DHS COASTAL RESILIENCE CENTER
EDUCATION PROJECT
YEAR 4 PROGRESS REPORT
July 1, 2018 – June 30, 2019

Project Title:
Preparing Tomorrow's Minority Task Force in Coastal Resilience through Interdisciplinary Education, Research, and Curriculum Development.

Principal Investigator Name/Institution:
PI, Dr. Ahmed Faik, Chair and Assistant Professor of the Department of Computer Science and Engineering Johnson C. Smith University

Other Partners/Institutions:
UNC-Chapel Hill, UNC-Charlotte, and Jackson State University (major partners)

Short Project Description

We focus on the integrative, interdisciplinary nature of real-world problems and strive to bridge traditional academic programs to develop solutions to coastal resilience and its related problems facing our nation. This project sustains an undergraduate education framework to prepare tomorrow's minority task force in coastal resilience (approximately 80% of JCSU students are minorities) by presenting tailored courses in coastal resilience, applied research experience, knowledge transfer activities, scientific seminars, and summer camps. The project is housed in the Department of Computer Science and Engineering of STEM College at JCSU, but collaborates across departments and programs. Project-supported courses are designed to introduce engineering, data analytics, natural science and social science topics to better understand coastal resilience. These courses are classified as "Integrated Studies, Global Studies, and Emergent Fields" general education electives, which students from all majors can take to fulfill the general education requirements. The summer camp, seminar and undergraduate research projects are also powerful tools for engaging all students and all disciplines in addressing coastal resilience issues.

1. Introduction and project overview:

Given the national need to prepare future coastal resilience professionals with educational and research experience, this proposed program supports a critical mission. Most existing coastal resilience related curriculum currently either targets graduate programs or vocational education. We developed an undergraduate education framework that meets the needs and standards for excellence in undergraduate education.

The project was designed around the following aims:

1) **Goal 1**: Develop a curriculum to prepare undergraduate students for careers in coastal resilience;
2) **Goal 2**: Create partnerships to conduct applied research in the area of coastal resilience;

3) **Goal 3**: Create ongoing opportunities for the transfer of skills, knowledge, people and ideas between JCSU and the community at large.

To help reach the above-mentioned goals, we defined the following processes:
1) **Process 1**: Develop four new courses to educate students with demonstrated interests and aptitudes in coastal resilience study;
2) **Process 2**: Design and deploy interdisciplinary coastal resilience seminar series;
3) **Process 3**: Establish and develop Faculty/Student research collaborations in coastal resilience;
4) **Process 4**: Design and offer a 1-week summer research camp to expose and increase the awareness of undergraduate students in coastal resilience study.
5) **Process 5**: Design and offer a 4-week summer research project to expose and increase the awareness of undergraduate students in coastal resilience study.

2. <u>End users:</u>

In the Spring of 2019 four faculty members conducted four separate DHS CRC related research projects.

Spring 2019 – Project 1

Student researchers: 4

Project title: "Data preparation for big data analysis and literature review on Infectious Disease Outbreaks following Natural Disasters."

Project description: This project is a follow-up of a research that was initiated last year that aimed to discover infectious disease outbreaks following natural disasters in the US 2014-2018. Data was analyzed and visualized in Tableau using data from the National Oceanic and Atmospheric Administration and the Center for Disease Control and Prevention. The data suggests that sexually transmitted, person to person, tick borne, waterborne and food borne infections increased in number of reported cases following a storm event. A main challenge in this project was manage a big data set, including identifying, retrieve and selecting data from big data sets and maintain responsive programs. The Spring project addresses creation of a workflow to program the download and prepare the data for analysis. Alteryx was used to download data from the Socrata API, exclude irrelevant data and prepare data for analysis. As our initial analysis was limited to data 2014-2018, only few clusters of outbreaks and natural disaster correlations were identified. In the current project we aimed at preparing data from 1998-2019 to be able to generate hypothesis about outbreaks and natural disasters. To verify that our method identified known events of natural disasters causing disease outbreaks we completed a comprehensive literature review to identify scientific papers describing natural disasters and diseases outbreaks correlations.

