

EvergreenLP: Using a Social Network as a Learning Platform

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Abstract— We are living more of our lives situated within online networks and communities where digital artifacts can be collected and processed to showcase individual and group behavior representations. Growing data bandwidth coupled with amplified computational resources are aligning to allow for analysis of human behaviors at unprecedented scales. The proper data generation, collection, storage and analysis techniques are mostly untaught in the undergraduate experience. Pedagogical research shows that project based learning encourages and supports design thinking and collaborative work; skills that are important to practitioners in data science centric industries. To address these academic needs, we develop the Evergreen Learning Platform (EvergreenLP). EvergreenLP is an interdisciplinary project based learning framework that leverages pedagogy rooted in Critical Media Literacy. Students take advantage of design-learning principles on the front-end and computational discipline standards on the back end. Students are engaged in the design, development and use of this platform while simultaneously contributing data content on the chosen social media platform. Our data analysis and visualization environment allows the student coders and non-coders to explore data science principles in context of a current event or topic trending on twitter. In this paper, we experimentally assess and present the benefits of introducing culturally relevant data techniques to African-American female students in an interdisciplinary seminar on #BlackGirlMagic (#BGM).

Keywords-project-based learning; critical media literacy; social media;

I. INTRODUCTION

Since the world has become more technologically advanced, social media has rapidly increased communication amongst people. Online communities contain a vast and robust amount of data accessible for analysis to better understand the broader population. Today, social media serves as a vital platform for connecting and creating opportunities for individuals to freely express and disseminate their views and opinions. Data and information regarding one's thoughts, habits, sentiments, movements and behaviors is constantly being generated and collected. Specifically, the acquisition and analysis of big data from social media is changing how we can learn and predict social science phenomenon. These data are being utilized by companies to make better decisions, smarter systems, and superior products for consumer markets. Twitter, in particular, has been a valuable resource for corporate, municipal and social agents to gain broader understandings of trends and outlooks about them. The idea of free

expression on social media is extremely pivotal particularly for African-Americans whose voices are often silenced.

Black Twitter, one of twitter's sub-communities, consists of content that focus on current issues and topics that are directly related and affect the black community. Black Twitter has emerged as a technology mediated communication environment and has served as a vital tool to promote social change within the African-American community. By analyzing trending topics, issues, and movements using the Twitter APIs, conclusions can be made on how to influence future tweets and hashtags on Black Twitter. These projections could lead to the improvement of the Black community as a whole. The implementation of twitter's back feed, using the hashtag (#), has allowed communities to collect, access and curate topics of importance and concern. These Black culturally relevant hashtags, commonly called *blacktags*, are digital objects, valuable artifacts of Black culture which lead to the circulation of race within social media [1], [2].

For instance, the #BlackLivesMatter movement, that some refer to as the modern-day civil rights movement, was born from this community. It has brought together people of like-minds on particular issues within the Black community in a new and valuable way. This social media situated sub-culture has the potential to be a driving force behind administering important cultural and sociopolitical initiatives. Moreover, these initiatives could possibly emerge to create an even larger impact on a national and global scale.

The use of Black Twitter data by student populations in African-American communities can help foster a broader understanding of data science, big data and data analytics in a way that is culturally relevant to themselves and their community. In prior work [3], the incorporation of data science elements were piloted as a course-based project and through a year-long research-based experience with computer science majors. Preliminary observations emphasized the value of classroom instruction with real-world application and thus has motivated this work.

The primary objective of this work is to develop a student centered system to mediate student interaction and analysis of social media data/content for coursework and research projects in both computing and non-computing university courses. Accessing web based API resources require deep understandings of computer science and networking principles in order to gather and understand readily accessible data streams [4],[5]. To mitigate the awareness gap and allow students quicker access to data science techniques, we co-create this platform with current

computer science majors in order to facilitate broader understanding of the software design and development process, while concurrently making these frameworks invisible to students who are not as technologically adept.

