1. **OVERVIEW AND CONTEXT**

The need to educate more cybersecurity professionals is well documented throughout government, industry, and academia (National Science & Technology Council, 2019). Cybersecurity education and research are increasingly crucial for our society as cyberattacks are on the rise and many critical infrastructures, e.g., the energy sector, are prime targets (Lyngaas, 2023). Cybersecurity is now an identifiable discipline with a breadth and depth of content that encompasses software development, networking, database management, ethics, law, policy, human factors, and risk management, among other areas. There is a need to examine and study cybersecurity from a systems perspective, encompassing and integrating many different disciplines and elements, and to integrate technological advances such as artificial intelligence (AI) into cybersecurity education. While advances in AI and machine learning could result in more dangerous threats to cyber systems, AI is also expected to enhance cybersecurity by automating routine tasks and assisting in techniques and vulnerability management (Segal, 2023). An additional challenge is the underrepresentation of minorities and people of color in cybersecurity education and the workforce, who often face barriers to entry and advancement (Segal, 2023; Allen, 2022; Reed & Acosta-Rubio, 2018; Fisk et al., 2023). According to a report issued by the Aspen Institute (2021), only 9% of cybersecurity experts are Black, about 8% are Asian and 4% are Hispanic. Efforts to address diversity and inclusiveness in cybersecurity education are needed to provide different perspectives, approaches, and strategies toward protecting our nation’s security.

This proposal by Virginia State University (VSU), *a CAE-CD designated institution and an HBCU*, answers the call for qualified, diverse graduates in government cybersecurity positions by establishing a *new* NSF CyberCorps Scholarship for Service (SFS) program for undergraduate students. Our proposed SFS program is a collaboration between Computer Science (CS) Department faculty in the College of Engineering and Technology, and Computer Information Systems (CIS) department faculty in the Reginald F. Lewis College of Business, both of which have well-established undergraduate cybersecurity programs. In this project, we will recruit and enroll a cohort of ten (10) undergraduate cybersecurity students who will receive SFS support for up to two years. Through faculty mentoring, scholarly and professional development activities, internships, and partnerships with industry/government experts, SFS students will enhance their cybersecurity education and skill building, leading toward placement with a federal government agency after graduation. SFS activities and lessons learned will build and inform a community of practice at VSU and in the broader cybersecurity community.

VSU is one of two land-grant institutions and one of five Historically Black Colleges and Universities (HBCUs) in the Commonwealth of Virginia. The University is fully accredited by the Southern Association of Colleges and Schools Commission on Colleges and offers 36 undergraduate degree programs, 16 graduate degree programs, two doctoral degree programs, and eight certificate programs among its six colleges. Situated in the city of Petersburg, VSU is accessible to the Washington DC, Raleigh-Durham-Chapel Hill, and Richmond metro areas. The University has an enrollment of 4,300 undergraduate students and 348 graduate students (Fall 2022 data), and 11 residence halls. Student enrollments are trending upward. In 2021 and 2022, VSU increased enrollments by more than 7% and 8%, respectively. Over 90% of VSU’s students are Black or African American and over 60% of students are Pell-eligible. The 2022 US News and World Report ranked VSU in the top 30 [of 101] of Best Overall HBCUs and in the top 20% of “Performers on Social Mobility” of Regional Universities in the South, evaluating which schools best serve and graduate underrepresented students.

All participating faculty on this project are enthusiastic about the opportunity to establish an SFS program at VSU and have actively participated in the planning and development of this proposal. Both departments have a rigorous undergraduate cybersecurity curriculum; motivated and hands-on faculty; dedicated laboratory facilities; and student-focused teaching, academic advisement, and mentoring, which are described in more detail below.

**Curriculum:**

VSU’s **Computer Science** Department offers both a BS and an MS in Computer Science, and a CS minor. The 120-hour undergraduate CS program is accredited by the Computing Accreditation Commission of ABET. The CS curriculum provides students with a firm foundation in both architecture and software, as well as a hands-on understanding of a variety of applications of the fundamental ideas and techniques of Computer Science. Through a selection of advanced electives from Mathematics, CS, Computer Engineering, and Information Systems and Decision Science programs, students can explore areas of special interest in depth.

The National Security Agency’s (NSA) designation of VSU’s CS program as a National Center of Academic Excellence in Cyber Defense (CAE-CD) recognizes the department’s curriculum and its alignment with the NSA's stringent standards. The department’s *undergraduate track in Information Security* and the graduate-level Information Assurance track were established in 2009 and 2010, respectively. Students who pursue the Information Security concentration are required to take the necessary courses for obtaining the BS in computer science, in addition to CSCI 451: Computer Security and CSCI 496: Web Design and Cyber Security. The prerequisite of these courses is the core required course CSCI 358: Introduction to Information Security. Additional cybersecurity-related courses include CSCI 402 Introduction to Artificial Intelligence, CSCI 450: Computer Forensics, CSCI 452: Introduction to Cryptography, CSCI 361: Embedded Systems, CSCI 445: Computer Communication Networks, CSCI 482: Matrix Computations, and CSCI 488: Advanced Systems Architecture.