The DHS grant has provided the opportunity for four JCSU undergraduate students to participate in an internationally competitive research project that can have implications on disaster response policy. They have learnt essential skills to complete their SIP and for future research endeavors, including literature searches, reading scientific literature, data preparation and data visualization. The data visualizations and analysis have identified disease outbreaks which needs to be further investigated so their response can be incorporated in natural disaster emergency response plans. The data preparation workflow for big data sets created in this project can be used as a basis for

courses and projects in biology and computer science, which will improve quality and currency of education and research at the university. I will incorporate it in a the senior paper courses that I teach. I plan to apply for funding both to improve the research course offerings as well as the research environment at the university as well as to work on data analysis of the collected data.

Spring 2019 – Project 2

Student researchers: 3

Project title: "Environmental monitoring using wireless sensors network

Project description: 2018 was the most destructive year for wildfires in recent history and research indicates it will only continue to get worse. In California alone it was estimated that it would take 3 billion for cleanup – 1.3 billion more than in 2017. In late 2018, over 19,000 houses and business were lost to the massive fires that plagued both southern and northern California. Not only are wildfires dangerous to an individual, but they can be also costly – as wildfires become more prevalent insurers are will either increase prices or be less likely to payout in an event of a wildfire. The continued increase in global temperatures will lead to wildfires last longer, burn more acres and have more extreme fire behavior. The purpose of this research is to introduce a proactive monitoring solution that will mitigate the impact of wildfires by providing predictive models that determine areas of high risk. The data collected in this project will consist of moisture, humidity, and temperature with which areas of high risk will be determined. The use of real time data and predictive models will allow time to plant preventative measures, faster response time and real time monitoring. Environmental monitoring is required to protect the public and the environment from toxic contaminants and pathogens that can be released into a variety of media including air, soil, and water. Air pollutants include sulfur dioxide, carbon monoxide, nitrogen dioxide, and volatile organic compounds, which originate from sources such as vehicle emissions, power plants, refineries, and industrial and laboratory processes. Soil and water contaminants can be classified as microbiological (e.g., coliform), radioactive (e.g., tritium), inorganic (e.g., arsenic), synthetic organic (e.g., pesticides), and volatile organic compounds (e.g., benzene). Pesticide and herbicides are applied directly to plants and soils, and incidental releases of other contaminants can originate from spills, leaking pipes, underground storage tanks, waste dumps, and waste repositories. Some of these contaminants can persist for many years and migrate through large regions of soil until they reach water resources, where they may present an ecological or human-health threat. 2. ARCHITECTURE There is one small computing device called the raspberry pie 3 generation device which is a small version of a computer central processing unit. This unit has in-built sensors which can be programmed in python 3.7.2 version to work wirelessly to communicate and transport wireless messages and data across the communication channel. There are three in-built sensors - moisture measuring sensors, temperature measuring sensors and humidity sensors. The console in sublime has been programmed in such a way that it can display the current measurements values for the soil of a specific location which is extremely important because these data are very much spatial-correlated. We used one laptop where this programming interface is working continuously 24*7 for few days irrespective of the weather. Due to severe changes in regular climate at the location where this experiment has been executed. Changes in weather has left significant changes in the data receiving by these sensors and these kinds of changing data are very much helpful to build a prediction-based model which we plan to build as a continuation of this research study

Spring 2019 – Project 3

Student researchers: 3

Project title: "Data-driven Resilience and Community Disaster Mitigation."

Project description: I held weekly research meetings with the student researchers to carry out the project implementation. First, I directed them to relevant literature about community disaster mitigation through the use of social media. Social media for disaster mitigation is especially relevant among traditional college students or those between the ages of 18 – 21. Most institutions have a crisis communication plan that includes a mix of SMS messaging, emails and automatic phone calls. However, when an emergency occurs on campus, it makes sense to also send the alert out via social media. So, we discussed the importance of using this platform for disaster management analysis, particularly among college students.

