



**Report on the Implementation of
SB 18-086 - Cybersecurity
December 2024**



Prepared and submitted by the
Colorado Department of Higher Education
under the Executive Leadership of Dr. Angie Paccione
Pursuant to the statutory authority of C.R.S. 24-33.5-1905 (4)

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Introduction

C.R.S. 24-33.5-1905 (4) directs the Department of Higher Education (DHE, the Department) to prepare a report detailing progress made towards critical state cybersecurity goals at institutions of higher education that received an appropriation through SB 18-086. Specifically, the report must include, at a minimum:

1. The number of faculty or adjunct faculty hired at each institution of higher education as a result of the funding;
2. The number of student internships created with the funding at each institution of higher education;
3. The number of degrees or certificates that have been awarded at each institution of higher education in connection with the funding;
4. The number of scholarships awarded at each institution in connection with the funding;
5. The number of presentations and seminars given on cybersecurity by each institution of higher education; and
6. The amount of all other money that has been raised to match the state investment, which may include tuition, fees, federal funds, and industry donations.

Six governing boards were awarded funding in the 2023-2024 fiscal year. The following report summarizes their spending.

TABLE 1: SB 18-086 Appropriations and Expenditures, by Institution, Fiscal Year 2023-24

Shows SB 18-086 appropriation, actual expenditures, required scholarship award total, and actual scholarships awarded by Governing Board for Fiscal Year 2023-2024.

	SB 18-086 Appropriation	Total Amount Expended	SB 18-086 Scholarship Requirement	Total Amount Spent on Scholarships
Colorado Mesa University	\$300,000	\$227,381	\$30,000	\$30,000
Metropolitan State University of Denver	\$300,000	\$325,953	\$30,000	\$30,000
Western Colorado University	\$200,000	\$377,699	\$20,000	\$95,000
Colorado State University System	\$1,200,000	\$1,200,000	\$180,000	\$703,252
University of Colorado System	\$2,800,000	\$2,800,000	\$560,000	\$561,500
Colorado Community College System	\$300,000	\$300,000	\$30,000	\$300,000

TABLE 2: SB 18-086 Activity Funding FY 2023-24

Summarizes activities funded by SB 18-086 funding for Fiscal Year 2023-2024.

	Faculty and Adjuncts Hired	Internships Created	Degrees and Certificates Awarded	Scholarships Awarded	Presentations and Seminars Given	Amount of Other Funding Raised
Colorado Mesa University	0.25	12	5	15	15	\$0
Metropolitan State University of Denver	6	10	54	20	0	\$41,420
Western Colorado University	1.5	0	7	35	12	\$85,125
Colorado State University System	8	73	189/49/687	69	107	\$2,850,000
University of Colorado System	20	39	313	312	276	\$1,795,227
Colorado Community College System	3	41	102	24	3	\$145,000

Full Institutional Responses

Institutions used the funds received to support a wide range of public-facing activities, such as hosting summer camps, presenting at conferences, and offering trainings for community members. Institutions also raised significant additional funds to support their work in the cybersecurity realm. For additional details on institutional activities and funds raised, each institution's full response has been included in the subsequent pages. In some cases, responses have been edited for formatting and grammar but are otherwise unchanged from the institutional submission.

Colorado Mesa University

Table 3: SB 18-086 Appropriation Expenditure Report CMU

Governing Board Name	Colorado Mesa University
Total SB 18-086 Appropriation	\$300,000
Actual Amount Spent on Scholarships	\$30,000
Total number of scholarships awarded (see note 1)	15
Required Allotted Amount Earmarked for Scholarships	\$30,000
At or above allotted amount of scholarship earmark	Yes
Number of faculty/adjuncts hired as a result of funding (see note 2)	0.25
Number of student internships created (see note 3)	12
Number of degrees/certificates awarded in connection with SB 086 funding (see note 4)	5
Number of presentations/seminars given on cybersecurity	15
Amount of all other money raised to match state investment	\$0
Total Amount Expended	\$227,381
<p>Please discuss any additional ways in which SB 086 money was spent, which may not be captured in lines 6-9 and fundraising efforts as reported in FY22 and any other information you would like to be included in the report.</p> <p>Student researchers at the Cybersecurity Center have authored 2 peer-reviewed journal articles.</p>	

Metropolitan State University

Table 4: SB 18-086 Appropriation Expenditure Report MSUD

Governing Board Name	Metropolitan State University of Denver
Total SB 18-086 Appropriation	\$300,000
Actual Amount Spent on Scholarships	\$30,000
Total number of scholarships awarded	20
Required Allotted Amount Earmarked for Scholarships	\$30,000
At or above allotted amount of scholarship earmark	Yes
Number of faculty/adjuncts hired as a result of funding	6.0
Number of student internships created	10
Number of degrees/certificates awarded in connection with SB 086 funding	54
Number of presentations/seminars given on cybersecurity	0
Amount of all other money raised to match state investment	\$41,420
Total Amount Expended	\$325,953
Please discuss any additional ways in which SB 086 money was spent, which may not be captured in lines 6-9 and fundraising efforts as reported in FY24 and any other information you would like to be included in the report.	
The department continued funding a Cybersecurity Program Manager, a full-time Cybersecurity specialist in Dept. of Computer Information Systems, and the Director of the Cybersecurity Center, as well as scholarships for undergraduate students with the SB 18-086 monies.	

Cybersecurity-SB 18-086 Spending Summary - September 2023

The Bachelor of Science Degree in Cyber Security

The Bachelor of Science Degree in Cyber Security has continued to see growth in enrollment since it began Fall 2018. At the end of the 2022-2023 academic year, the program had 430 majors. Of those 430, 144 were senior status. During the spring of 2022, the BS in Cybersecurity earned the National Center of Academic Excellence in Cyber Defense by the National Security Agency (NSA). The Master of Science in Cybersecurity (CYBM) has also seen growth since it began in 2019 with 15 students. At the end of AY 2022-2023, there were 35 students enrolled in the program.

Faculty and Staff

The department continued funding a full-time Cybersecurity specialist faculty in Computer Information Systems and a Cybersecurity Program Manager with SB 18-086 monies. In addition, we partially fund the Director of the Cybersecurity Center. The SB 18-086 monies are also used to fund several of the adjunct faculty who teach courses in the Cybersecurity program. The funding provides adjunct pay for about 3-5 faculty a semester, but the programs cover the other 8 to 11 faculty who teach the 18 different Cybersecurity undergraduate courses each Fall, Spring, and Summer. Across the three departments, nine full-time faculty teach courses in the Cybersecurity programs.