The **Computer Information Systems** Department, housed within the Reginald F. Lewis College of Business, provides students with a strong understanding of the use, design, development and management of information systems and information technology (IT). The College of Business holds the highest accreditation awarded to business schools: the Association to Advance Collegiate Schools of Business (AACSB). CIS department curriculum is structured to provide students with a strong foundation in quantitative, modeling, and analytical skills; systems orientation; computer programming skills; and IT currency. Students can develop and manage a variety of real projects and prepare for certifications in Security+, Network+, CompTIA Security+, CompTIA Network+, and Certified Ethical Hacker.

The CIS department offers a BS degree in Management Information Systems (120 semester hours) with a minor in Cybersecurity and Forensics. The *cybersecurity minor* consists of the following required courses (18 semester hours): MISY 330: An Introductory Computer Programming Language; MISY 367: Introduction to Computer Networks; MISY 368: Introduction to Information Security and Assurance; MISY 468: Advanced Information Security and Assurance; MISY 478: Managing Organizational IT Security Risks; and MISY 488: Information Technology Security and Forensics. In May 2023, the CIS Department began collecting requisite documents to apply for the Center of Academic Excellence (CAE-CD) designation.

**Facilities:**

The Department of Computer Science has three cybersecurity laboratories available for faculty and student use, as described below:

1) The *Cyber Security Lab*, located in Room 28E, Hunter McDaniel Hall, holds 30 iMacs and includes 7 monitors for visualizing data similar to a Security Operating Center. Students in this lab develop cybersecurity-based applications and perform networked monitoring. Industry partner Microsoft provides the Azure platform for simulated monitoring of networks to detect cyberattacks. The lab is only accessible by VSU computer science faculty, who have 24-hour access. This space can accommodate 40 students.

**Figure 1: CS Department Cyber Security Laboratory.**

2) The *Digital Forensics Lab*, in 31N Hunter McDaniel Hall, is shared by the CS and Criminal Justice departments. This lab holds 30 Windows machines and can hold 40 students. This lab space is intended to prepare computer science and criminal justice students for the computer forensics profession. Students from the CSCI 450 computer forensics lab use this space for course exercises.

3) *The Auxiliary Cyber Security Lab*, located in 22E Hunter McDaniel Hall, is an auxiliary space for additional cyber security-based research. This lab holds 25 Windows and Linux machines. This space can hold 50 students. This space is predominately used for undergraduate and graduate research in cyber security. Faculty have 24-hour access to this space, which is typically restricted from evening to morning hours.

The CS Department also has a *GPU-Accelerated Deep-Learning Research Cluster*. The instrumentation is a 24 GPU cluster consisting of two NVIDIA DGX A100 (8x NVIDIA A100 GPUs) research nodes and two 4x NVIDIA A100 GPUs education nodes. This equipment is used for performing the complex and numerous computations required for big data and deep learning-centric cybersecurity solutions and research.

Through the CS Department’s **Cyber Security and Digital Forensics [CSDF] center,** which encompasses both the Cyber Security Lab and Digital Forensics Lab(see Figure 1)**,** faculty and studentswork together to analyze, develop, and produce solutions to cybersecurity-related problems, and to educate center members in basic research practices and professional development. CSDF’s two main research thrusts are i) *Cyber Defense and Digital Forensics*, and (ii) *biometrics-based IoT solution development*. Students in the Digital Forensics thrust utilize virtualization technologies to simulate penetration testing, network architectures to monitor networked traffic and detect anomalies, and forensics techniques and equipment. The biometric-based IoT solution development thrust focuses on IoT solutions for access control and behavioral biometrics for continual authentication. Students study the application of different classifiers on behavioral biometrics for improved classification of cyber threats. This thrust also looks at how an individual designated machine is used.

The *CIS Department Cybersecurity Laboratory* (Figure 2) is equipped with 30 student workstations, Windows- and Apple-based computers, and printer/scanner/Wi-Fi connectivity. This laboratory is also used by students and faculty involved in the college’s three student organizations: the National Cyber League, Women in Cybersecurity, and Black Data Processing Associates. The department has recently submitted grant proposals to add more equipment to the laboratory and anticipates having an additional laboratory available for student use this coming academic year.