II. DATA SCIENCE AND DIGITAL ACTIVISM IN HIGHER EDUCATION

According to a 2014 Pew Research Center study on African Americans and Technology Use, the digital divide is narrowing across specific technology platforms [7]. In some cases, technology usage and adoption among college-educated youth is well above the national average. Twitter specifically has become extremely popular among African American youth ages 18-29 and Black users are higher than their White counterparts [8]. The cultural landscape of computer science in higher education is growing on pace with technology infusion on every level of our society. African- American youth are taking greater interest in computing disciplines and many institutions do not leverage previous computing experiences, new interaction and learning techniques that may appeal to this current generation of learners. To address this concern, the use of culturally significant topics and pedagogy that transforms students from technological consumers to producers. As learning is increasingly mediated by technology usage, it is important to note that efficacy can be increased by facilitating the social processes of learning [6], [9], [10]. The use of twitter and twitter back feeds have been implemented in both traditional and online course environments with positive effects [11]. For the most part, the use of twitter in academic settings has focused on increased engagement within the course. We pose that use of

twitter data within the undergraduate experience has not been as actively implemented specifically due to data accessibility and use limitations. It is with this challenge in mind that the EvergreenLP allows not only for the use of twitter as an engagement platform, but also for the extraction of data that can be utilized to enhance understanding of course objectives.

III. THEORETICAL FRAMEWORK

This application and implementation is based on pedagogical theories drawn from critical medial literacy as situated in a project based learning platform.

A. Critical Media Literacy as a pedagogical approach

Media permeates every area of our lives and our immersion eliminates our ability to be unaffected [12]. Most educators cannot impact students engagement in media consumption outside and often within school boundaries, so it is important for educators to consider utilizing these preferred communication channels in classroom spaces [13]. Considering that students are already bringing this media centric technologies into the learning environment, its value should not be discounted.

The value of critical media literacy pedagogy lies in its ability to foster skills that support research and analysis of social conditions of student's everyday lives, while it encourages critical thinking and production of multimodal literacies [14]. The five core components of critical media literacy instruction according to the Center for Media Literacy, as implemented through this work, are shown in Table I:

TABLE I: The Core Components and Concepts of Media Literacy

<i>Key Words</i>	<i>Concepts</i>	<i>Deconstruction using #BlackGirlMagic</i>
Authorship	All media messages are constructions	Who created this content?
Format	Media messages are constructed using creative language with its own rules	On what platform is this content being presented? How does this relate to a specific community?
Audience	Different people experience the same media message differently.	Is this content specific to a sub-community?
Content	Media have embedded values and points of view.	Is this content in support of black girl magic?
Purpose	Most media messages are organized to gain profit and/or power.	How effectively does this content promote positive narratives about black women?

Coupling the value and scope of media context in our society with the creation of large amounts of data generated through interactions in social media technologies, educators can leverage influences of social and political themes that empower and inspire engagement with data and technology in ways never done before. By implementing these themes among the women scholars at Spelman College and centering Black girls' lived experiences through critical media literacy enables Black girls to counter the stereotypes

that haunt society's collective consciousness about Black women and girls with genuine stories of Black girlhood [13].

B. Project Based Learning

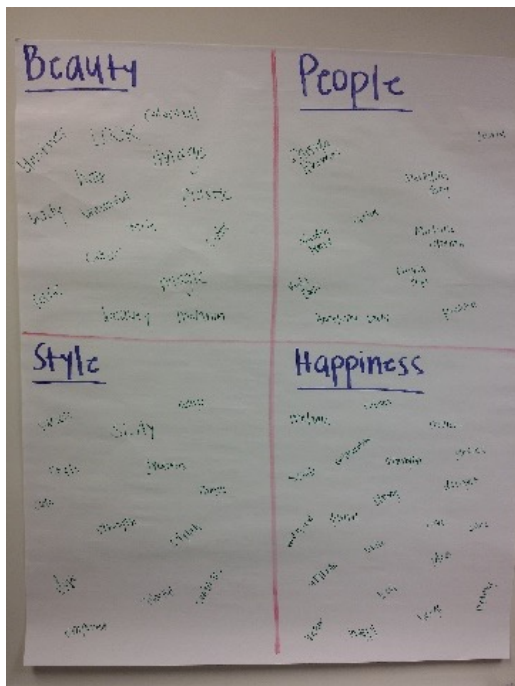
Project based learning (PjBL) has become a widely used method of teaching in various STEM disciplines [15]. As a variant of self-organized learning, PjBL affords students the flexibility of student contribution that allows for utilization of their own unique abilities and tasks. The Evergreen

Learning platform provides an application-based tool to supplement interdisciplinary student projects to include social media data. The final assessment for the learning objectives of this work is the production of data driven media content topically related to social constructs around black girlhood. Students will leverage the Evergreen LP, along with traditional research practices, to include current and generated data content for their projects.