SB 18-086 monies have not been used to directly fund academic research, but the faculty have continued to engage in academic scholarship around cybersecurity. We have used funding from the CYBM program to help offset some of the professional development costs for faculty. Below are a few examples of academic scholarship produced by the faculty:

- Fustos, J. Cybersecurity Certificate Selection Process: A Data Envelopment Analysis Approach. Published in February 15, 2023. *2023 SEDSI CONFERENCE* – presentation and proceedings
- Lambert, W. B., Fustos, J. & Moreno, A. (2023). Cybersecurity Certificate Selection Process: A Data Envelopment Analysis Approach. *Journal of Applied Business and Economics*.
<https://doi.org/10.33423/jabe.v25i3>
- Li, L. "Cybersecurity Education: An Interdisciplinary Approach." *International Police Executive Symposium*, 31st Annual Meeting, August 2022.
- Zhu, W. "Converting Upper-Division Undergraduate Computer Science Courses Online: Challenges, Student Performance, and Student Perceptions" *Frontiers in Education 2022*, Uppsala, Sweden, October 8-11, 2022. Data collected from Computer and Network Security course.

Scholarship

MSU-Denver created a scholarship in Fall of 2018 and has allocated 10% of the annual SB 18-086 awards to be distributed for scholarships. In FY 23, \$33,000 was awarded to 22 students in the amount of \$1500 per student.

Other Areas and Institutional Matches

The three departments fund a majority of part-time and full-time faculty who teach courses in the Cybersecurity Degree Program. The CYBM fund is also used to pay adjunct faculty who teach in the MS program or conference attendance. For FY 23, the CYBM program paid \$4,000 in professional development funds for faculty. The College of Health and Human Sciences also provided personnel support in the amount of \$1,020.00 for FY23.

Additionally, the Department of Criminal Justice and Criminology and the CYBM program fund paid \$6,300 to sponsor a table at the Women in Cybersecurity Conference hosted in Denver in March 2023. Three faculty and four students were able to attend the conference because of the sponsorship.

Graduate or Certificates

During FY 23, 40 undergraduate students completed their BS in Cybersecurity, and 15 students completed their MS in Cybersecurity. There were also 11 students who completed the STEMPath certificate program. The Cybersecurity Center continues to partner with MSU Denver's Classroom to Career Hub to provide students opportunities to complete Cybersecurity certifications through the Cybersecurity Certification Club (C3). During FY 23, 13 students earned CompTIA ITF+ and 4 students earned CompTIA A+ certifications. The Cybersecurity Center is also providing experience for students via the Public Infrastructure Security Cyber Education System (PISCES).

Amount of matching monies, including tuition, fees, federal funds, and industry donations:

The total amount of matching monies for FY 23 is \$119,708.04. The program continues to partner with MindSpark to provide STEMPath Cybersecurity Certificates to K-12 teachers. During FY 23, the program received \$70,708.04 in tuition monies for the STEMPath Certificates. The Cybersecurity Center received \$49,000 from external partners to support C3 certification initiatives, which allows students to go through a semester-long preparation program and test for certain industry certifications.

Western Colorado University

Table 5: SB 18-086 Appropriation Expenditure Report WCU

Governing Board Name	Western Colorado University
Total SB 18-086 Appropriation	\$200,000
Actual Amount Spent on Scholarships	\$95,000
Total number of scholarships awarded (see note 1)	35
Required Allotted Amount Earmarked for Scholarships	\$20,000
At or above allotted amount of scholarship earmark	yes
Number of faculty/adjuncts hired as a result of funding (see note 2)	1.5 FTE (\$197,574)
Number of student internships created (see note 3)	
Number of degrees/certificates awarded in connection with SB 086 funding (see note 4)	7
Number of presentations/seminars given on cybersecurity	0
Amount of all other money raised to match state investment	\$ 85,125
Total Amount Expended	\$377,699
<p>Please discuss any additional ways in which SB 086 money was spent, which may not be captured in lines 6-9 and fundraising efforts as reported in FY24 and any other information you would like to be included in the report.</p> <p>Cyber funding has created vital opportunities for faculty development and salaries in information security, supported by institutional resources for hiring and retention. Collaborating with financial aid has expanded scholarship opportunities for students entering this workforce, while networking among cybersecurity faculty statewide has strengthened Western’s programs. Although Western did not host any seminars this year, InfoSec students were directed to online networking and seminar opportunities, and faculty participated in monthly online events like "Get to know your fellow CAE-CD Colleagues."</p>	

Colorado State University

Table 6: SB 18-086 Appropriation Expenditure Report CSU

Governing Board Name	Colorado State University System
Total SB 18-086 Appropriation	\$1,200,000
Actual Amount Spent on Scholarships/Internships	\$703,252
Total number of scholarships awarded (see note 1)	69
Required Allotted Amount Earmarked for Scholarships	\$180,000
At or above allotted amount of scholarship earmark	Yes
Number of faculty/adjuncts hired as a result of funding (see note 2)	8
Number of student internships created (see note 3)	73
Number of degrees/certificates/cybersecurity course completion	189/49/687
Number of presentations/seminars given on cybersecurity	107
Amount of all other money raised to match state investment	\$2,850,000.00
Total Amount Expended	\$1,200,000
<p>Please discuss any additional ways in which SB 086 money was spent, which may not be captured in lines 6-9 and fundraising efforts as reported in FY22 and any other information you would like to be included in the report.</p>	

University of Colorado System

Table 7: SB 18-086 Appropriation Expenditure Report CU System

Governing Board Name	University of Colorado System
Total SB 18-086 Appropriation	\$2,800,000
Actual Amount Spent on Scholarships	\$561,500
Total number of scholarships awarded	312
Required Allotted Amount Earmarked for Scholarships	\$420,000
At or above allotted amount of scholarship earmark	Yes
Number of faculty/adjuncts hired as a result of funding	20.0%
Number of student internships created	39
Number of degrees/certificates awarded in connection with SB 086 funding	313
Number of presentations/seminars given on cybersecurity	276
Amount of all other money raised to match state investment	\$1,795,227
Total Amount Expended	\$2,800,000
<p>Please discuss any additional ways in which SB 086 money was spent, which may not be captured in lines 6-9 and fundraising efforts as reported in FY24 and any other information you would like to be included in the report.</p>	

Executive Summary

In addition to SB18-086 reporting criteria, the impact of the state’s investment in the Colorado cybersecurity ecosystem, including academic and community programs, industry outreach and partnership, and filling workforce needs, cannot be understated. These efforts are critical to Colorado’s support for expanding and strengthening the UCCS ties with commercial and governmental cybersecurity agencies across Colorado and to continue being a national leader in cybersecurity-related public and private sector activities. The following narrative details these funds' comprehensive impact on UCCS efforts to engage, support, and grow cybersecurity in Colorado and beyond.

Altogether, UCCS, in partnership with the National Cybersecurity Center (NCC), spent all of the \$2,800,000 FY 2024 State appropriation, shown in Figure 1. Additionally, nearly **\$1,350,979** in new grants and additional funds were awarded to and obtained by UCCS and NCC, in addition to the **\$4,536,423** in ongoing grants and **\$7,654,899** in completed grants (these are also reported in Figure 1.