**A room with computers and tables

Description automatically generatedFigure 2: CIS Department Cybersecurity Laboratory.**

**Students:**

VSU’s 2020-25 Strategic Plan prioritizes academic excellence and student success and engagement. It focuses on developing student leaders who are more engaged with their learning, have the soft skills necessary to be successful in their careers, and are equipped with the knowledge, skills, and disposition to be globally competitive while remaining civically engaged. To meet these objectives, VSU has focused on increasing enrollment through targeted recruitment efforts; expanding and strengthening academic programming and services, as well as co-curricular and student support services; and enhancing the collegiate environment to facilitate students to persist and achieve their goals of degree and certificate completion. The results of these institutionally driven initiatives are demonstrated by increases in enrollment, student retention rates, and student engagement.

**Applications and Enrollments:** In the past three years,undergraduate applications and enrollments for CS and CIS have been on the rise at VSU, reflecting increased recruitment efforts and student demand for computing-related educational and career pathways (Table 1). Both departments have seen an upswing in the number of students interested in cybersecurity-focused concentrations or minors.

**Table 1: CS and CIS Department undergraduate student enrollment (Fall semester headcounts).**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **Fall 2018-19** | **Fall 2019-20** | **Fall 2020-21** | **Fall 2021-22** | **Fall 2022-23** |
| **BS in CS** | 116 | 156 | 151 | 167 | 266 |
| **BS in MIS** | 65 | 70 | 72 | 68 | 74 |

From 2018-19 through 2022-23, the MS in CS program had enrollments of 6, 6, 4, 11, and 13 students, respectively.

**Retention:** Over the past five years (2017-18 through 2021-2022), the CS department undergraduate student retention rates have averaged **72.8%**. Retention rates were highest in the fall of 2021 and 2022, at **79% and 82%**, respectively. During this same period, the CIS department undergraduate retention rates averaged **76.4%**, achieving rates of 85% and 80% in the fall of 2021 and 2022, respectively. As an institution, VSU is ranked in the Top 10 in Student Retention Programs at HBCUs. The University also ranked 8th on the list released by UniversityBusiness.com, using the U.S. Department of Education Scorecard for 2019-2020.

**Engagement:** VSU’sstudent-led professional organizations (ACM, IEEE, NSBE, SWE, the National Cyber League, Women in Cybersecurity, and the Black Data Processing Associates) provide numerous opportunities for leadership, networking, and continuing education. Students in both the CS and CIS departments participate in academic competitions where students compete for prizes. The CS Department (including senior personnel Drs. Reynolds, Lee, Shelton, and Davis) hosts an annual 2-day hackathon where VSU CS students compete for a prize award of up to $4500. The latest competition involved more than 20 students and was sponsored by Amazon and the Central Intelligence Agency. During these events, several industry and agency professionals guest lectured to the participants, speaking about job opportunities, entrepreneurship, and life in STEM.

Faculty and students from the CIS Department (including senior personnel Akkaladevi, Nicholas-Donald, Challa, and Gao) regularly participate in the National Cyber League (NCL) competition. NCL is a cybersecurity competition powered by Cyber Skyline, a leading cloud-based cybersecurity skills evaluation platform for students to practice their cybersecurity skills. The NCL scenario-based challenges are designed around performance-based exam objectives of CompTIA certifications and are aligned to the National Initiative for Cybersecurity Education (NICE) Cybersecurity Workforce Framework published by the National Institute of Standards and Technology (NIST). NCL hosts two seasons every year, in the spring and fall. The competition includes practice, individual, and team games, including a Team Capture the Flag (CTF) Game. Participating students are awarded a cybersecurity resume noting the standards and concepts that are mastered. NCL awards scholarships covering participation in the competitions to students from HBCUs. NCL also works with faculty to ensure that the cybersecurity pathway is enhanced for all their students.

The University Innovation Fellows program, sponsored by Google and Stanford University, offers the opportunity for CS and CIS students to engage in an entrepreneurial student leadership program that builds on and enhances what they learn in the classroom. The Fellows are a global community leading a movement to ensure that all students gain the attitudes, skills and knowledge required to navigate a complex world. These student leaders from schools around the world create opportunities to help their peers build the creative confidence, agency, and entrepreneurial mindset needed to address global challenges and to build a better future. Fellows create student innovation spaces, start entrepreneurship organizations, facilitate experiential workshops, work with faculty and administrators to develop new courses, and much more.

**Student Outcomes:** The number of degrees conferred in the CS and CIS departments for the past five academic years is shown in Table 2 below.

**Table 2: CS and CIS undergraduate degrees conferred, 2018-19 through 2022-23.**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **2018-19** | **2019-20** | **2020-21** | **2021-22** | **2022-23** |
| **BS in CS** | 13 | 18 | 23 | 14 | 26 |
| **BS in MIS** | 11 | 9 | 14 | 16 | 12 |

To support and enhance their academic programs, cybersecurity students have been successful in securing summer internships in their field of study, including internships at the Port of Virginia (Wong, 2022), the MITRE Corporation and the National Security Agency. Most undergraduate students secure jobs related to their field of study or pursue graduate/professional education.