Next, I led the students through the application process to become a Twitter Developer so they could build a Twitter app to analyze disaster community tweets. All new developers must apply for a developer account to access Twitter APIs. Once approved, developers can begin to use Twitter's standard APIs, which were needed to carry out the project activities. I taught students how to use the Twitter Developer interface and GitHub to store and manage their code. The developer portal is a self-serve user interface within developer.twitter.com where developers can manage their API access and Twitter apps. The developer portal is visible with a logged in context to developer.twitter.com and an approved developer account. Students learned to access the developer portal by clicking on the 'Dashboard' link or the @handle dropdown navigation panel in the top right-hand corner of developer.twitter.com. Also, I instructed them on how to register for a GitHub account. GitHub is a free web-based hosting service for version control using Git and is mostly used for computer code. I helped students use their GitHub website on the Twitter developer portal to create a new Twitter Application and get associated API keys and tokens.

Once the students were set up as Twitter developers, I showed them how to download and install the Anaconda distribution of Python. Anaconda is a free and open-source distribution of the Python and R programming languages for scientific computing. With Python, the students and I made a Twitter application using scripts to extract tweets from two disaster management organizations, FEMA Region 4 and Samaritan's Purse. I showed the students how to understand a Tweet Object, and extract data from a Tweet object using Python. I showed them how to use attributes such as created at, id, text, and user.

To complete the project, I showed the students how to use sentiment analysis to assess the extracted tweets from their chosen disaster management organization. We discussed how this is made possible through Natural Language Processing (NLP). NLP is an area of growing attention due to increasing number of applications like chatbots and machine translation. In some ways, the entire revolution of intelligent machines in based on the ability to understand and interact with humans. After the tweets were extracted and stored into a CSV file, the students and I used two Python packages to measure the overall sentiment of the tweets over the last several hours and then across specific times such as during recent hurricanes. The example we used was Hurricane Florence, which hit North Carolina August 31, 2018 – September 19, 2018. Using both the Twitter application, Python, and the sentiment analysis packages, students learned how

disaster management groups could make data-driven decisions to help mitigate community disasters.

Lastly, I introduced students to several additional research opportunities where I verified that one submitted an application to graduate school and another submitted an application to complete two summer undergraduate research projects doing similar tasks. I reviewed, edited, and helped revise their project summaries at the conclusion of the research project.

Spring 2019 – Project 4

Student researchers: 4

Project title: National disasters Preparedness in NY City and Charlotte NC

Project description: Students in this research evaluated the preparedness of residents in New York City and Charlotte, NC. The coast in general is threatened by competing demands due to the diversity of resources. For example, New York's coastal area is unique as it contains a variety of natural, recreational, commercial, cultural, and energy resources of local, statewide, regional and national significance. Data for this research was collected by the students from a revised survey that asked questions of respondent's preparedness and mitigation plan, also the survey include questions such as age, lifestyle, income, own or rent and soon, the survey consists of 37 questions including six different disasters.

- Students used Data Mining for Exploration & analysis of data to discover meaningful patterns.
- Students use Data Mining analysis to test the relationship between factors such as education, gender, age, income.
- Analyze and find the natural disasters experienced in a lifetime and the number of years lived in a location and actual natural hazards to the preparedness level in the event of a natural disaster.

In the Summer of 2019 one faculty members guided 25 students through a 1-week intensive DHS CRC related research project.

Summer 2019 – 1-week Project

Student researchers: 25

Project title: Students are to define a problem, get some data analyze it and propose solutions using Tableau.