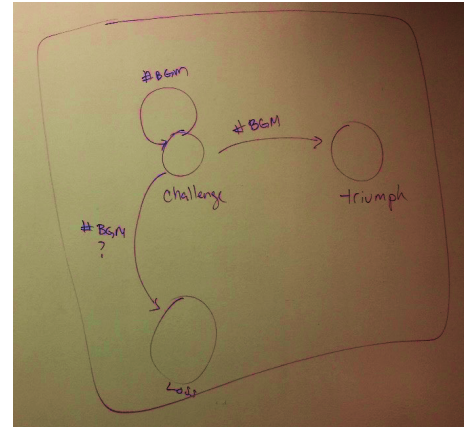
C. Constructivism in Computing Education

Presenting our platform in a multidisciplinary course lends to a natural marriage of constructivism in computing concepts. Many educators may find challenges implementing constructivism within their computing based courses due to the rigidity of course content requirements. By introducing scientific and data centric principles as scaffolded in a thought-based course, students can take the time to establish mental constructions through explorations of data, themes and classifications through culturally and personally motivated contexts [16]. Constructivism based pedagogies state that student's conceptual understandings occur through immersion in real-world situations while interacting with people and things [17], [18]. In curation of social media content of choice, students are encouraged to build meaningful theories about how media creates understanding and change in our society.

Early semester data analysis of student-generated essays are shown in Figure 1 and Figure 2. Students were prompted to create deeper understandings of themes based on text frequencies from previous written work.



1. Figure 1: Classifications of Student Essays on Black Girl Magic



2. Figure 2: The influences of Black Girl Magic as a State Diagram

THE EVERGREEN LEARNING PLATFORM

There has become an increasing interest in providing opportunities for students to leverage and engage the data in meaningful ways that can foster understanding and broaden their technical skills while gaining exposure to data science. We present our Evergreen Learning Platform (EvergreenLP) framework to help address the data science educational gap. We are designing EvergreenLP as a content management system using a rapid prototyping paradigm. The components needed to construct a production-level content management system covers a wealth of software engineering design concepts and implementation approaches. Through rapid prototyping, the framework's development concepts can be learned when needed and directly applied. Hence, computer science students design and implement the back-end components first that then motivate the front-end components. These front-end components allow students who do not have technical proficiency to leverage learning outcomes in computational social science for multidisciplinary project implementations. Situated in critical media literacy theory, EvergreenLP allows students access to Twitter data through an application-based interface (Figure 3).

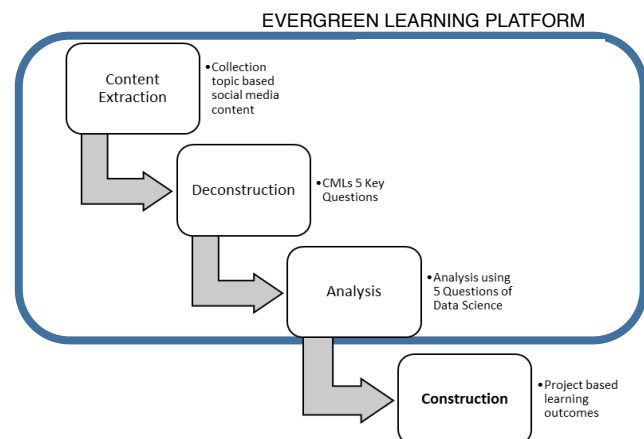


Figure 3: The Evergreen Learning Platform situated in Critical Media Literacy

1) Content Extraction

Within a classroom environment, students can query and gather topical content available on twitter. Hashtags and keywords are used to explore twitter repositories and filter the raw social media data as shown in Figure 4. Once data files are fetched by the application, twitter data can be curated using analysis and visualizations provided within the framework, or utilizing raw data files in a separate analysis environment. Students can choose which parameters to be stored locally during file download.

TAGS

#blackgirlmagic x #spelman x #1881 x Add a tag

PARAMETERS

- ☒ id
- ☒ text
- ☒ language
- ☒ username
- ☒ no_followers
- ☒ no_friends

Figure 4: The Evergreen Learning Platform Example of Query

2) Deconstruction

Student can see examples of twitter data and metadata during the file extraction. Understanding the complexity of the data can help students formulate more multifaceted questions to be addressed via data analysis.