They have been hired by leading companies including IBM, Deloitte, Amazon, Microsoft, Lockheed Martin, Defense Logistics Agency, Raytheon Technologies, NAVSEA, and Dominion Energy. Students interested in graduate programs have been admitted into and successfully completed master’s level programs at leading universities such as NYU, George Washington University, and Virginia Tech. Students have found that VSU’s proximity to three large metropolitan areas is a distinct advantage in accessing the abundant cybersecurity job opportunities in government and industry in these areas.

**Industry and External Partnerships**:

The Computer Science Department of Virginia State University partnered with the Advancing Minorities Interest in Engineering (AMIE) organization as part of the HBCU CYBERSECURITY INDUSTRY COLLABORATION PILOT. Professionals from Abbott, Microsoft, and Raytheon Technologies served as guest lecturers and mentors, and met with faculty to better understand existing strengths and collaborate toward educating more students to help address the nation’s talent gap.

Virginia State University is a member of the Commonwealth Cyber Initiative (CCI). The Commonwealth Cyber Initiative (CCI), funded by the Virginia General Assembly, is a commonwealth-wide ecosystem of innovation in cybersecurity and cyber-physical systems (CPS) security. The Computer Science department of VSU works closely with CCI.

In addition, the Department of Computer Science is working with multiple industry and government partners on cyber-focused projects.  The Army Strategic Program for Innovation, Research and Employment (ASPIRE) is an educational Capstone program sponsored by the US Army C5ISR Center RTI Directorate. One student team developed a “leave behind audio device (LBAD)”. The LBAD is a small digital audio recorder created to discreetly record information hidden in everyday objects using Bluetooth or Wi-Fi connection. The recording would then be able to be downloaded remotely over a secure link.  The CIA provided mentorship for another team working on a multifactor biometric authentication system. The students met and presented the progress of their work and delivered bi-weekly reports for their mentors to present to the CIA leadership.

1. **PROJECT GOALS, OBJECTIVES, AND OUTCOMES**

The overall goal of this project aligns with the primary goal of the SFS program, which is the education and training of SFS scholarship students after graduation in qualified federal, state, or tribal positions dealing with cybersecurity. Supported students agree to work for a period equal to at least the duration of the scholarship in the cybersecurity mission of the U.S. executive branch or with other governmental entity or tribal government as specified by the SFS program guidelines. SFS scholars participate in summer internships related to cybersecurity, attend an annual SFS Job Fair, and engage in other activities such as conferences, competitions, workshops, and seminars that are recommended by their advisers to enhance their individual skills and knowledge.

In this project, we plan to recruit and enroll 10 SFS undergraduate students who are pursuing a cybersecurity-related program concentration or minor, providing SFS scholars with stipends and professional development for up to two years per student. Specific project objectives, plans/activities, and anticipated outcomes are as follows:

***Objective 1:*** *Enhance and augment scholars’ academic coursework and promote team-building skills through a co-curricular collaborative group project.*

**Plan:** Each year, SFS faculty will plan and coordinate a co-curricular collaborative project that the entire SFS cohort students will work on as a group. Projects may encompass themes such as addressing cyber concerns that specifically affect the area local to VSU [lower income area majority underrepresented populations], cyber solutions utilizing artificial intelligence for preventative action of cyber attacks, and cyber solutions specifically for DoD agencies. SFS senior personnel will serve as faculty mentors for this effort, providing instructions and guidance as needed. These projects will be supported by industry partners such as the CIA, NSA, and other private companies.

**Anticipated Outcomes:** SFS students will participate in a yearly co-curricular collaborative project as a cohort, thus enhancing their technical skill building and their ability to work across disciplines toward common goals and outcomes.

***Objective 2****: Increase student participation in intercollegiate competitions to expand interest in cybersecurity education and careers.*

**Plan:** SFS students and faculty mentors will participate in two annual events. In the fall, they will participate in the National Cyber League competition, and in the spring, they will participate in a 2-day Hackathon event hosted at VSU. These events will also help increase student exposure to and build interest in cybersecurity through publicizing the events with flyers and class announcements.

**Anticipated Outcomes:** Through increased publicity and recruitment efforts to VSU students, as well as undeclared majors, student participation in these events is expected to increase over the project period.

***Objective 3****: Increase cybersecurity-focused outreach and recruitment events at VSU to expand interest in cybersecurity education and careers.*

**Plan:** SFS students will accompany faculty mentors from their departments on a minimum of one biannual outreach/recruitment event at VSU designed to inform prospective students about the cybersecurity program curriculum and opportunities. This activity particularly targets VSU freshmen and sophomore students and undeclared majors.