Project description: Students are divided to 5 groups each group consists of 5 students. Dr. Amin is helping the students how to search and find data about a natural disaster of their choice. Then they have to collect the data, clean the data and put it in the right format to be analyzed. Dr. Amin is introducing to the students Tableau software. For most of the students it was the first time to work with Tableau software, it was a challenge.
In this short period of time each group of students is learning the Tableau software and managing to work on a project on a natural disaster and analyze the data using. Each group of students also is preparing a report of at least10 pages about the project and a power point presentation. On the 5 th day each group is presenting to STEM faculties.

These are the titles for the 5 groups.

Group 1: Comparing flood damage between states on an economic level

Group 2: Purchasing Insurance Coverage for your Property Based on the Prevalence of Major Disasters in Coastal States.

Group 3: Categorization and Preparation of Wildfires by states within the US

Group 4: Comparing global geographical earthquakes based on magnitude, damage, cost, and fatalities.

Group 5: Analyzing destruction of hurricanes in the United States with emphasis on comparing hurricane Harvey and Katrina's wind speed, pressure, and rainfall to determine the correlation between these variables and mortality rates.

In addition, during the Summer of 2019 three faculty members guided students through a 4-week intensive DHS CRC related research projects.

Summer 2019 – 4-week Project 1

Student researchers: 4

Project title: Building TORNADO Resilient Communities

Project description: Often, Tornadoes are treated with a great deal of mythos and can commonly be thought of as being as somewhat unpredictable. The research is invested in ascertaining what conditions and metrics, that are readily accessible to the public; should be analyzed in order to prepare for tornadoes, more accurately predict their outcomes, and subsequently build resilient communities. In addition, what emphasis and resources should be allocated based on a tornado's corresponding Fujita rating.

Our research was focused on Florida, Iowa, Colorado, Nebraska, Missouri, Texas, Oklahoma, Kansas, Illinois, and Alabama. We used the data mining techniques decision tree and linear discriminant analysis. Our sources were tornadohistoryproject.com, USA.com, and the USDA Forest Service. The research findings suggest that although the majority of the general public's attention is focused on catastrophic tornadoes; weaker storms over time may actually culminate in more losses.

Summer 2019 – 4-week Project 2

Student researchers: 4

Project title: Build a Practical Contraflow Model for Natural Disasters Evacuation Plans Using Fuzzy Inference System

Project description: Emergency evacuation is the immediate and urgent movement of people away from the threat or affected area of the occurrence or in this case a natural disaster. These evacuations may be carried out before or after the natural disasters such as hurricanes, floods and earthquakes etc. Emergency evacuating planning is an intricate part in evacuating people. These plans are developed to ensure the safest and most efficient evacuation time of all expected residents of a city or region. Proper planning involves the use of contraflow lanes in addition to special technologies to ensure full, fast and complete evacuation. A contraflow control lane is an emerging and developing tool that may be used to improve evacuation traffic capacity.

In this summer project, students will design, develop and build a contraflow control system with MATLAB Fuzzy Logic Toolbox (Type-1 and Interval Type-2) to provide a practical evacuation

plan model for decision makers to effectively and efficiently perform evacuation process via national highways prior the disasters coming.

The project's procedures and outcomes can be summarized as:

1. Familiar students with a powerful tool, MATLAB Fuzzy Logic Toolbox with 8 projects.
2. Design and build a contraflow system model with MATLAB Fuzzy Logic Toolbox GUI App (Type-1).
3. Develop and build a contraflow system evacuation model with MATLAB Fuzzy Logic Toolbox functions (Type-1).
4. Familiar students with Interval Type-2 Fuzzy Inference System (IT2FIS) and its related Toolbox as well as related functions.
5. Design and build a contraflow control system model with IT2FIS

The final products of this project also include:

1) Final Project Report
2) Final MS PPT Presentations
3) Final Project Poster

Summer 2019 – 4-week Project 3

Student researchers: 4

Project title: DHS Coastal Resilience Infectious Disease Outbreaks following Natural Disasters in the US 2014-2019