Over the last year, UCCS has:

- Generated over \$56m in cyber funding (grants, matching funds) since 2019
- UCCS has funded between 12 – 17 research projects per year across 5 UCCS colleges since 2020

- From 2019 to 2023, cyber funds have been used to hire 20 cyber faculty/adjuncts, employ 80 student interns, award 767 cyber degrees and certificates, and allot ~\$3.2M in scholarships to more than 940 students
- While overall UCCS enrollment has declined in recent years by 13% (Spring 2020 – Spring 2024), Cybersecurity has offset declines, with enrollment growing almost 37% in the last 4 years.

UCCS and NCC are continuing to exponentially expand the cybersecurity ecosystem with initiatives, programs, research, and partnerships that are paying significant dividends by enhancing cybersecurity for Colorado and the nation. UCCS and NCC are grateful to the Colorado legislature and Governor for giving us this opportunity.



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UCCS has leveraged SB-086/CSI \$2,800,000 in 2023-2024 from the JBC to achieve the following under the broad legislation requirements:

Scholarship Amount – \$561,500

- 95 College of Engineering and Applied Science (EAS) students were awarded cybersecurity scholarships totaling \$390,000
- 27 College of Business (COB) students were awarded cybersecurity scholarships totaling \$125,500
- 72 College of Public Service (COPS) students were awarded cybersecurity scholarships totaling \$20,000.
College of Education (COE) students were awarded 20 cybersecurity scholarships totaling \$16,000
- 100 Middle and High School students received scholarships to Summer Middle School Cybersecurity Camps totaling \$10,000

Total Students Scholarships Awarded – 312

- 20 graduate and 75 undergraduate EAS cybersecurity students
- 9 graduate and 18 undergraduate College of Business (COB) cybersecurity students
- 72 COPS undergraduate cybersecurity students
- 18 College of Education (COE) cybersecurity students

- 100 Middle and High School students (in addition to the 20 students funded by an NSA grant) attended six no-cost (covered by CSI funds) weeklong cybersecurity camps at UCCS Summer 2024

Faculty Hires – 1 new, 1 vacancy, 18 ongoing

- College of Engineering and Applied Science (EAS) - 1 tenure track ongoing, 1 instructor ongoing, 1 new hire
 - In addition to the previously hired Endowed Gallogly cybersecurity chair in 2021 outside these funds, EAS has 2 tenured positions and 1 instructor with CSI funds. Cybersecurity focus areas for these faculty include cybersecurity operations, security in intelligent transportation, and privacy and anonymous networks.
- Cybersecurity Program Office (CPO) – 4 ongoing staff
 - Continues to employ the Director of Cybersecurity Programs with this funding, a cybersecurity full-time grant manager, a marketing and outreach position (.5 time), and a full-time events coordinator.
- College of Business – 2 Tenure Track ongoing, 1 instructor ongoing, pending 1 tenure track faculty Fall 2025
 - With the departure of 1 tenure track faculty, hiring will be done this year for a replacement. COB currently employs 2 tenure track faculty, one of which is the Cougar Endowed Chair, and one cybersecurity instructor with department funding.
- College of Public Service – 1 instructor
 - funds professional developing one current faculty in cybersecurity digital forensics
 - With the departure of 1 tenure track faculty, hiring will be done this year for a replacement.
- NCC – 8 ongoing staff

Student Internships Created – 39 degrees, 192 certificates

- UCCS cybersecurity students obtained 23 (22 EAS, 1 COB) cybersecurity internships in 2023- 2024
- UCCS EAS Blockchain research project supports 2 part-time interns and directly executes the legislative SB18-086 requirement to conduct research and development on encryption and data integrity techniques
- International Alliance of Trust Chains supported 3 part-time interns in 2023-2024. Interns conducted system administration, including installing/maintaining software on the IATC servers, doing security patches, and dealing with infrastructure issues
- 4 part-time cybersecurity interns were developers on block-chain coding
- The NCC hosted 5 cybersecurity student internships
- The Space ISAC hosted 2 cybersecurity college interns for 2023- 2024, fellows that conducted strategic

planning and evaluation of the cybersecurity threat intelligence platform

Degrees and Certificates Awarded – 313

In addition to the degrees and certificates awarded at UCCS this year, the University of Colorado (CU) Regents in spring 2024 approved a new certificate called Space Cyber Enterprise Management in the College of Business

UCCS EAS/COB degrees – 121 graduated

- Bachelor's degree in Innovation (BISC-BI, BUBI/CYSM & INFS) – Graduated 2023- 2024: 19 (10 in COB, 18 in EAS); Enrolled: 82 (COB: 15, EAS: 67)
- Bachelor of Science Cybersecurity (CSCI-BS/CYBS and CSCI-BS/ASES) – Graduated 2023-2024: 12; Enrolled: 97
- Bachelor of Arts Cybersecurity (CSCI-BA/CYBA) - Graduated 2023-2024: 8; Enrolled: 61
- BS in Business Emphasis Area in Cybersecurity Management (BUBS-BS CYSM & INFS);

COB – Graduated 2023-2024: 36; Enrolled: 125

- Master's Degree in Computer Science EAS (CSCI-MS/AMP & GMI) – Graduated 2023- 2024: 15; Enrolled: 77
- Master's Degree in Cybersecurity EAS (MAEG-MENG) - Graduated 2023-2024: 6; Enrolled: 18
- MBA Emphasis in Cybersecurity Management CoB (MBAD-MBA, MBAE-MBA, MBAO-MBA) – Graduated 2023-2024 3; Enrolled 28
- Doctor of Philosophy Degree EAS (ENGR-PHD: Engineering CSC & STY, SECR-PHD: Security)– Graduated 2023-2024 10; Enrolled 48
- Doctor of Business Administration in Cybersecurity Management CoB (EDBA-DBA)– 2022-2023: 0; Enrolled: 17
- Bachelor of Innovation in Computer Science (BICS-BI AMP, BSC, CRC, CTM, GLB) -Graduated 2023-24: 5; Enrolled: 28
- Bachelor of Science in Computer Engineering (CPEN-CS) - Graduated 2023-2024: 7; Enrolled: 65
- The College of Public Service Degrees
- Enrolled 24, a 450% increase since launching the focus area 2 years ago
- Criminal Justice, (CRJU-BA) - Cyber Crime & Cybersecurity Track Option - Graduated 2023-2024: 5; Enrolled: 24

The College of Letters, Arts and Sciences (LAS) Degrees

Students in the College of LAS have been exploring the intersection of cybersecurity and degrees in LAS, such as philosophy, mathematics, and sociology, and currently offer two undergraduate degrees. While the relative youth of LAS cyber programs means there have not been any conferrals, they now have 6 enrollees in their cyber programs and degrees.