**Anticipated Outcomes:** Prospective student interest in cybersecurity education at VSU is expected to increase, as measured by the number of applications received from students declaring an interest in cybersecurity.

1. **PROJECT PLAN AND TIMETABLE**

Prior to the beginning of the program, we will develop recruitment materials (flyers/brochures) and a project website and begin publicizing the program to CS and CIS students. We will also hold an informational session with students and advisers from both colleges to inform them about the opportunities provided through the SFS scholarship program, the eligibility criteria, program expectations, and the service obligation requirements.

In the first year of the program, we plan to enroll three undergraduate students of junior standing, offering them two years of scholarship funding and professional development allowances. We expect these students to return to finish their degree programs the following year. At the same time, we would enroll two new students, making up a total cohort of five students in Year 2. Thus, our planned cohorts from Years 1 through 5 will total 3, 5, 5, 5, and 2 students, respectively, as shown in Table 3 below. We will ensure that the last cohort of scholars completes their plan of study within the five-year budget.

**Table 3: Planned cohorts for VSU’s SFS program.**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Students | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 |
| 1st Year | 3 | 2 | 3 | 2 | 0 |
| 2nd Year | 0 | 3 | 2 | 3 | 2 |

The selection process and criteria for VSU’s SFS program will follow an annual program cycle of recruitment; selection of students; initial counseling and orientation; assignment of faculty and advising mentors; development, monitoring, and updating of individual APD plans; engagement in a co-curricular group project; participation in annual SFS job fairs and internships; participation in intercollegiate competitions; exit counseling prior to job placement after graduation; graduation and job placement; and program assessment/report-out. The exit counseling will provide information about fulfilling the SFS scholarship service obligation, options for temporarily deferring the period of completing the service obligation, and terms and conditions under which the CyberCorps scholarship must be repaid.

VSU will monitor the compliance of scholarship recipients with respect to their post-scholarship employment obligations and will provide to the SFS Program Office (annually) the verifiable post-scholarship employment documentation through the completion of scholarship recipients’ post-scholarship employment obligations.

**Selection Process and Criteria:**

VSU has established the following eligibility criteria for its SFS program:

* A U.S. citizen or lawful permanent resident.
* Demonstrate a commitment to a career in cybersecurity.
* A full-time student with junior or senior class standing in a cybersecurity-related degree program.
* Minimum GPA of 3.0.
* Meet criteria for employment with the federal government.
* Be able to receive a federal government security clearance.

**Orientation, Enrollment, and Mentoring**:

Students selected as SFS scholars will receive an e-mail notifying them of their selection and asking them to confirm their acceptance. Each student will meet with their assigned faculty advisors and college adviser prior to their initial enrollment to develop an academic and professional development (APD) plan that will serve as a roadmap for their educational pathways at VSU through graduation and placement. The APD will include elements such as a plan of study, areas of disciplinary/technical focus, professional development needs and potential opportunities (e.g., technical/scientific conferences), and related co-curricular activities. This plan will be updated yearly or more often as needed.

This initial meeting will include a counseling session to re-affirm SFS scholarship program expectations and service obligation requirements, and the circumstances under which an SFS scholarship needs to be repaid or treated as a Direct Unsubsidized Loan to be repaid. A background check on all SFS students will be conducted by VSU before enrollment can be finalized.

**Project Timetable:**

|  |  |
| --- | --- |
| **Semester/Year** | **Activity** |
| Spring 2024 (Pre-program) | * Develop recruitment materials and website * Conduct informational sessions for prospective students * Select and enroll students for first cohort |
| Fall 2024 (Year 1) | * Start Cohort 1 * Fall National Cyber League competition * Plan collaborative group project |
| Spring 2025 (Year 1) | * Attend SFS Job Fair * Spring Hackathon competition * Collaborative group project * Recruitment and selection for Cohort 2 |
| Summer 2025 (Year 1) | * Summer internships * Assess Year 1 activities and outcomes * Report out to NSF (Annual Report) |
| Fall 2025 (Year 2) | * Start Cohort 2 * Fall National Cyber League competition * Plan collaborative group project |
| Spring 2026 (Year 2) | * Attend SFS Job Fair * Spring Hackathon competition * Collaborative group project * Recruitment and selection for Cohort 3 |
| Summer 2025 (Year 2) | * Summer internships * Assess Year 2 activities and outcomes * SFS Senior Personnel prepare materials for publication * Report out to NSF (Annual Report) |
| Fall 2026 (Year 3) | * Start Cohort 3 * Fall National Cyber League competition * Plan collaborative group project * SFS Senior Personnel submit paper for conference |
| Spring 2027 (Year 3) | * SFS Job Fair * Spring Hackathon competition * Collaborative group project * Recruitment and selection for Cohort 4 |
| Summer 2027  (Year 3) | * Summer internships * Assess Year 3 activities and outcomes * Report out to NSF (Annual Report) |
| Fall 2027 (Year 4) | * Start Cohort 4 * Fall National Cyber League competition * Plan collaborative group project |
| Spring 2028 (Year 4) | * SFS Job Fair * Spring Hackathon competition * Collaborative group project |
| Summer 2028 (Year 4) | * Complete summer internships * Assess Year 4 activities and outcomes * Report out to NSF (Annual Report) |
| Fall 2028 (Year 5) | * Start Cohort 5 * Fall National Cyber League competition * Plan collaborative group project |
| Spring 2008 (Year 5) | * SFS Job Fair * Spring Hackathon competition * Collaborative group project * SFS Senior Personnel prepare materials for conference/journal publication |
| Summer 2008 (Year 5) | * Assess and evaluate overall project outcomes * Report findings to NSF * SFS Senior Personnel submit paper for conference/journal publication |

