

Co-Curricular Technology Pathways E-Advisor

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Introduction

Problem

- ❖ Students at Duke University have an overwhelming amount of co-curricular opportunities, so it can be difficult for students to determine which activities or resources align best with their interests



Solution

- ❖ Work with Duke O.I.T. to develop an “e-advisor” that recommends students a list of co-curricular programs based on their previous involvement

Data Collection

Ideal Data

- ❖ Descriptions and characteristics of each co-curricular
- ❖ Students’ co-curricular “pathways”
 - A record of programs, clubs, and resources that students utilize in throughout their Duke career

Tag Words

- ❖ Created 55 tag words by reading the description of technology-related co-curriculars
- ❖ Web-scraped Duke Groups using these tag words to find relevant co-curricular activities
 - Used this data to determine which programs were associated with certain tags

Student Data

- ❖ Unable to obtain data directly from organizations, so instead collected data from willing Data+ participants
- ❖ Intend to collect more student participation data using our R Shiny website (see slide 3)

Our Recommendation Algorithm

- ❖ **Objective** → to provide *useful* and *personalized* recommendations to Duke undergraduate students
 - Useful recommendations would be co-curriculars that are similar to ones the user has already participated in
 - Personalized recommendations would be co-curriculars that students similar to the user have participated in
 - Combined content-based (75%) and collaborative (25%) filtering to create a hybrid recommendation algorithm
 - As more students contribute to our data set, we intend to weigh collaborative filtering more heavily

Content-Based Filtering

- ❖ Uses tag words to find programs similar to the user's co-curriculars

	Tag #1	Tag #2	Tag #3	Tag #4
Program #1	1	0	0	1
Program #2	1	1	1	0
Program #3	1	0	0	0
Program #4	0	0	1	1
Program #5	0	1	0	1

- ❖ Performs TF-IDF calculations on binary matrix of tag words and programs
 - Gives less weight to programs that have many tag words
 - Gives less weight to tag words that are applied more frequently to many different programs
- ❖ Ranks the activities from most recommended to least recommended, excluding activities in which the user has already participated

Collaborative Filtering

- ❖ Uses student data to compare the user's co-curriculars to other students' participation

	Student #1	Student #2	Student #3	Student #4
Program #1	0	1	1	0
Program #2	1	1	0	0
Program #3	0	1	0	0
Program #4	0	0	1	0
Program #5	1	1	1	1

- ❖ Calculates programs' cosine similarities based on student data to compare them

$$\text{similarity} = \cos(\theta) = \frac{A \cdot B}{\|A\| \|B\|} = \frac{\sum_{i=1}^n A_i B_i}{\sqrt{\sum_{i=1}^n A_i^2} \sqrt{\sum_{i=1}^n B_i^2}}$$

- ❖ Uses similarity scores and student participation history to determine an overall score for each student and program combination
- ❖ Ranks activities by their overall score, excluding activities in which the student has already participated

R Shiny Web Application

Create User Profile

Please select the programs that you have participated in during each year you have been at Duke.

- Summer programs are counted under the academic year you finished directly prior to the program.
- If you have not completed a specific year yet, please select "NA".

Please select up to 3 majors. If you are unsure, simply select "Undeclared".

***Major(s)**

Statistical Science
Computer Science

Please type the year in which you will graduate from Duke.

***Graduation Year**

2019

***Programs - Year 1**

Data+ The Foundry

***Programs - Year 2**

DataFest DoMath

***Programs - Year 3**

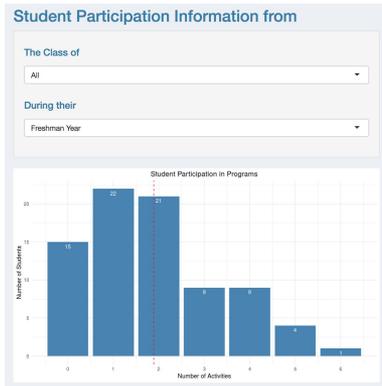
Duke Engage

***Programs - Year 4+**

NA

Submit

**Requires Duke Login and Co-Lab OAuth*
User Profile: Stores the user information associated with the Duke account



Statistics: Displays the average number of co-curriculars for each grade and class year

Co-Curricular Recommender

If you have already completed your user profile, you are able to see your recommendations below by simply clicking on the button.

If you have participated in only one or two co-curricular activities here at Duke, we would recommend that you initially try the "Find Similar Co-Curriculars" tab.

Recommend

Show 10 entries

CoCurriculars	Description
Bass Connections	Bass Connections is a university-wide initiative launched by a \$50 million gift from Anne and Robert Bass. Bass Connections provides both graduate and undergraduate students with greater exposure to inquiry across the disciplines, leadership with culturally diverse students, sustained mentorship in teams and the chance to experience the intersections of the academy and the broader world.
Duke Smart Home	The Duke Smart Home Program is a research-based approach to smart living sponsored by the Pratt School of Engineering. Primarily focused on undergraduates, the program encourages students from different academic disciplines to form teams and explore smart ways to live in the home.
Happy Kids, Healthy Kids	The mission of Happy Kids, Healthy Kids is to be an active part of the solution to the childhood obesity epidemic while also improving the health of today's youth. We will equip local children and parents with the tools to achieve a healthy, more active lifestyle.
Females Excelling More in Math, Engineering, and Science (FEMMES)	By incorporating engaging, hands-on activities into all of our programs, we allow the girls to learn in a fun, supportive environment and explore their potential in the STEM fields. We hope to build our participants' confidence in their academic skills and to empower them to pursue their dreams.
Duke Net Impact Undergrad	Net Impact's mission is to make a positive impact on society by growing and strengthening a community of new leaders who use business to improve the world. Net Impact offers a portfolio of programs and initiatives to educate, equip, and inspire members to make a tangible difference through business.
Catalyst	Catalyst is a social and pre-professional community of tech enthusiasts. We strive to connect our members to peers with similar interests and provide members with mentorship in the field of technology. As a diverse, tight-knit group on campus, we can rely on each other for not only career and academic advice, but also for social and emotional support.
Duke Electric Vehicles	Our home is at Duke University, where our mission is to enable more sustainable transport by inventing future electric vehicle technologies. We want to engage and inspire forward-thinking students on opportunities in electric mobility through creative engineering.

Recommend: Retrieves the user information and gives recommendations

Most Popular Activities by

Class

All

Major

Computer Science

Activity	Frequency
Data+	53
Bass Connections	27
DataFest	13
HackDuke	11
Duke Engage	10
Duke Machine Learning	10
Duke Splash	10
Duke Undergraduate Research Society	7
Females Excelling More in Math, Engineering, and Science (FEMMES)	7
Institute of Electrical and Electronics Engineers - Duke Student Branch (IEEE)	7

Activity	Frequency
HackDuke	11
Duke Machine Learning	9
DataFest	7
Duke Splash	7
Institute of Electrical and Electronics Engineers - Duke Student Branch (IEEE)	6
Blueprint	5
Females Excelling More in Math, Engineering, and Science (FEMMES)	5
Duke Business Oriented Women	4

Showing 1 to 10 of 64 entries

Showing 1 to 10 of 44 entries

Statistics: Lists the most popular co-curriculars by major and class year

Try the app with your Duke account [here!](#)

Future Work

- ❖ Improve our recommendation algorithm
 - Ask organizations to self-select tags
 - Collect data from students through the website
- ❖ Incorporate student "pathways" in the system
- ❖ Implement a rating system for recommendations
- ❖ Add more co-curriculars, including non-tech activities, to our database



Contact Us

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