Project description: This project aimed to discover infectious disease outbreaks following natural disasters. Data from the National Oceanic and Atmospheric Administration and the Center for Disease Control and Prevention was used to highlight outbreaks occurring in the United States after natural disasters. Definitions for natural disasters and disease outbreaks where created based on previous studies. By analyzing the data to find events that correlated between similar time and location, according to the definitions, clusters of data points were collected. The data suggests that sexually transmitted, person to person, tick borne, waterborne and food borne infections increased in number of reported cases following a natural disaster. The study identified outbreaks of specific diseases which differed from the Center for Disease Control and Prevention's list of possible outbreaks following a natural disaster, such as Gonorrhea, Campylobacteriosis, Invasive Pneumococcal disease, Salmonellosis and Pertussis.

Floods has been linked to water-related infectious diseases, for example diarrhea, due to water contamination and damage to water systems, as wells as increasing endemic vector-borne diseases. Evidence of a relationship between storm-related events and infections mainly comes from large-scale disasters. In 2005, Louisiana and Mississippi experienced an increase in West Nile neuroinvasive disease after Hurricane Katrina, which was a category three storm. Here the objective was to identify infectious disease outbreaks following storm events of different magnitudes in the United States. Data of storm events and other significant weather phenomena was combined with weekly number of cases of infectious diseases. The Storm Events Database from the National Oceanic and Atmospheric Administration and the National Notifiable Diseases Surveillance System from the Center for Disease Control and Prevention were mined for patterns. Data sets were prepared using Alteryx and data analysis and visualizations were

performed using Tableau. Data from all states from 2014 to April 2019 were included. Here a natural disaster was defined as a storm event or weather phenomena that causes property damage over $500,000. An outbreak was defined as an occurrence of an infectious disease with at least five cases per week and the current week number of cases at least 100% higher than the average number of cases from the four previous weeks. By mining the data to find events that correlated in time and space, clusters of data points were collected. Preliminary analysis suggests that sexually transmitted, vector borne, water borne, and food borne infections increased following storm events. Impact of climate, income level and vaccination coverage on natural disasters and infectious disease outbreaks was investigated .

The DHS grant has provided the opportunity for four JCSU undergraduate students to participate in an internationally competitive research project that can have implications on disaster response policy. They have learnt essential skills to complete their senior paper and for future research endeavors, including literature searches, reading scientific literature, data analysis and data visualization. The data visualizations and analysis have identified disease outbreaks which needs to be further investigated so their response can be incorporated in natural disaster emergency response plans. The Alteryx data management software and the Tableau data visualizations created in this project can be used as a basis for courses and projects in biology and computer science, which will improve quality and currency of education and research at the university. I will incorporate Tableau in a new course in research methods with a focus on data analytics where real data will be used for course projects. I plan to apply for funding both to improve the research course offerings as well as the research environment at the university as well as to work on data analysis of the collected data.

3. **Unanticipated Problems:**

We did not manage to get any faculty from other collaborating institutions in our work-plan due to conflict in time and schedule. The conflict was discussed with the End users and in our next academic year we intend to plan far enough ahead of time to avoid any conflicts.

We could not track some of our graduating students. We have plans to establish Linkedin and Facebook as well as other social media accounts for the department, through which we can stay in touch with our graduating students. We also plan to work with the Institutional Planning, Assessment, Effectiveness and Research office at our university to follow up with students who have graduated in the past. In addition, we will contact CRC to identify mechanisms others have used to determine post-graduate employment/education.

4. **Students and recent graduates:**
- 1 student applied for graduate studies at Coastal Carolina University in the field of disaster management.
- 3 students applied for Research Experiences for Undergraduates at Coastal Carolina University.

5. **Project Impact:**
The courses incorporated cybersecurity, data mining, machine learning, ArcGIS and bioinformatics.