1. **KEY PERSONNEL**

The following VSU faculty will serve in key personnel roles on this project:

**Table 4: Key personnel, roles, and responsibilities.**

|  |  |  |  |
| --- | --- | --- | --- |
| **Faculty Name** | **Department** | **Role in Project** | **SFS Responsibilities** |
| Michael Reynolds, PhD | CS | PI | Manage overall project activities as delineated in Management and Administrative Plan (Section 6). |
| Somasheker Akkaladevi, PhD | CIS | Co-PI | Mentoring and advising duties for cohort participants in CIS |
| Joon-Suk Lee, PhD | CS | Co-PI | Mentoring and advising duties for cohort participants in CS |
| Aurelia Nicholas-Donald, PhD | CIS | Co-PI | Mentoring and advising duties for cohort participants in CIS |
| Joseph Shelton, PhD | CS | Co-PI | Oversee required SFS industry and government agency-specific projects. Handle logistics of meetings, purchase required equipment, and confirm SFS scholars are staying on task. |
| Chandrasheker Challa, PhD | CIS | Senior Person | Facilitator for cohort collaborative activities, additional advising support |
| Brittany Davis, MS | CS | Senior Person | Facilitator for cohort collaborative activities, additional advising support |
| Shanzhen Gao, PhD | CIS | Senior Person | Facilitator for cohort collaborative activities, additional advising support |
| Olumide Malomo, PhD, CISSP | CIS | Senior Person | Facilitator for cohort collaborative activities, additional advising support |

**Michael A. Reynolds, Ph.D.** **(Principal Investigator),** Assistant Professor of Computer Science, received his PhD in Electrical Engineering from the University of Virginia. Prior to his VSU appointment, Dr. Reynolds served as dean in the engineering and technology divisions of two community colleges, where he was responsible for grant seeking/administration (including a $2.5M TAACCCT RE-AIM grant); curriculum development; community outreach; and building partnerships with industry, research entities, and K-12 school systems. Dr. Reynolds teaches and does research in the areas of network security and application security. He is co-PI of a 2023 VSU Innovation Grant to build a VR/AR Experience Center to support and enhance curriculum and research.

**Somasheker (“Soma”) Akkaladevi, Ph.D.** **(co-PI)**, Associate Professor of Computer Information Systems, earned a PhD in Computer Science from Georgia State University. His main research areas are in Computer Networks, Network Security, Artificial Intelligence, and Data Mining. Dr. Akkaladevi has received VSU Research initiation grants for computer networking projects including analyzing security threats in Bluetooth wireless technology and implementing security measures on handheld devices. He is deeply committed to student-oriented and career-oriented teaching and is extensively involved in curriculum development and AACSB and SACS accreditation processes.

**Joon-Suk Lee, Ph.D. (co-PI),** Department Chair and Associate Professor of Computer Science, received his PhD in computer science from Virginia Tech. His research contributions are in the areas of Computer Supported Cooperative Work, Computer Supported Collaborative Learning, human-computer interaction, interactive system design, and technology-augmented coordinated behaviors. Dr. Lee teaches courses in iOS app development, HCI, advanced software development, and programming. He is a former research scientist/senior software engineer in the semiconductor and telecommunication industries.

**Aurelia Nicholas-Donald, Ph.D.** **(co-PI),** Associate Professor of Computer Information Systems, earned her PhD in International Business, with a focus on Computer Information Systems and a concentration in Statistics, from the University of Texas at El Paso. She teaches and conducts research in network security, cloud computing, network architecture, wireless security, and other areas. An Information Systems professional for more than 20 years, she has received several teaching and advising awards throughout her career and has led VSU teams in intercollegiate competitions.