- University Studies with a Computer Security intent – Graduated 2023-2024 0; Enrolled: 1
- Interdisciplinary Studies with a Cybersecurity intent – Graduated 2023-2024 0; Enrolled: 1
- Bachelor of Arts Interdisciplinary Studies (INST-BA) - Graduated 2023-2024 0; Enrolled: 4

UCCS certificates – 192

- Engineering and Applied Sciences Certificates – 0 (self-reported)
- Network System Security EAS – Graduated 2023-2024 0; Enrolled 0 (students self-report; none reported)
- Undergraduate Applied Cybersecurity Certificate EAS – 2023-2024 0; Enrolled 0 (students self-report; non-reported)
- College of Business Certificates – 30
- Graduate Certificate in Cybersecurity Management COB (CYSM-CRG, CYSM- CERU)– Graduated 2023-2024 6; Enrolled 2
- Undergraduate Certificate in Cybersecurity Management COB - graduated 2023-2024 24; Enrolled 11
- College of Public Service Certificates – 33
- Homeland Security and Emergency Management Leadership (GHSE-CERG) Graduate Certificate - Graduated 2023-2024 1; Enrolled: 7
- National Security Intelligence (GNSI-CERG) Graduate Certificate – Graduated 2023-2024 0; Enrolled: 13
- 32 Digital Forensic Investigators earned certificates, indicating mastery of the discipline, which is necessary to obtain credentials and qualify as an expert in court to testify about their findings.

NCC – 129 certificates

- K-12 Educational Camps – 116 certificates
- Cybersecurity training – Adults – 13 participants

Seminars, Presentations, and Publications on Cybersecurity – 276

UCCS Cybersecurity Distinguished Lecture/Invited Talk Series: 15

- Hosted 15 Distinguished Lectures by world-renowned scientists, with attendees primarily from UCCS students and faculty. The speakers also interacted intensively with UCCS students and faculty after the lecture.
 - o Lt Gen (ret) B.J. Shwedo (Director, Institute for Future Conflict, United States Air Force Academy), March 13, 2024, “The War in Ukraine and Cyber Warfare”
 - o Professor Lawrence A. Gordon (University of Maryland), April 5, 2024, “Economic Aspects of Cybersecurity”
 - o Professor Yuguang Fang (City University of Hong Kong), June 14, 2024, “Resources on the Move:

How Vehicles Provide Service Support for Smart Cities”

- Dr. Kevin Du (Syracuse University), October 2, 2023, "Developing an Internet and Blockchain Emulator for Research and Education"
- Lt Col Dr. Wayne “Chris” Henry (Air Force Institute of Technology), October 13, 2023, "Cybersecurity Research at Air Force Institute of Technology"
- Brandon Bailey (Aerospace), October 20, 2023, "Space Attack Research and Tactic Analysis Overview"
- Prof. Delores J. Knipp (University of Colorado Boulder), November 6, 2023, "The Sun as a Jammer, Spoofer and Data Denier"
- Prof. Maryline Laurent (Télécom SudParis, Institut Polytechnique de Paris, France), November 29, 2023, "Positioning privacy issues vs cyber security"
- Professor Todd E. Humphreys (UT Austin), February 7, 2024, "The Final Frontier is the Next One: Low-Earth Orbit’s Geostrategic Role”
- Dr. Scott Jasper (Naval Postgraduate School), February 12, 2024, "Russian Cyber Operations in the Ukraine War"
- Dr. Arun Viswanathan (Jet Propulsion Laboratory), April 4, 2024, "From Rockets to Routers: Navigating the Cybersecurity Challenges of Space Exploration"
- Professor Sigrid Elschot (Stanford University), April 23, 2024, "Safeguarding Spacecraft from Cosmic Hazards and Cyber Threats"
- Dr. Mohamed Abomhara (Norwegian University of Science and Technology), April 30, 2024, "Additional Measures When Transferring Healthcare Data to Third Countries"
- Dr. Genshe Chen (Information Fusion Technology), May 13, 2024, “Adaptive Markov Inference Game Optimization (AMIGO) for Rapid Discovery of Evasive Satellite Behaviors”
- Dr. Jianxi Gao (RPI), June 19, 2024, “Resilience of Complex Networks”

College of Engineering and Applied Sciences – 46 publications

- Eric Ficke, Raymond Bateman, and Shouhuai Xu. AutoCRAT: Automatic Cumulative Reconstruction of Alert Trees. Proceedings of International Conference on Science of Cyber Security (SciSec’2024), August 2024, to appear
- Theodore Longtchi and Shouhuai Xu. Characterizing the Evolution of Psychological Factors Exploited by Malicious Emails. Proceedings of International Conference on Science of Cyber Security (SciSec’2024), August 2024, to appear
- Theodore Longtchi and Shouhuai Xu. Characterizing the Evolution of Psychological Tactics and Techniques Exploited by Malicious Emails. Proceedings of International Conference on Science of Cyber Security (SciSec’2024), August 2024, to appear
- Xiaoyu Zhang, Maochao Xu, and Shouhuai Xu. Smart Home Cyber Insurance Pricing. Proceedings of

International Conference on Science of Cyber Security (SciSec'2024), August 2024, to appear

- J. Turner, S. Li, and S. Xu. Jamming-Resistant Communications via Cryptographic Secret Sharing, Proceedings of IEEE International Conference on Communications 2024 (ICC'2024), June 2024
- Theodore Tangie Longtchi, Rosana Montañez Rodriguez, Laith Al-Shawaf, Adham Atyabi, Shouhuai Xu. Internet-Based Social Engineering Psychology, Attacks, and Defenses: A Survey. Proc. IEEE 112(3): 210-246 (2024), May 2024
- Logan Zeien, Caleb Chang, Ekzhin Ear, and Shouhuai Xu. Characterizing Advanced Persistent Threats Through the Lens of Cyber Attack Flows. Military Cyber Affairs Journal, Volume 7, Issue 1, Article 5. May 2024, Available at <https://digitalcommons.usf.edu/mca/vol7/iss1/5>
- Zhen Li, Ning Wang, Deqing Zou, Yating Li, Ruqian Zhang, Shouhuai Xu, Chao Zhang, and Hai Jin. On the Effectiveness of Function-Level Vulnerability Detectors for Inter- Procedural Vulnerabilities. Proceedings of the 46th IEEE/ACM International Conference on Software Engineering (ICSE'2024): 157:1-157:12, April 2024
- Deqiang Li, Shicheng Cui, Yun Li, Jia Xu, Fu Xiao, Shouhuai Xu. PAD: Towards Principled Adversarial Malware Detection Against Evasion Attacks. IEEE Transactions on Dependable and Secure Computing, 21(2): 920-936 (2024), April 2024
- H. Zhang, J. Peng, J. Mao, and S. Xu. Repeated Data Breaches and Executive Compensation. Applied Economics Letters, January 10, 2024
- Keith Paarporn, Philip N. Brown, Shouhuai Xu. Analysis of Contagion Dynamics with Active Cyber Defenders. Proceedings of the 62nd IEEE Conference on Decision and Control (CDC'2023): 4990-4995. December 2023
- Shuai Li, Alessio Baiocco, and Shouhuai Xu. Characterizing Privacy Risks in Healthcare IoT Systems, Proceedings of the First International Workshop Secure and Resilient Digital Transformation of Healthcare (SUNRISE'2023), November 30, 2023
- Ekzhin Ear, Jose L. C. Remy, Antonia Feffer, Shouhuai Xu. Characterizing Cyber Attacks against Space Systems with Missing Data: Framework and Case Study. IEEE Conference on Communications and Network Security (CNS'2023): 1-9, October 2023
- J. Peng, H. Zhao, J. Mao, and S. Xu. How do repeated data breaches affect firm policies?. Accepted to Applied Economics Letters, September 2023.
- Zhen Li, Ruqian Zhang, Deqing Zou, Ning Wang, Yating Li, Shouhuai Xu, Chen Chen, and Hai Jin. Robin: A Novel Method to Produce Robust Interpreters for Deep Learning-Based Code Classifiers. Proceeding of the 38th IEEE/ACM International Conference on Automated Software Engineering (ASE'2023): 27-39, September 2023
- J. Shi, D. Zou, S. Xu, and H. Jin. CVMan: A Framework for Clone-Incurred Vulnerability Management. Applied Sciences 13 (8), 4948, 2023, August 2023
- Zheyuan Sun, Maochao Xu, Kristin M. Schweitzer, Raymond M. Bateman, Alexander Kott, Shouhuai Xu.