6. Institutionalization:

Sources of post-CRC support established:

S/F	Agency Name	Project Name/ Project Director	Grant Life	Original Award Date	Total Amount Awarded FY 18	Indirect Cost
F	National Science Foundation NSF: HBCU-UP	**(HBCU-UP) Historically Black Colleges and Universities Undergraduate Program - "Developing a Minor in Data Science at JCSU" Dr. Felesia Stukes**	August 1, 2018 - July 30, 2019	8/1/2018	$149,466.00	$37,650.00
F	ED- Department of Education	**(MSIEP) Minority Science and Engineering Improvement Program Grant Dr. Sabina Otienoburu**	October 1, 2018 - September 30, 2019	10/1/2017	$77,937.00	$4,681.00
F	Department of Homeland Security	**Sub-Contract with UNC-CH- Coastal Resilience Center of Excellence- Research Lead Dr. Ahmed Faik**	July 1, 2018 - June 30, 2019	7/1/2018	$90,000.00	$3,194.00
Other	Oxford University	**Worldwide Antimalarial Drug Resistance Network (The WWARN Project) Dr. Sabina Otienoburu**	August 1, 2018 - December 31, 2018	8/1/2018	$5,000.00	$0.00
Other	Oxford University	**Worldwide Antimalarial Drug Resistance Network (The Second WWARN Project) Dr. Sabina Otienoburu**	May 28, 2019 - December 31, 2019	05/28/2019	$18,159.00	$1,287.00
F	ED- Department of Education	**(MSIEP) Minority Science and Engineering Improvement Program Grant Dr. Suryadip Chakraborty**	October 1, 2018 - September 30, 2019	10/1/2018	$245,475.00	$14,979.00
F	NSF / UNCC	**"UNC Charlotte Intelligence Community Center of Academic Excellence" Amin Awatif, Bledsoe-Gardner**	09/2019-09/08/2024	06/2019	$ 195,651.00	$43,191.00
F	Department of Defense Research and Education Program for HBCUs and MSIs - Equipment/Instrumentation	**"Data Science Education and Sport: Equipping the DATA Bulls" Dr. Felesia Stukes**	4/30/2019 - 4/29/2020	06/21/2019	$173,837.00	$2,798.00
F	Department of Defense Research and Education	**"Intelligent Mobile Robot System for Designing and Implementing Nested Fuzzy Logic**	5/1/2019 - 4/30/2020	06/21/2019	$227,862.00	$13,339.00

	Program for HBCUs and MSIs - Equipment/Instrumentation	Controllers to Reduce the Effects of Electromagnetic and Environmental Radiations on Military Robots and Manipulators" Dr. Ying Bai				
TOTAL					987,736.00	77,928.00

Following CRC support, the project will be maintained in our STEM College. We have already added the two seminars (CSC210 Career Preparation Seminar I, and CSC211 Career Preparation Seminar II) to the curriculum and they are currently required from the students in all three of our majors.

The two courses "Risk Analysis and Management" (CSC430) and "Data Mining" (CSC432) have already been developed, taught and added to the department curriculum and the university catalogue.

The following two courses; "Introduction to Geographic Information System" and "Network Science", have been developed and taught in past semesters under generic computer science electives. They will be added to the university catalogue and the curriculum of the three majors in our department. The course "Introduction to Geographic Information System" is in the process of being added to the university catalogue as part of a new minor in our Computer Science and Engineering department.

Some of the faculty members of our Computer Science and Engineering department as well as one or two faculty members of the Natural Sciences and Mathematics (NSM) department will be involved in sustaining the project. Mostly the same faculty members who were involved in the project in the past year, plus one or two others

7. Interactions with research projects:

Fourteen of our students visited NCSU civil engineering department, which itself is one of the DHS CRC grant participants. Our students presented their findings from three different research projects. Faculty as well as several graduate students from NCSU presented their findings from their own research projects.