**Joseph Shelton, Ph.D. (co-PI),** Assistant Professor of Computer Science, received his PhD in computer science from North Carolina Agricultural and Technical University. Dr. Shelton serves as Director of the Cyber Security and Digital Forensics (CSDF) center and is the institutional POC for NSA’s CAE-CD designation. He has published in biometric-based IoT solution development , and he teaches courses in advanced systems architecture, and advises the undergraduate capstone projects and graduate student research.

**Chandrasheker Challa, Ph.D. (Senior Person),** Associate Professor of Computer Information Systems, received his PhD in Business from Virginia Commonwealth University. He teaches courses and conducts research in the areas of cybersecurity assessment, cybersecurity curriculum development, database design, project management, Gen Z technology-related issues, and Information technology and information security policies & procedures. He is a Certified Security + professional.

**Brittany Davis, M.S. (Senior Person)**, Instructor, Engineering and Computer Science, teaches courses in information assurance, computer security, and data science. She is a doctoral student in Computer Science and Informatics at North Carolina Agricultural and Technical State University and a former IT Specialist at the National Oceanic and Atmospheric Administration (NOAA).

**Shanzhen Gao, Ph.D. (Senior Person),** Associate Professor of Computing Information Systems, has a PhD in Applied Mathematics and a PhD in Computing and Information Sciences and is a Lifetime Fellow of the Institute of Combinatorics and its Applications. He has taught more than 20 different CS and CIS courses to students at VSU and other universities. His research interests lie in applying mathematics to computer science and vice versa; topics include cybersecurity, risk management, data science, AI, parallel and distributed computing, algorithms, discrete mathematics, combinatorics, and graph theory.

**Olumide Malomo, Ph.D., CISSP (Senior Person),** Associate Professor of Computer Information Systems, Associate Professor of Computer Information Systems received his Ph.D. in Computer Science from Howard University with a specialization in Cybersecurity, Federated/Cloud Computing Security, and Blockchain Technology. He has over 20 years of experience as an IT Engineer and IT Security Engineer in the industry. Dr. Malomo teaches and conducts research in the areas of cybersecurity, AI/machine learning, cloud computing, and big data analytics for emerging networked systems, including IoT/Cyber-physical systems. He is a certified information systems security professional (CISSP).

1. **PROJECT EVALUATION PLAN**

The project-specific evaluation process for the project will include both formative and summative strategies focused on whether the project is evolving effectively and as planned, including recruitment and enrollment, student achievement, faculty development, curriculum, institutional partnerships. and placement of SFS scholars in internships and in qualified cybersecurity positions after graduation. Formative and summative assessment strategies and measures are detailed below.

*Formative assessment* strategies: We will use quantitative and qualitative data to monitor project performance, assess program outcomes on a yearly basis, and take any necessary corrective action measures. The project objectives and assessment measures are as follows:

**Objective 1: (evaluated by SFS senior personnel)**

*Enhance and augment scholars’ academic coursework and promote team building skills through a co-curricular collaborative group project.*

**Metrics:**

* Overall student participation in the group projects
* Completion of the project objectives and tasks
* Overall quality of the work, as determined by SFS senior personnel

**Objective 2: (evaluated by SFS students and senior personnel)**

*Increase student participation in intercollegiate competitions to expand interest in cybersecurity education and careers.*

**Metrics:**

* Attendance at the Hackathon competitions, measured by the number of participants
* Attendance at the National Cyber League competitions, measured by the number of participants

**Objective 3: (evaluated by the PI and co-PIs)**

*Increase cybersecurity-focused outreach and recruitment events at VSU to expand interest in cybersecurity education and careers.*

**Metrics:**

* Number of outreach/recruitment events at VSU in which SFS students participate
* Prospective student interest/engagement in outreach/recruitment events, measured by tracking prospective student contact information

*Summative assessment* indicators measure the overall success of the project and include the following measures:

* Number of SFS students graduating from their four-year degree programs
* Number/percent of SFS graduates placed into positions in the US government’s executive branch

1. **MANAGEMENT AND ADMINISTRATIVE PLAN**

The program will be managed by the PI, Dr. Michael Reynolds, with the help of Co-PIs Drs. Akkaladevi, Lee, Nicholas-Donald, and Shelton. The PI will work with VSU’s Financial Aid Office to verify scholarship candidate eligibility and in the disbursement of stipends and allowances. The PI will also coordinate with the Office of Personnel Management (OPM) for summer internship and job placement, student attendance at the annual SFS Job Fair, tracking student progress, and program evaluation activities.