Cyber Attacks Against Enterprise Networks: Characterization, Modeling and Forecasting. Proceedings of International Conference on Science of Cyber Security (SciSec'2023): 60-81. August 2023

- Md Mahabub Uz Zaman, Liangde Tao, Mark Maldonado, Chang Liu, Ahmed Sunny, Shouhuai Xu, Lin Chen. Optimally Blending Honey pots into Production Networks: Hardness and Algorithms. Proceedings of International Conference on Science of Cyber Security (SciSec'2023): 285-304. August 2023
- Rosana Montañez Rodriguez, Theodore Tangie Longtchi, Kora Gwartney, Ekzhin Ear, David P. Azari, Christopher P. Kelley, Shouhuai Xu. Quantifying Psychological Sophistication of Malicious Emails. Proceedings of International Conference on Science of Cyber Security (SciSec'2023): 319-331. August 2023
- Qi Xia, Qian Chen, and Shouhuai Xu. Near-Ultrasound Inaudible Trojan (NUIT): Exploit your speaker to Attack your Voice-Controllable Devices. Proceedings of Usenix Security'2023, August 2023. UCCS Communique has reported this paper and 20 news media reports worldwide (see What's New – LCD (xu-lab.org)).
- Ekzhin Ear, Jose L. C. Remy, and Shouhuai Xu. Towards Automated Cyber Range Design: Characterizing and Matching Demands to Supplies. Proc. of the 2023 IEEE International Conference on Cyber Security and Resilience (CSR'2023). August 2023
- Sanghyun Byun, Arijet Sarker, Sang-Yoon Chang, and Jugal Kalita, Secure Aggregation for Privacy-Preserving Federated Learning in Vehicular Network, ACM Journal on Autonomous Transportation Systems, 2024
- Hsiang-Jen Hong, Sang-Yoon Chang, and Xiaobo Zhou Auto-Tune: An Efficient Autonomous Multi-Path Payment Routing Algorithm for Payment Channel Networks, Elsevier Computer Networks, 2023
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- Charles Benight, Margaret Morison, Carlos Eugenio Lopes Pires Xavier Torres, Barney Ricca, Shouhuai Xu, Yanyan Zhuang, "Mass Trauma Resilience Open Science Data Sharing Solutions Technology", the 39th Annual Meeting, International Society for Traumatic Stress Studies (ISTSS'23), November 2023.
- Christina Glasauer, Martin K.-C. Yeh, Lois Anne DeLong, Yu Yan, Yanyan Zhuang, "'C'ing the Light — Assessing Code Comprehension in Novice Programmers Using C Code Patterns", *Computer Science Education*, February 2024.
- Yanyan Zhuang, Yu Yan, Lois Anne DeLong, Martin K.-C. Yeh, "Do Developer Perceptions Have Borders? Comparing C Code Responses across Continents", *Software Quality Journal*, November 2023.
- Keynote, conference, panel, and other presentations in the year 2023 – 3 presentations
- Mincheol Shin, Sang-Yoon Chang, Jonghyun Kim, Kyungmin Park, and Jinoh Kim, Intelligent Trajectory-Based Approach to UAV Location Integrity Checks, IEEE International Conference on Computer

Communications and Networks (ICCCN), 2024, Hawaii, USA

- Junxian Zhao, Xiaobo Zhou, Sang-Yoon Chang, and ChengZhong Xu, Let It Go: Relieving Garbage Collection Pain for Latency Critical Applications in Golang, ACM International Symposium on High-Performance Parallel and Distributed Computing (HPDC), 2023, Orlando, USA
- Kelei Zhang and Sang-Yoon Chang, Performance or Anonymity? Source-Driven Tor Relay Selection for Performance Enhancement, IEEE International Conference on Computer Communications and Networks (ICCCN), 2024, Hawaii, USA

Scholarship for Service students (SFS) – 1 Publication, 6 Conference Presentations

- Sang-Yoon Chang, Arijet Sarker, Simeon Wuthier, Jinh Kim, Jonghyun Kim, and Xiaobo Zhou, Base Station Gateway to Secure User Channel Access at the First Hop Edge, Elsevier Computer Networks, 2024
- Nazmus Sakib, Simeon Wuthier, Kelei Zhang, Xiaobo Zhou, and Sang-Yoon Chang, From Slow Propagation to Partition: Analyzing Bitcoin Over Anonymous Routing, IEEE International Conference on Blockchain and Cryptocurrency (ICBC), 2024, Dublin, Ireland
- Sourav Purification, Simeon Wuthier, Jinh Kim, Jonghyun Kim, and Sang-Yoon Chang, Fake Base Station Detection and Blacklisting, IEEE International Conference on Computer Communications and Networks (ICCCN), 2024, Hawaii, USA
- Manohar Raavi, Simeon Wuthier, and Sang-Yoon Chang, Securing Post-Quantum DNSSEC Against Fragmentation Mis-Association Threat, IEEE International Conference on Communications (ICC), 2024, Denver, CO, USA
- Arijet Sarker, Simeon Wuthier, Jinh Kim, Jonghyun Kim, and Sang-Yoon Chang, Version++: Cryptocurrency Blockchain Handshaking with Software Assurance, IEEE Consumer Communications & Networking Conference (CCNC), 2023, Las Vegas, USA (Also had a Demo titled Version++ Protocol Demonstration for Cryptocurrency Blockchain Handshaking with Software Assurance. Best Demo Award at IEEE CCNC 2023.)
- Manohar Raavi, Simeon Wuthier, Xiaobo Zhou, and Sang-Yoon Chang, Post- Quantum QUIC Protocol in Cloud Networking, European Conference on Networks and Communications & 6G Summit (EuCNC), 2023, Gothenburg, Sweden
- Sanghyun Byun, Arijet Sarker, Ken Lew, Jugal Kalita, and Sang-Yoon Chang, Privacy- Preserving Trust Management for Vehicular Communications and Federated Learning, Silicon Valley Cybersecurity Conference (SVCC), 2023, San Francisco, USA

College of Business (COB) Publications – 2

- Terri Johnson Akse, Jerry Sellers, and Bruce Chesly. International Astronautical Congress in Paris 2022 (Cyber in the Space Domain). We also have an abstract that was accepted to the IAC for 2023 in Baku.
- Jiwei Luo, Jian Luo, Guofang Nan, Dahui Li. Fake Review Detection System for Online E-commerce Platforms: A Supervised General Mixed Probability Approach. Decision Support Systems, 2023, 114045,

<https://doi.org/10.1016/j.dss.2023.114045>.

