptNet
  9  Semantic Networks
 10  AI Winter
 11  Layer Cake
 12  Apple
 13  Alfred Lennon
 14  Berlin
 15  Sameer
 16  Microsoft
 17  The Glass Palace
 18  A11
 19  London
 20  Peter Norvig
 21  YAGO
 22  IRI
 23  Mona Lisa
 24  Neo4J
 25  Concordia
 26  Sir George Williams University
 27  Concordia University
 28  Concordia University
 29  CONCORDIA UNIVERSITY
 30  DBpedia
 31  DBpedia Spotlight
 32  DBPedia
 33  Winograd
 34  Terry Winograd
 35  French
 36  PHP
 37  A12
 38  IBM
 39  Rumelhart
 40  AI
 41  Intelligent Systems
 42  A Notes
 43  RDF
 44  Resource Description Framework (RDF)
 45  FOAF
 46  Discovery
 47  Liyang
 48  TBox
 49  Computer Science
 50  RDF/XML
 51  WordNet
 52  Léonard de Vinci
 53  Leonardo da Vinci
 54  SHRDLU
 55  Liverpool
 56  le titre
 57  Natural Language Processing (NLP)
 58  NLP
 59  natural language processing (NLP)
 60  Amazon
 61  Prentice Hall
 62  WWW
 63  English language
 64  English
 65  XOR
 66  RDF Schema
 67  RDF schema
 68  ttl
 69  Jena
 70  Canada
 71  RDF triple
 72  RDF Triple
 73  Github
 74  GitHub
 75  UIMA
 76  Recommender Systems
 77  Knowledge Worker
 78  Gene Ontology
 79  Microsoft Tay
```

```
ML
Machine Learning
Amazon Alexa
Alexa
Deep Learning
Microsoft Cortana
Jeopardy!
Stanford
ELIZA
Steve Jobs
MIT
LOD
Dublin Core
McGill
McGill College
McGill University
McGill University
KNN
kNN
Concor
2D
Learning Curve
Naïve Bayes
Naive Bayes Classification
British
Enron
inference
DL
James Pustejovsky
Guantanamo Bay
Unsupervised
Unsupervised learning
Arthur
NSF
Pros & Cons
Chapter 7
CIA
Time complexity
Cambridge Analytica
Alison
Manhattan distance
False Positive
PDS
Elasticsearch
NuBus
Moodle
Newsgroup
TF-IDF
CAESAR
Christopher
Hamlet
Cambridge University Press
AP
Alag
BRUTUS
Tempest
John Berryman
Boolean model
IDF
Anthony Julius
CLEOPATRA
GUMO
Doug Turnbull
Prabhakar Raghavan
This week
Lego
EU
The Next Web
TED
Congress
thesauri
ACM
David Wood
TBL
The Artist
Morgan
loc
LOC
Unicode
Christian
Schema.org
Nexus
Uniform Resource Locator
ISO
Dewey Decimal
Luke
X5
```

```
167  Data Publishing
168  PE
169  Amsterdam
170  Milan
171  RT
172  Q5
173  RDB
174  BabelNet
175  James
176  OPE
177  Eötvös Loránd University
178  CSV
179  Springer International Publishing
180  IG
181  MusicBrainz
182  Tim Berners-Lee
183  LOD Datasets
184  Open Graph Protocol
185  Paris Hilton
186  API key
187  Quebec
188  NextProt
189  Loyola College
190  fuseki
191  Fuseki
192  Wordpress.com
193  Mexico
194  POST
195  National Cancer Institute
196  MAX
197  Amazon AWS
198  UniProt
199  QL
200  AVG
201  N-Quads
202  TriG
203  Web Ontology Language (OWL)
204  Paris
205  META tags
206  Mtl Blog
207  OpenCalais
208  JDK
209  xf
```

Topic 1.8