The Black Twitter Project

Stream Results

STATUS

COMPLETE

TABS

Data

Word Cloud

Language Count

Keyword Count

Map

All Data

REQUEST URL

https://stream.twitter.com/1.1/statuses/filter.json?track=%23blackgirlmagic%20t magic%20%23spelman

REQUEST PARAMETER

Duration 600, Track by ["#blackgirlmagic","black-girl-magic","#spelman"], Location

CAPTURED DATA (7)

* Object

created_at "Thu Apr 14 04:40:26 +0000 2017"

entities: Object

hashtags: Array (4)

urls: Array (1)

favorite_count: 0

favorited: false

filter_level: low

id: 85274323647213400

id_str: "85274323647213400"

in_reply_to_status_id: null

in_reply_to_status_id_str: null

possibly_sensitive: false

lang: "en"

retweet_count: 0

retweeted: false

source: "Facebook"

text: "♥♥♥♥♥ #blackgirlmagic"

Figure 5. The Evergreen Learning Platform results

3) Analysis

Basic analysis and visualization tools available on EvergreenLP allow students to derive deeper insights into the nature of the twitter data extracted. Students are able to see word clouds, text and language frequencies, location visualizations and language data.

4) Construction

Student developed projects utilizing the EvergreenLP framework are presented in the next section.

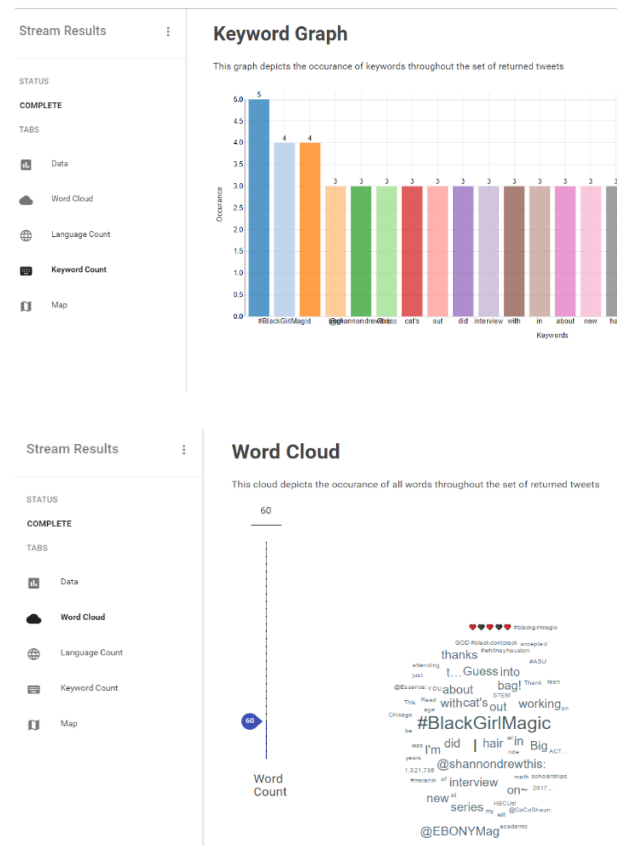


Figure 6: The Evergreen Learning Platform Data Visualizations

IV. PUTTING DATA DRIVEN PRINCIPLES INTO PRACTICE

Spelman College is an all-women's, historically black college that is a global trailblazer of higher education for women of African descent from around the world. As a liberal arts college, Spelman is dedicated to the wholistic empowerment of their students while promoting a commitment to positive social change. One initiative the college employs toward this end is through the Interdisciplinary Big Questions Colloquia (IBQC). One major goal of this class is to promote the developing of "free-thinking Black women". Specifically, the IBQC supports the following learning objectives:

- To be free from dogma, orthodoxy, group think, clichés and stereotypes;
- To enter into a clash of ideas about race and gender;
- To violate assumptions;
- To support an invitation to think.