Cybersecurity Program Office – 140 presentations

- Presentations were given to ISSA, AFCEA (Armed Forces Communications & Electronics Association), Small Business Development Center, 10 corporate partners, Space ISAC membership, CS Rocks K-12 conference, Cyber First Fridays, Colorado Springs K-12 school superintendents, middle school cyber camps, Women in Cybersecurity (WiCyS), UCCS Cybersecurity Career Panels, NSA Centers of Academic Excellence, Cyber Education, CAE Community Symposium, Cybersecurity Across Disciplines, and many other local, national, and international partners.

College of Public Service - 1 publication, 1 presentation

- Quintana, K., Sutton Chubb, C., Olson, D., & Kosloski, A. (2024). Cybersecurity Skills, Knowledge and Abilities for Criminal Justice Professionals: An Exploratory Study of Practitioners' Perspectives. *Journal of Cybersecurity Education, Research and Practice*, 2024(1), 20.
<https://digitalcommons.kennesaw.edu/jcerp/vol2024/iss1/20/>
- Guest Lecture Series in Cybercrime and Cybersecurity - Quintana, K., Kosloski, A.E., Olson, D., & Chubb, C. 2024. Online Participation in Illicit Economies. Presented at the Western Criminology Conference in Cybercrime and Cyber Victimization panel.

National Cybersecurity Center (NCC) – 36 presentations

Space ISAC- 25 presentations

Based on a combination of state and additional funds, attended, and presented at national and international conferences including Space Symposium, CYSAT, CyberLEO, Space Industrial Conference/SSIB Workshops, Small Sat and more.

- Matching/additional grants – New - \$1,350,979, Ongoing - \$4,536,423, Completed -\$7,654,899
 - o Cybersecurity Program Office - \$ 4,613,785
- New grants - \$159,062
 - o National Security Agency (NSA) – \$159,062, GenCyber Combination Teacher/Student Camp GenCyber Teacher Grant, 2024-2026, Gretchen Bliss,
 - o Joshua Alcorn, Terri Johnson Akse
- Ongoing Grants - \$441,991
 - o National Science Foundation – \$180,097 of \$100,000,000 – NSF Engines Development Award for 2023 – 2025, Gretchen Bliss, Dr. Xu, and other community partners
 - o NSA – \$112,215 – GenCyber Student Camp 2022 – 2024, Gretchen Bliss, Josh Alcorn
 - o NSA – \$149,680 – GenCyber Teacher Camp 2022 – 2024, Gretchen Bliss, Josh Alcorn
- Completed in FY 2023/2024 - \$3,912,731
 - o NSA – \$103,272 – GenCyber Introduction Teacher Camp 2020 – 2022, Gretchen Bliss, Josh Alcorn
 - o NSA – \$106,564, GenCyber Advanced Teacher Camp 2020 – 2022, Gretchen Bliss, Josh Alcorn
 - o NSA – \$349,907 – CAE Northwest Hub 2021-2023, Gretchen Bliss
 - o NSA – \$3,352,987 – Faculty Development 2020-2023, Gretchen Bliss, Terri Johnson Akse

- SI funded Research Projects – New \$366,986 (Not included in “Matching/Additional Grant” total)
 - COPS - Public Safety Initiative (PSI) Cybersecurity Initiative Funding Request -\$95,000, Janet Van Kampen
 - COPS - Understanding the Social & Behavioral Role in Cybercrime & Cybersecurity -\$15,692, Anna Kosloski
 - COE - Enhancing Digital Leadership for Student Affairs and Higher Education Professionals - \$2,500, Patty Witkowsky, Phillip Morris, Nick Tapia-Fuselier
 - LAS - Developing Language and Cultural Literacy Skills to Address Strategic Diversity Needs in Cybersecurity – \$13,333, Fernando Feliu-Moggi
 - COB - Graduate Certificate in Space Cyber Enterprise - \$30,000, James Van Scotter
 - EAS - International Alliance of Trust Chains - \$10,000, Terrance Boulton
 - Library - O'Reilly for Higher Education Subscription - \$8,463, Joel Tonyan, Rhonda Glazier
 - EAS - Creating and Holding UCCS Distinguished Lecture Series in Cybersecurity -\$10,000, Shouhuai Xu
 - EAS - Creating a Cybersecurity Metrics Framework to Enable Quantitative Decision-Making - \$50,000, Shouhuai Xu
 - EAS and Blockframe - PhilosBDL Blockchain Development Research Program -\$90,041, Terrance Boulton, Christopher Gorog
 - COE - Campus Connections: Cultivating Social and Emotional Wellness in At-Promise Youth through Digital Citizenship - \$17,907, Joe Wehrman, Cortny Stark, Diane Stutey

UCCS Engineering/Cybersecurity Grants – \$12,731,114

- New grants - \$583,932
 - NSF \$134,684, POSE: Phase I: Open-Source Ecosystem (OSE) for Open-Source Software Safety Pre-qualification, June 2024-May 2025, Gedare Bloom, Yanyan Zhuang
 - USDOT \$5,000, Dwight David Eisenhower Transportation Fellowship Program (DDETFP) Graduate Fellowship, August 2023-May 2024, Gedare Bloom, Katrina Rosemond
- UCCS was awarded funding from NSF for the CyberCorps Scholarship for Service (SFS) program- 7 cybersecurity students (4 PhD, 2 MS, and 1 Undergraduate) – \$685,247 for AY 2023-2024 (\$2,123,883.27 cumulative since Fall 2019).
- “CC* Campus Compute: Building a Computational Cluster for Scientific Discovery”, National Science Foundation (NSF), \$294,361, PI: Greg Williams, co-PI: Oluwatosin Oluwadare and Yanyan Zhuang, July 2024 – June 2026.
- “ERI: ECCS: Concealing Side-Channels in Real-Time Schedulers”, National Science Foundation (NSF), \$149,887, PI: Gedare Bloom, co-PI: Yanyan Zhuang, March 2022 – February 2025.
- Ongoing Grants - \$4,094,432
 - VICEROY – \$1,999,567, Cyber Ranger Forge: A University of Colorado System Virtual Institute for Cyber Range and Research based Advanced Training of