There are several institutional and college-level groups that will be involved in the management of this project. The project will involve VSU’s Office of Sponsored Programs in award processing and set-up, as well as review/processing of annual reports, budget and award changes, and official communications with NSF. VSU’s Grants and Contracts Office will be involved in the processing, tracking, and reporting of project expenditures. Administrative and finance staff in both colleges will be responsible for processing financial transactions such as student expense reimbursements and professional development expenses.

Undergraduate advisers from both colleges will help develop, monitor, and update students’ personalized Academic & Professional Development Plans. They will also help the project co-PIs and senior personnel to monitor academic progress and assist with placement in internships and jobs.

The program elements identified in NSF program solicitation 23-574 and respective assigned VSU administrative responsibilities are shown in Table 5 below.

**Table 5. SFS program elements, assigned responsibilities and action items.**

|  |  |
| --- | --- |
| **Program Element** | **Responsibility and Action Items** |
| Verification of scholarship candidates’ eligibility, including the recipients’ academic merit, appropriate professional skills; and enrollment in a cybersecurity program. | The PI and co-PIs will prescreen candidates during the selection process to verify their eligibility/status for receiving the scholarship. |
| Budgeting for scholarships consisting of stipends, tuition, education-related fees, and other allowances. Scholarships will not be based on student financial need. | The PI and co-PIs will work with VSU Sponsored Programs, Grants and Contracts, Financial Aid, and other appropriate institutional offices. All expenditures will be authorized and signed off on by the project PI. |
| Provision of academic year stipends of $27,000 per year for undergraduate students and $37,000 per year for graduate students, budgeted as Participant Support costs. The design of the cohort plan must ensure that the last cohort will complete their program of study within the five-year budget. | Academic year stipends of $27,000 per year for undergraduate students are budgeted. One-half of the stipend will be disbursed in August and one-half in January. |
| Provision of scholarship amounts to be used for expenses normally incurred by full-time students at the institution, including tuition and education-related fees (not including meal plans, housing, parking, or other such items). | Tuition and fees are included in the Participant Support budget using current rates, with estimated increases, and assuming students take 15 credit hours per semester. |
| Provision of a professional development (PD) allowance of $6,000 per academic year for the SFS Job Fair and other related travel, conferences, research materials, books and supplies, professional training and certifications, etc. | The PI will approve all PD expenses in advance, in accordance with students’ APD plans, and the $6,000/year allowance will be reimbursed as expenses are submitted. The Job Fair expenses will be handled the same way. |
| Students are required to take government internship positions in the summer between the first and second year of scholarship study. | Students will attend the SFS Job Fair and work with the SFS Program Office and project senior personnel to obtain appropriate internships. |
| Provisions for tracking the academic progress of students to determine their continued eligibility throughout the academic part of the program based on the SFS PI guidebook. | The PI and co-PIs will work directly with academic advisers and assigned faculty mentors to check on the academic progress of the SFS students. |
| Post-graduation tracking of students to verify that they meet the service obligation. | The PI and co-PIs will coordinate with the SFS Program Office to verify that the scholars’ service obligation is being met. |

1. **Intellectual Merit**

This project addresses the need to bring multiple perspectives and disciplines to cybersecurity education and the workforce to help tackle some of the nation’s most pressing security challenges. Our proposal is a novel collaboration between Computer Science and Information Systems department faculty in two departments who bring different approaches, skills, and knowledge areas to the cybersecurity discipline. Working together, CS and CIS faculty will plan and mentor cross-disciplinary group projects to be undertaken by SFS students. This collaboration represents a new approach to teaching and learning cybersecurity concepts at VSU, which could later be extended into the classroom and curriculum. The results of these collaborative group projects will be shared on the project website and with other SFS programs, universities, community colleges, and high schools. SFS students and faculty will have the opportunity for additional professional development through attendance at cybersecurity conferences such as DEF CON and CyberConVA. Appropriate journals for publishing research results include the ACM Inroads, Cyber Education Journal, Journal of Cybersecurity, ACM Transactions on Computing Education, among others.

1. **BROADER IMPACTS OF THE PROPOSED WORK**

The broader impacts of this project primarily focus on the opportunities we would like to provide to our predominantly minority, low-income undergraduate students who are pursuing cybersecurity education. As previously noted, over 90% of VSU’s students are Black or African American, and over 60% are Pell-eligible. Through their placement in federal government positions, our SFS graduates would help build a pipeline that could bring other minority students into the cybersecurity workforce. Our ability to offer financial support to deserving, committed students in cybersecurity will be a tremendous boost to our students’ success at VSU and will enhance our recruitment efforts. We also expect that SFS funding will result in increased student interest and engagement in cybersecurity curriculum and co-curricular activities such as academic competitions.

1. **Results from Prior NSF Support**

Neither the PI nor the co-PIs of this proposed project have any prior NSF support to report.