The IBQC are topical seminars designed by faculty to introduce new students to interdisciplinary and the liberal arts intellectual experience. During the Spring 2017 semester, an IBQC titled "#BlackGirlMagic: Social and Technological Influences in Promoting Positive Digital

Narratives on African-American Womanhood”. The course exposes students to data science principles, content and themes of influence that exists in black twitter and social media through concepts such as twitter backfeed and data analysis on topics related to black girlhood and the popular hashtag #BlackGirlMagic. By exploring themes centered in positive black girlhood and womanhood, students can find value in cognitive social science research perspectives that may lend to future careers in fields of data science and analytics.

A. Participants

As shown in Figure 8, seventeen (17) first-year students enrolled in the course and participated in data understanding activities. The diversity of majors represented provides a good cross section of data-dependent disciplines. We began the seminar series by assessing each student’s comfort level working with data was assessed at the start of the course (Figure 7). Their responses indicate some familiarity with handling data, but not advanced data techniques.

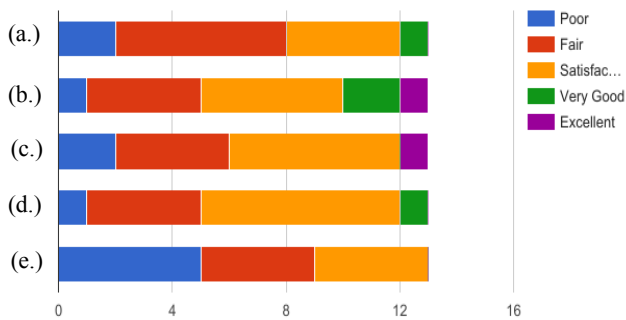


Figure 7: Distribution of Comfort Levels with Data Science Principles (a) Level of skill/knowledge at the start of the course, (b) Comfort level with finding data sources of interest, (c) Comfort level with understanding the meaningfulness of data, (d) Comfort level analyzing data, (e) Comfort with creating appropriate data visualizations.

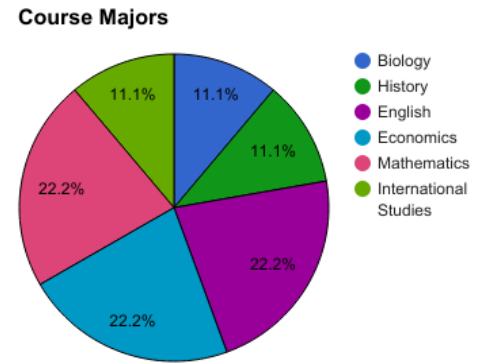


Figure 8: First Year Student Majors

B. Big Data Engagement for Students

Incorporating data science education is an emerging trend in higher education. Due to the uniquely transdisciplinary nature of the field, it is important to create educational aspirations that expose students to meaningful experiences with data early in their academic career regardless of their field of study. Data Science as a discipline first appeared in 2001 with the following curricular guidelines: Multidisciplinary Investigations, Models and Methods for Data, Computing with Data, Pedagogy, and Tool Evaluation. Data Science methods were presented in the course by highlighting the 5 principle questions that Data Science can answer. Students were prompted to think about data collected in the course, including text, videos, images, communications, stories, movies, notable persons, and develop questions that data science can answer regarding themes of black girl magic (Table II).

TABLE II: Data Scientist Worksheet and Sample Responses

	<i>Sample Questions</i>	<i>Student Sample Questions</i>
a. Classification	Is it A or B?	Is it in support of #BGM or against? Is it beneficial or harmful (sentiment analysis)?
b. Anomaly Detection	Is it weird?	Is it trending? Is it exclusive?
c. Regression	How much/many?	Number of articles in support of #BGM? How many Instagram pictures refer to famous actresses? How many people are using the hashtag?
d. Clustering	How is it organized?	Who are the key influencers? What are the popular topics? What are the required books/authors?
e. Reinforcement Learning	What to do next?	Should it be endorsed?

Black Women & Education

Women enrolled into college.

According to the 2011 U.S. Census Bureau, by both race and gender there is a higher percentage of black women enrolled in college than any other group including Asian women, white women.