- ROTC Cadets for Next Generation Cyber Operations, July 2023 – June 2026, Shouhuai Xu, Joshua Alcorn, Sang-Yoon Chang, Keith Paarporn
- NSF – \$180,000, Regional Innovation Hub: RISE. Technical Pillar Lead 2023- 2025, Shouhuai Xu
- International Alliance for Strengthening Cybersecurity and Privacy in Healthcare – \$120,000, 2023-2028, Shouhuai Xu
- NSA – \$244,969, University of Colorado Colorado Springs CAE Grant August 2021 – August 2024, Gedare Bloom, Shouhuai Xu, Philip Brown
- NSF – \$599,896, Career: Foundations for Real-Time System Security, July 2021 – June 2026, Gedare Bloom
- ETRI – \$440,000, Electronics and Telecommunications Research Institute or ETRI (Prime Sponsor is Institute for Information & Communication Technology or IITP from South Korea), Securing Availability and Integrity for 6G Flying Base Station Control and Communications, April 2021 – December 2024, Sang-Yoon Chang
- ETRI – \$210,000, Electronics and Telecommunications Research Institute or ETRI (Prime Sponsor is Institute for Information & Communication Technology or IITP from South Korea), Trust Network Model for 6G Networking Security, July 2021 –December 2024, Sang-Yoon Chang
- CU Next – \$300,000, Creating CU Cyber Range to Make UCCS and CU Denver a National Leader in Cybersecurity Education and Workforce Development, UCCS Co-PIs: Joshua Alcorn, Jugal Kalita, and Greg Williams. CU Denver Co-PIs: H. Jafarian, J. Murdoc, and D. Sicker, 2022-2025 Shouhuai Xu
- Completed in FY 2024 – 3,742,168
 - NSF – \$500,000, SHF: Small: Whole-application Coordinated Parallelization Through The Optimization Of Abstraction Hierarchies, July 2019 – September 2023, Qing Yi, Shouhuai Xu
 - NSA – \$108,660, 2022 DOD Cyber Scholarship, September 2022 – December 2023, Jugal Kalita
 - NSF – \$250,472, Game Theoretic Methods for Socially Networked Multi- Agent Systems, August 2020 – July 2023, Philip Brown
 - UCCS Equity, Diversity, and Inclusion – \$24,080, Recruiting and Retaining Women in Cybersecurity, 2021 – 2024, Yanyan Zhuang, Gretchen Bliss, Katrina Rosemond
 - UCCS – \$19,929, Faculty Revitalization Fellowship Program, June 2023 – May 2024, Yanyan Zhuang
 - ISA – \$6,153, Cyber Risks in the Smart Home Ecosystem, June 2022 – February 2023, Shouhuai Xu
 - NSF – \$292,141, CICI: RDP: Security and Privacy Policy Enforcement for Research Data Protection, July 2019 – July 2023, Yanyan Zhuang
 - Argonne National Laboratory – \$45,178, RTEMS Subcontract, June 2023 – August 18, 2023, Gedare Bloom

- Committee for Research and Creative Work (CRCW) – \$7,493.00, Do Developer Perceptions Have Borders? Comparing C Code Responses across Continents, June 2020 – August 2023, Yanyan Zhuang
- NSF – \$1,029,915, CICI: SSC: Real-Time Operating System and Network Security for Scientific Middleware, October 2018 – March 2024, Gedare Bloom
- NSF – \$250,472, Game Theoretic Methods for Socially Networked Multi- Agent Systems, August 2020 – July 2023, Philip Brown
- NSF – \$499,094, Assuring Cyber Security and Privacy for Human Resilience Research: Requirements, Framework, Architecture, Mechanisms and Prototype, July 2021 – June 2024, Shouhuai Xu, Yanyan Zhuang
- NSF – \$708,581, Cybersecurity hardening for scientific industrial control systems, August 2019 – September 2023, Gedare Bloom
- NCC - \$119,708
- SPACE ISAC – \$1,800,000
- Membership dues valued at roughly \$ 1.8M in FY 2023.

In addition to the University specific requirements, UCCS has undertaken significant work on legislation-specific technical requirements:

- Public Safety Initiative (PSI) (within the College of Public Service (CPS)) – In support of SB 18-086 Section 4 24-33.5-1904 paragraph 2f, “Support state and federal law enforcement agencies with their responsibilities for investigating and collecting information related to cyber-based criminal and national security threats” continued to facilitate professional development education and training for 37 area law enforcement agencies across Colorado.
- 64 Digital Forensic Investigators received cybercrime training, and one agency received hardware and software to enhance its cybercrime investigative abilities.
- 32 Digital Forensic Investigators earned certificates, indicating mastery of the discipline, which is necessary to obtain credentials and qualify as an expert in court to testify about their findings.
- PSI Support to Law Enforcement (LE) delivered \$99,311 in cybercrime training and equipment to 37 area LE agencies, sponsoring 11 cybercrime investigation courses for 64 law enforcement Investigators. Most of the LE agencies that received support are also members of the Colorado Internet Crimes Against Children (ICAC) Task Force. The ICAC Task Force assists state and local law enforcement and prosecutorial agencies in developing effective, sustainable responses to online child victimization, including responses to Child Sexual Abuse Images (CSAM). The ICAC Program has increased law enforcement's capacity to combat technology facilitated crimes against children at every level. In 2023, the Colorado ICAC Task Force conducted over 2,400 investigations and 4,100 forensic exams.
- *Cellebrite: Seattle PD ICAC- https://youtu.be/F_pcWXohOMY
PSI heightens awareness and expands the training and education of law enforcement personnel to

prevent, investigate, and respond to cybercrimes.

PSI delivers cybersecurity capability and expertise in an increasingly critical area of law enforcement. PSI offers insight and advice necessary to adapt and contend with a rapidly evolving cybersecurity threat.

UCCS funded “Blockchain Research Program in Support of Colorado Senate Bill SB18-086

In support of the SB18-086 section two requirements. The largest efforts were in applied development of MVP version of the components designated for public use by the State of Colorado programs, key developments include:

- Sixteen (16) servers for IATC consortium services were installed at the UCCS data center, and the first instance of the division one service is operational. Partnerships are in place for division two consortium services to be operated and tested at Pacific Northwest National Laboratory.
- Publication of testing results for parallel homogeneous independent ledgers operating in parallel (Philos) was published in the dissertation by Dr. Gorog, “A Sustainable Framework for Distributed Ledger.” A Sustainable Framework for Distributed Ledger - ProQuest
- Development and release of the service console to provide homogeneous administration for each system of all the various system types.
- Development of the platform for the creation and execution of transaction contracts implementing a custom language supported with a GUI developer interface and execution virtual machine for execution of distributed ledger transactions.
- The production supporting the zero-trust module for each of the Philos™ systems was extended to support the initiation of the Philos operation using a common executable program for all systems.
- Services were created for monitoring the runtime operations of each Philos™ system with a system health monitor and log issues to local and remote systems logging platforms.
- Partnerships were initiated with Southern California Edison to utilize the ledger when mature to support the transaction coordination of critical infrastructure physical devices supporting their mission.
- Alliance with Lockheed Martin was set up to utilize the platforms when mature to track military supply chain components and operations.
- Membership of the Blockchain Development community grew to 480 community members, and the BOD for the PhilosBDL corporate changed out to bring on new president Pam Russell and Board Members Micheal Samorokov, Kirk Schipke, and Tim Montgomery.
- Engaged with standards from IEC and ISO, discussing the provision of platform criteria for international standards.
- Interns from the University of California Berkley, Wright State University, De Paul University, and Colorado State University were added to the program.
- Two funded interns were supported by the Jefferson County Workforce Center and one through the

Pikes Peak Work Center.