8. Publications:

- Ying Bai & **Hang Chen**, "Build an Optimal Evacuation Contraflow Model for Natural Disasters by Using Fuzzy Inference System", to be appeared on Proceedings of the 2018 IEEE International Conference on Fuzzy System, July 8-13, Rio de Janeiro, Brazil, 2018.
- Cody Byrd, Jean-Marie Nshimiyimana, Ehije Idehenre, **Hang Chen** (Faculty Advisor), "Data Analysis of Haiti's Resiliency Post-2010 Earthquake". Presented at the 2017

Emerging Researchers National (ERN) Conference in Science, Technology, Engineering and Mathematics (STEM).

- NyJae Dickerson, Adonis Tillman, Desmond Taylor, Awatif Amin (Faculty Advisor) "Using Data Mining to analyze Natural Disasters at 10 countries". Presented at the 2017 Emerging Researchers National (ERN) Conference in Science, Technology, Engineering and Mathematics (STEM).

9. **Year 4 Education Activities and Milestone Achievements:**

Education Activities and Milestones: Status as of 6/30/2019

Reporting Period 7/1/2018 – 6/30/2019			
Education Activities	Proposed Completion Date	% Complete	Explanation of why activity/milestone was not completed
Develop one new course on Network Science	12/31/2018	75%	It will be taught in the Spring 2020.
Host three seminars each semester. The seminars' presenters are participants in the CRC program. The topics they present are related to the CRC program. The students will benefit from the seminars		0%	due to conflict in time and schedule
Select eight students to conduct research projects, during the Spring semester. The students will be selected according to the courses the students are enrolled in, which are related to this program. The goal is to have the students apply the knowledge they gain from their courses on analyzing CRC data, and possibly present their findings in conferences and publications. 12 students were selected during the Spring 2019 semester and conducted research according to the courses the students were enrolled in.	2/28/2019	100%	
Design a one-week summer camp focused on Coastal Resilience for eight students. 25 students conducted and presented 5 different topics during the 1-week summer research camp.	6/30/2019	100%	
Select nine students and three faculty members to form the summer research teams, during the Summer session. Different students and different subjects will be covered from the Spring semester. 14 students conducted and presented 3 different research projects during the 4-week summer research camp.	6/30/2019	100%	
Education Milestones			

Approval of a new course by the College or Department	6/30/2019	100%	
Eight students complete the spring research course and research project. Students may be able to present the results of the project in conferences and STEM journals. 12 students were selected during the Spring 2019 semester and conducted research according to the courses the students were enrolled in.	6/1/2019	100%	
20 students complete the one-week summer camp. Students will be exposed to emergency management and CRC activities and apply their knowledge gained in the summer camp by using software tools to complete a project. 25 students conducted and presented 5 different topics during the 1-week summer research camp.	6/30/2019	100%	
Nine students and three faculty members complete four-week summer research projects. The end results are power point presentations and posters that can be presented in conferences. 14 students conducted and presented 3 different research projects during the 4-week summer research camp.	6/30/2019	100%	

10. Year 4 Transition Activities and Milestone Achievements:

Transition Activities and Milestones: Status as of 6/30/2019

Reporting Period 7/1/2018 – 6/30/2019			
Transition Activity	Proposed Completion Date	% Complete	Explanation of why activity/milestone was not completed
Continued enrollment of students in developed courses and research projects. All of our STEM students are being targeted, which is around 250 students.	6/30/2019	100%	
Dissemination of the undergraduate education and research education framework and results. The results will be presented to practitioners in the field through conferences and publications. Other universities will benefit from the information.	6/30/2019	100%	
We established collaboration with research partners at other academic institution. Collaboration with companies are still in progress (red Ventures).	6/30/2019	50%	
Transition Milestone			

We will be targeting all 20 students, who will be participating in the summer research camp, for employment in the HS enterprise or continue to graduate studies. Our goal is to place at least two students in full-time positons in the HS enterprise and two students in graduate programs.	6/30/2019	100%	
Students will be required to present their findings in ERN (Emerging Research National) conference, STARS (Students Transitions Achievement Retention & Success), Tapia (ACM Richard Tapia Celebration of Diversity in Computing). We also plan to have some of the students' results published in peer-reviewed journals.	6/30/2019	0%	Conferences conflicted with the students' schedules.
Present at one to two conferences per year.	6/30/2019	0%	Planning to attend and present the DHS summit in July 2019