```
Your input ->  Which students have retaken the same course at least 2 times?
Here's all students that have retaken a course at least 2 times:
      subjectArea    catalog    firstName    lastName       studentId    nbTimesTaken
---  -------------  ---------  -----------  -----------  -----------  --------------
  0  AHSC           330        Breia        Crowell         43248687               2
  1  ANTH           270        Sanya        Ray             41103045               2
  2  ANTH           345        Sinead       Thomas          47855211               2
  3  ANTH           472        Danee        Lam             41687401               2
  4  SOCI           472        Danee        Lam             41687401               2
  5  ARTH           200        Tiwanna      Phelps          42266030               2
  6  ARTH           266        Romy         Spence          43970807               2
  7  ATRP           624        Keane        Lowry           45656225               2
  8  BIOL           227        Brandelyn    Williford       46414172               2
  9  BIOL           350        Mahmoud      Scarborough     44328251               2
 10  BIOL           351        Lorilei      Bishop          47062293               2
 11  BLDG           365        Sheren       Mitchell        43177841               2
 12  BLDG           6071       Evalina      Bruce           44111281               2
 13  CART           212        Stepahnie    Bradford        48779825               2
 14  CHEM           221        Therron      Brandon         49621189               2
 15  CIVI           432        Jameca       Golden          49370084               2
 16  CIVI           483        Sherard      Gilliam         47931566               2
 17  COEN           313        Brandelyn    Williford       46414172               2
 18  COEN           313        Gladis       Frazier         49832947               2
 19  COMP           249        Leshay       Marks           43331314               2
 20  COMP           346        Sarkis       Peele           49107786               2
 21  COMP           445        Linsday      Petersen        42884783               2
 22  COMP           5481       Viliami      Boyette         41656779               2
 23  COMS           240        Agustine     Alexander       41630765               2
 24  COMS           370        Stevi        Dunn            48964072               2
 25  COMS           695B       Teressa      Manning         41358236               2
 26  COMS           861        Lacye        Yu              43152116               2
 27  DANC           301        Justeen      Moon            49857777               2
 28  ECON           615        Zachariah    Braswell        49092469               2
 29  ECON           662        Hollyann     Sutton          43446352               2
 30  ELEC           442        Jaquitta     Cobb            46215613               2
 31  ENGL           384        Serena       Raynor          47414185               2
 32  ENGL           441        Charese      Wood            44351512               2
```

33	ENGL	451	Joann	Ivey	44523268	2
34	ENGL	646	Shunda	May	49777638	2
35	ENGR	6411	Cherita	Herndon	41217532	2
36	ESTU	608	Venessa	Brantley	46985710	2
37	ETEC	536	Su	Dickens	45922911	2
38	ETEC	640	Jessieca	Rodriguez	44346566	2
39	ETEC	650	Dustyn	Brennan	43478189	2
40	EXCI	460	Adrienne	Brooks	41354838	2
41	FINA	320	Lavanda	Mathews	45650811	2
42	FLIT	230	Emmanuelle	Hurley	43248110	2
43	FLIZ	230	Emmanuelle	Hurley	43248110	2
44	FPST	297	Garrett	Morris	49501430	2
45	FRAN	215	Rami	Hull	44448879	2
46	FTRA	202	Nicholai	Yates	43988012	2
47	GEOL	210	Robertson	Swanson	49670104	2
48	GERM	270	Dewan	Connor	48636591	2
49	GERM	305	Orrin	Porter	42867964	2
50	HIST	201	Nickolaus	Wyatt	45946783	2
51	HISZ	201	Nickolaus	Wyatt	45946783	2
52	HIST	235	Keishawna	Morrison	49661907	2
53	HIST	277	Takara	Nolan	41477344	2
54	HIST	281	Jonisha	Pridgen	48300318	2
55	HISZ	281	Jonisha	Pridgen	48300318	2
56	HIST	340	Tho	Christian	43356669	2
57	HIST	365	Kyron	Adkins	46982724	2
58	HUMA	863	Kavita	Kuhn	47032123	2
59	INDU	490	Gertrude	Middleton	46328769	2
60	IRST	203	Jesselyn	Waller	46953764	2
61	MECH	311	Adaliz	Mullins	46076353	2
62	PHIL	609	Tyreka	Perez	43713212	2
63	POLI	216	Sheretta	Hampton	49097045	2
64	POLI	409	Courteney	Dickson	45967499	2
65	POLI	426	Vien	Rao	46187290	2
66	POLI	600	Loren	Godfrey	43303362	2
67	POLI	607	Yasir	Riggs	49074971	2
68	PSYC	250	Robertson	Swanson	49670104	2
69	PSYC	444	Omarr	Wilkins	46167225	2
70	PSYC	487	Terrall	Blake	42256310	2
71	PSYC	495	Rosalva	Rodgers	43147943	2
72	PSYC	801	Taquita	Creech	44602117	2
73	PSYC	823	Toy	Maynard	40188854	2
74	RELI	209	Jaquilla	Gorman	42935367	2
75	RELI	366	Sherlyn	Vaughn	47188616	2
76	SCUL	490	Colena	Russell	47761423	2
77	SOCI	203	Audrey	Starr	41164798	2
78	SOCZ	203	Audrey	Starr	41164798	2
79	ANTH	276	Taiwo	Atkins	48183647	2
80	SOCI	276	Taiwo	Atkins	48183647	2
81	ANTH	381	Rashi	Schmidt	45112117	2
82	SOCI	381	Rashi	Schmidt	45112117	2
83	SOEN	228	Cornelious	Locklear	45251717	2
84	SOEN	490	Wanda	Mills	47201164	2
85	SPEC	601	Odette	Lynn	47693867	2
86	SPEC	835	Truman	Brady	40180367	2
87	STAT	250	Smita	Chan	45431677	2
88	TESL	324	Kima	Sanchez	46226538	2
89	TESL	486	Travell	West	46861855	2
90	THEO	236	Avalon	Sanders	46978272	2
91	THEO	322	Brean	Bullock	49980093	2
92	TRES	582	Celicia	Carr	47840304	2
93	CEWD	229	Kirsten	Simon	42444526	2
94	COMS	694	Glen	Snyder	48082836	2
95	ELEC	6391	Chalea	Kearney	45333591	2
96	ETEC	593K	Alacia	Dudley	46255616	2
97	HIST	225	Traniece	Donovan	48612768	2
98	INDI	801	Billyjoe	Barnes	44377786	2
99	INDI	829	Nadja	Potter	42076872	2
100	MECH	6251	Curran	Burgess	40159965	2
101	MUSI	472	Titania	Weaver	44790118	2
102	PSYC	850C	Pessy	Heller	46608061	2
103	RELI	601B	Tanara	Berman	41081117	2
104	ACCO	653T	Tyanne	Miller	41754691	2
105	ADED	489	Myishia	Singer	48519905	2
106	ARTH	803	Sharisse	Chase	49819684	2
107	CHST	625	Davy	Snow	48167830	2
108	EXCI	493	Carlus	Faulkner	45782429	2
109	FMST	332	Raniesha	Wilkinson	47083256	2
110	FMST	610	Analissa	Kim	46070927	2
111	INTE	298	Hadley	Klein	45522578	2
112	LIBS	498	Berta	Capps	44951559	2
113	POLI	499	Lawerence	Fisher	43036372	2
114	PSYC	228	Sherley	Shepherd	41407134	2
115	SCPA	298	Pa	Carlson	41075698	2
116	TDEV	398	Leandrea	Howe	41397747	2
117	HISW	205	Cedar	McBride	49538341	2
118	HISW	251	Gus	Rosen	42871831	2
119	INDI	639B	Darril	Barnett	48541329	2