- Grant pursuits filed with Department of Energy DE-FOA-0003223 partnering with Pacific Northwest National Labs, Southern California Edison, Maplewell Energy, UCCS, Colorado OIT, Freedom Motors, Colorado State University, G&W Electric, IATC, and PhilosBDL.
- Grant pursuit filed with National Institute of Standards In Technology 2024-NIST- RAMPS-01 with letters of support from partners: Lockheed Martin Corporation, University of Colorado Colorado Springs, Colorado State University, Colorado State University Pueblo, Pikes Peak Work Force Center, Jefferson County Business & Workforce Center, Colorado Smalls Government Contractor Collaborative, Colorado Small Business Development Center, Colorado APEX accelerator, Murray Security Services, PhilosBDL, Freedom Motors, CSD Cyber, AFCEA, International Alliance of Trust Chains, Innosphere Ventures, Catalyst Campus, and National Cybersecurity Center
- A grant pursuit filed with Department of Energy DE-FOA-0002500 for two concepts with partners: United Power, Southern California Edison, PNNL, NREL, General Electric, and WhyGreene Energy.
- IEEE Digital Privacy aligned support was expanded for a third year with funding increased to support a workshop conference at Carnegie Mellon University, policy workshops for legislators in Washington DC, and a second set for Brussels, Belgium EU, and a global privacy conference which will be held in San Jose, CA.
- Intellectual property from the effort has resulted in 4 issued U.S. Patents and 1 Issued with 9 Pending International Patent filings.
- Dr. Gorog presented at the Blockchain Conference to an online audience in Eastern Europe sponsored by the IEEE Blockchain Council.
- Dr. Gorog presented a keynote at the Intelligent Transportation Systems (ITS Canada) on “Digital Privacy and Virtual Trust in the Post-Digital Transformation Era.”
- Dr. Gorog is the current chair of the IEEE Digital Privacy Initiative. Details can be found at www.digitalprivacy.ieee.org.
- BlockChain Development Community: Volunteer members and companies provided 85% of the 53,000 hours contributed to the effort from 2017-2024. Compared to the \$517,472 invested by the State, this provides an equivalent in-kind community-sponsored effort of \$3,457,528.
- BlockFrame Incorporated: provided in-kind sponsorship via media outreach services, refreshments and prizes, venue cost, and professional services for weekly meetings. They also funded developer staff and legal fees for intellectual property protection. These in-kind services and sponsorship over a six (6) year period provided matching support of approximately \$540,000.
- Bees Computing & Ajames Technologies: provided in-kind sponsorship including management platforms, volunteer and community coordination support platforms and services, IT Managed Services, and web repositories. These in-kind services and sponsorship over a six (6) year period provided matching support of approximately \$120,000.
- Maintained engagement for Space ISAC Collaborative Groups - Information Sharing Working Group

(ISWG), Headquarters Task Force, Supply Chain Risk Management (SCRM) Working Group, Analyst Working Group, Space Policy Directive 5 (SPD-5) Task Force, Exercise Task Force, Space ISAC Summit Task Force, Headquarters Task Force, Cybersecurity Maturity Model Certification (CMMC) Task Force, Public Relations & Digital Strategy (PR&D) Task Force, Space Symposium Task Force, Space Threat Resource & Intelligence Knowledge Exchange (STRIKE) Task Force, Small Satellite Community of Interest, Artificial Intelligence / Machine Learning (AI/ML) Community of Interest, Zero Trust Architecture (ZTA) & Blockchain Community of Interest, Workforce Development Community of Interest, Research and Technology Community of Interest, and Cislunar Affinity Group. Now offering Affinity Group engagement with Cislunar Affinity Group and LEO Owner Operator (OO) Affinity Group. Watch Center capabilities are now highlighted with Watch Center Stand Ups focused by cell reporting function for discussion on outputs from the Watch Center cells and input from the community.

Colorado Community College System

Table 8: SB 18-086 Appropriation Expenditure Report CCCS

Governing Board Name	Colorado Community College System
Total SB 18-086 Appropriation	\$300,000
Actual Amount Spent on Scholarships	\$30,000
Total number of scholarships awarded (see note 1)	24
Required Allotted Amount Earmarked for Scholarships	\$30,000
At or above allotted amount of scholarship earmark	YES
Number of faculty/adjuncts hired as a result of funding (see note 2)	3.00
Number of student internships created (see note 3)	41
Number of degrees/certificates awarded in connection with SB 086 funding (see note 4)	102
Number of presentations/seminars given on cybersecurity	3
Amount of all other money raised to match state investment	\$ 145,000.00
NSF HIS Puente Grant (\$95,000), UCCS New Grant (\$50,000)	
Total Amount Expended	\$300,000
<p>Please discuss any additional ways in which SB 086 money was spent, which may not be captured in lines 6-9 and fundraising efforts as reported in FY22 and any other information you would like to be included in the report.</p>	
<p>Note 1: Cyber Security scholarships awarded through Financial Aid focus on offering significant support that will make the most impact for Cyber Security students. Allotted scholarship monies are awarded in \$1,250 apportionments to students to create significant positive impact for awardees.</p>	
<p>Note 2: SB 18-086 funds have been used to pay the salary and benefits for 3 full-time cyber security faculty members (2 full salaries and 1 partial salary).</p>	
<p>Note 3: Appropriated funds have been utilized to facilitate student connections with internship sites by planning hiring events, community partner gatherings, and travel related to building community partnerships. Partnered with UCCS in new funding for student internship stipends and support.</p>	
<p>Note 4: Completers for the cybersecurity degree and certificates since the implementation of SB 18-086 appropriation funds have grown significantly. During the past academic year, the Cyber Security program had 102 total completers, 51 of which earned an Associate of Applied Science degree in Cyber Security - which represented the largest group of completers to date for the full AAS degree - while 51 were awarded certificates in Cyber Security. Full-time personnel - funded by the SB 18-086 appropriation - allowed for program capacity and quality resulting in a greater number of Cyber Security completers.</p>	
<p>NOTE 5: In addition to the \$30,000 apportionment of scholarship monies from SB-18-086, the PPSC Foundation raised \$3,750 additional dollars for cyber security related grants. Both SB-18-086 and PPSC Foundation scholarships were \$1,250 per student award</p>	

Conclusion

Fiscal Year 2024-25 was the sixth year of additional funding for cybersecurity and distributed ledger technologies. After receiving limited funding due to the COVID pandemic, funding was fully restored for Fiscal Year 2021-22.

Outside of offering scholarships to students pursuing degrees and credentials related to cybersecurity, and the hiring of faculty and staff, institutions focused funding on improving their cyber facilities and offering outreach events through cyber centers.

Funding for this program is currently on-going through the institutions' limited purpose fee-for-service contracts.