Race/Ethnicity	Percentage
Asian	9.2%
Black	8.8%
White	6.8%
Hispanic	6.5%

Degrees Earned by Black Women in comparison to black student population

In 2010, black women earned 66 percent of all associate degrees awarded to black students, as well as 66 percent of bachelor's degrees, 71 percent of master's degrees and 65 percent of all doctorates awarded to black students

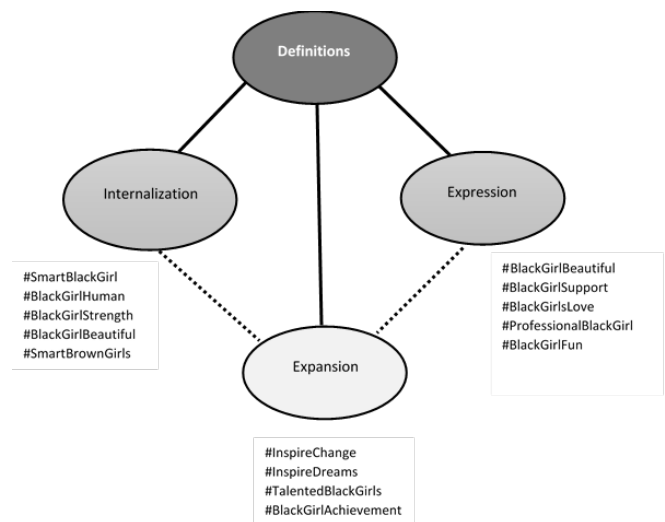
Degree Type	Percentage
Associate	66%
Bachelor's	66%
Master's	71%
Doctorates	65%

1980 1990 2000

V. DISCUSSION

A. Data Extraction of Student Essays and Social Media Content

By analyzing highly connected terms: ‘greatness’, ‘movement’ and ‘define’, three classifications of #BlackGirlMagic were established. After content mining thematic artifacts from several social media sites, students determined that the trend of #BlackGirlMagic was relates to Black women and girls define themselves through their internalizations, expressions and expansions (achievements). All of the terms relate to how Black women are defined in our society, but it is further noted that internalization and expression that can lead to expansion. All the terms can be uniquely identified by sub-campaigns (created as related hashtags) or be co-related in their causation or correlations as indicated in Figure 11.



Considering the resulting classifications students created projects based to address each area:

- Definitions — “Traditional Archetypes of Black Women through the lens of #BGM”
- Internalization — “#BGM – A love letter to Black girls”
- Expression — “The Ancient and Modern Technologies of #BGM”
- Expansion — “Spelman College the Birthplace of #BGM”

B. Student Perceptions and Next Steps

Students were assigned to give feedback of their understandings and assessments of their twitter fetches. Representative feedback centered on the following areas:

- Understanding of results
 - “My data visualizations showed me that a majority of the tweets were in Japanese (401 in Japanese and 163 in English). I thought this was weird because all of the [search terms] were in English...I am lead to believe that these terms are used widely in Japan and that it is possible that their culture thinks positively about African Americans and African American women”
- Quantity and quality of results
 - “With the search criteria and the search results in mind, I feel another factor must be added to the data to get more specific results from a search. I feel that including a time frame or rage of dates to search within would allow more tweets pertaining to a particular event or topic.”
 - “While using this database, I learned how much data is being collected every second of the day and how massive the data from twitter is.”

3. Using the feedback generated by the students we will be able to further develop the EvergreenLP framework to better meet the need of students. Student researchers will be charged with interface and visualization developments that will allow for more functionality of students in the type and quality of results to meet student requirements and preferences.

VI. CONCLUSION

Data, being at the center of many disciplines, has become a core knowledge base to incorporate into the undergraduate experience. The data collection, storage, retrieval and analysis techniques, tools and approaches are depended on an established discipline. While the emergence of data science is championed as the solution, the instructional materials for understanding data are in its infancy. In this work, we present a student-coded learning platform, EvergreenLP, which intends to provide computer science students a software engineering environment with data science applications. Students are learning experientially while building an application that can be used by non-computing students as a comprehensive platform to learn data management. Future work entails the application requirement review, finalizing the software design considerations (third-party software integration, testing and debugging) and the design and implementation of the application's user interface.

ACKNOWLEDGMENT

We would like to acknowledge that this work has been supported by the Clare Boothe Luce Undergraduate Research Program, Historically Black Colleges and Universities - Undergraduate Program Implementation Project: Course-based Undergraduate Research Experiences (CURE) Program, NSF Award No.1436759 and Historically Black Colleges and Universities - Undergraduate Program Targeted Infusion Project: Data Science eXtension (DSX) Program, NSF Award No.1623362.

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