11. Tables:

Table 1: Annual Courses and Enrollments

FAIK: Annual Courses and Enrollments

Courses Developed and Taught by Johnson C Smith University under Project DHS CRC						
Course		YEAR				
Number	Title	YR 1	YR 2	YR 3	YR 4	
CSC432	Course Title: Data Mining					
	Status: Developed (D); Revised (R); and/or Taught (T)	D, T	T	R, T	R, T	
	Offering: Elective (E), Concentration (C), Minor (M)	E	E	E	E	
	Number of students enrolled	12	8	10	10	
CSE439 A	Course Title: Introduction to Geographic Information System (GIS)	YR 1	YR 2	YR 3	YR 4	
	Status: Developed (D); Revised (R); and/or Taught (T)	-	-	D, T	R, T	
	Offering: Elective (E), Concentration (C), Minor (M)	-	-	E	E	
	Number of students enrolled	-	-	10	10	
CSE439 B	Course Title: Risk Analysis and Management	YR 1	YR 2	YR 3	YR4	
	Status: Developed (D); Revised (R); and/or Taught (T)		D, T			
	Offering: Elective (E), Concentration (C), Minor (M)	E	E	E	E	
	Number of students enrolled		10			
CSC210	Course Title: Career Prep I	YR 1	YR 2	YR 3	YR 4	
	Status: Developed (D); Revised (R); and/or Taught (T)		D	T	R, T	
	Offering: Elective (E), Concentration (C), Minor (M)			C	C	
	Number of students enrolled			16	30	
CSC211	Course Title: Career Prep II	YR 1	YR 2	YR 3	YR 4	
	Status: Developed (D); Revised (R); and/or Taught (T)		D	T	R, T	
	Offering: Elective (E), Concentration (C), Minor (M)			C	C	
	Number of students enrolled			19	30	
#	Course Title:	YR 1	YR 2	YR3	YR 4	
	Status: Developed (D); Revised (R); and/or Taught (T)					
	Offering: Elective (E), Concentration (C), Minor (M)					
	Number of students enrolled					

Table 2: Performance Metrics

FAIK – JCSU-Performance Metrics

Metric	Year 1 (1/1/16 – 6/30/16)	Year 2 (7/1/16 – 6/30/17)	Year 3 (7/1/17 – 6/30/18)	Year 4 (7/1/18 – 6/30/19)
HS-related internships (number)	1	1	0	0
Undergraduates provided tuition/fee support (number)	0	0	0	0
Undergraduate students provided stipends (number)	37	47	40	51
Graduate students provided tuition/fee support (number)	0	0	0	0
Graduate students provided stipends (number)	0	0	0	0
Undergraduates who received HS-related degrees (number) Students who participated CRC Research	9	20	7	12
Graduate students who received HS-related degrees (number)	0	0	0	0
Certificates awarded (number)	0	0	0	0
Graduates who obtained HS-related employment (number)	3	0	0	0
Lectures/presentations/seminars at Center partners (number)	0	0	0	0
DHS MSI Summer Research Teams hosted (number)	0	0	0	0
Journal articles submitted (number)	1	1	1	0
Journal articles published (number)	0	0	1	11
Conference presentations made (number)	0	2	0	2
Other presentations, interviews, etc. (number)	0	0	0	0
Trademarks/copyrights filed (number)	0	0	0	0
Requests for assistance/advice from DHS agencies (number)	0	0	0	0
Requests for assistance/advice from other agencies or governments (number)	0	0	0	0
Dollar amount of external funding	$267,417	$887,917	$2,031,917	$987,736.00
Total milestones for reporting period (number)	7	6	0	7
Accomplished fully (number)	4	6	0	5
Accomplished partially (number)	3	0	0	0
Not accomplished (number)	0	0	0	2