```
120  FBRS          386        Rami        Hull           44448879             2
121  ELEC          367        Jaamal      McNamara       42004164             2
122  PERC          209        Chalon      Monroe         43045045             2
123  PERC          498        Nichlos     Forrest        46504129             2
124  FTRA          638        Kima        Sanchez        46226538             2
125  COMP          6331       Lyle        McAllister     49376844             2
126  GPTK          714        Travers     Lawrence       41871544             2
127  COMS          484        Brean       Bullock        49980093             2
128  GEOG          264        Ellena      Stanton        43729289             2
129  GPLL          38         Trenae      Bryan          44166698             2
130  SSOQ          609        Hobie       Johnson        47747097             2
131  BIOL          476        Sheren      Mitchell       43177841             2
132  COMP          432        Latavia     Harrell        43119582             2
133  INDU          6521       Kirsten     Simon          42444526             2
134  MIAE          221        Shonika     Duncan         42720631             2
135  CEPS          1105EO     Kellis      Davies         44331863             2
136  ACCO          220        Artisha     Anderson       47842519             1
137  ACCO          220        Jemaine     Roach          49453432             1
138  ACCO          220        Jodi        Scott          47495787             1
139  ACCO          220        Karlyn      Merrill        41588547             1
140  ACCO          220        Karra       Boyer          49004841             1
141  ACCO          230        Claudy      Rosenthal      41918453             1
142  ACCO          230        Lily        Welsh          44331134             1
143  ACCO          230        Pierce      Moran          41623212             1
144  ACCO          230        Roxana      Hawkins        41221982             1
145  ACCO          240        Bernadette  Bradley        45836201             1
146  ACCO          240        Gabriel     Browning       48317725             1
147  ACCO          240        Keidra      Lawson         48350817             1
148  ACCO          240        Lyndsi      Braun          40771970             1
149  ACCO          240        Shanette    McDaniel       42090163             1
```

Topic 1.9

```
Your input ->  Which students have failed SOCI 336 at Concordia University
Here's all students that have failed SOCI 336 at Concordia University:
     firstName    lastName      studentId  subjectArea      catalog  grade
--  -----------  ----------  -----------  -------------  ---------  -------
 0  Mariela      Morrow         43952942  SOCI                336  F
```

Topic 1.10

```
Your input ->  What is COMP 474, that is offered by Concordia University, about?
No problem, the description for COMP 474 at Concordia University says:
Rule-based expert systems, blackboard architecture, and agent-based. Knowledge acquisition and representation. Uncertainty and conflic
ours per week. Laboratory: two hours per week.
Prerequisite: COMP 352 or COEN 352.
```

Topic 2.1

see topic 1.1 - 1.10

Topic 2.2

see topic 1.1

Topic 2.3

```
Your input ->  Which topics are covered in worksheet 5 of COMP 6721?
These are the topics covered in worksheet 5 of COMP 6721:
     topicLabel    resourceURI
--  ------------  ------------------------------------------------------------------------------------
 0  XOR           C:/Users/Admin/PycharmProjects/unibot/Data/Lectures/COMP6721/Worksheets/worksheet05.pdf
 1  neuron        C:/Users/Admin/PycharmProjects/unibot/Data/Lectures/COMP6721/Worksheets/worksheet05.pdf
 2  Perceptron    C:/Users/Admin/PycharmProjects/unibot/Data/Lectures/COMP6721/Worksheets/worksheet05.pdf
 3  Delta         C:/Users/Admin/PycharmProjects/unibot/Data/Lectures/COMP6721/Worksheets/worksheet05.pdf
 4  Alison        C:/Users/Admin/PycharmProjects/unibot/Data/Lectures/COMP6721/Worksheets/worksheet05.pdf
```

Topic 2.4

see topic 1.3