Utah Board of Higher Education
Virtual Meeting
Friday, October 1, 2021

AGENDA

2:00 – 2:05 PM	Welcome – Chair Simmons	
2:05 – 2:10 PM	Funding recommendations for Deep/Emerging Tech grants from Deep Tech Advisory Council – Board member Datta	TAB A
2:10 – 2:15 PM	Masks in a medical setting	
2:20 – 3:20 PM	**Closed Session**	
3:20 – 3:30 PM	**Action Item** 1. UHEAA Legacy Portfolio	

Projected times for the various meetings are estimates only. The Board Chair retains the right to take action at any time. In compliance with the Americans with Disabilities Act, individuals needing special accommodations (including auxiliary communicative aids and services) during this meeting should notify ADA Coordinator, 60 South 400 West, Salt Lake City, UT 84180 (801-646-4783), at least three working days prior to the meeting. TDD # 801-321-7130.

UTAH SYSTEM OF HIGHER EDUCATION

MEMORANDUM

TAB A

October 1, 2021

Deep/Emerging Technologies Grant Selections

In accordance with USHE policy R430, the Deep Technology Advisory Council issued a request for proposals on July 26, 2021 seeking to fund programs in support of growing the workforce needed to conduct research and development in Utah's expanding deep technology industries, including but not limited to: advanced materials, artificial intelligence, augmented and virtual reality, biotechnology, photonics, quantum computing, robotics, and secure computing.

The Council received 22 proposals, with representation from six of the eight degree-granting institutions. The proposals were scored using the criteria outlined in policy R430-5.3. Based on the scores and subsequent discussion among the members of the Council, nine proposals were selected.

Institution	Application Title	Year 1	Year 2	Year 3
UVU & USU Joint	Intermountain Intelligence, Industry and Security Consortium	$1,671,300	$1,671,300	$1,671,300
Utah Valley University	Automated Drone-Based System with AI Training	$417,088	$383,502	$0
University of Utah	Deep Learning Certificate in AI and Robotics	$245,400	$85,400	$85,400
University of Utah	Graduate Programs in Secure Computing	$302,787	$181,921	$186,179
University of Utah	Bringing Fairness in AI to Forefront of Education	$112,153	$113,149	$118,181
Utah State University	Stackable Credentials in Data Science	$70,337	$72,827	$75,412
Dixie State University	Precision Medicine and Functional Genomics Program	$575,710	$225,920	$230,714
Weber State University	Autonomous Vehicle Systems Graduate Certificate	$290,000	$290,000	$290,000
Weber State University	Machine Learning/Data Science	$355,800	$355,800	$355,800
	Total	**$4,040,575**	**$3,379,819**	**$3,012,986**

Commissioner's Recommendation

The Commissioner recommends that the nine grant proposals selected by the Deep Technology Advisory Council be approved by the Board for recommendation to the legislature for funding.

Attachment

DTTI Grant – Recommended Programs for Funding

Utah Valley University and Utah State University
Intermountain Intelligence, Industry and Security Consortium

Overview

The threat landscape facing Utah's deep technology sector has never been more challenging or complex. Cyberattacks have increased in severity and scope. Intellectual property is constantly under threat of theft, resulting in significant financial loss for individual companies and the American economy. Critical infrastructure is vulnerable to hacking, disrupting millions of lives and costing billions of dollars. Weaknesses in our companies, systems, processes, and practices are exploited by criminals, terrorists, and hostile foreign governments. The breakneck pace of technological innovation that is fueling Utah's standout economic growth and private sector diversification has raised the state's profile as a target. The 2018 update to the US Intellectual Property Commission Report, headed by Former Director of National Intelligence Dennis Blair and Utah's own Jon M. Huntsman, former Utah governor and Ambassador to China, underscores that "China's industrial espionage and cyber theft efforts continue *without adequate US investment in manpower and programs to thwart these efforts*." Even global health crises and natural disasters that originate far from our state have demonstrated the capacity to harm Utah's businesses and Utahns' lives. These are not future problems—they are happening now, and they are happening here in Utah.

Our proposal addresses this reality and proposes the creation of a multifaceted academic pipeline program that will produce workforce innovators with the cross-disciplinary credentials to meet this challenge and go further—establishing Utah as a national leader not only in technological research and development but in next-generation security thinking and practice. Our proposal will ensure that Utah's keystone industries as well as state and local government are staffed to handle contemporary security
In its design, the I3SC IDAR program delivers both immediate and long-term benefits in advancing these goals. Some immediate impacts will result from concepts and programs our schools have piloted and with funding can expand to scale. In other cases, our I3SC team will advance entirely new curriculum in pioneering fields (including Anticipatory Intelligence, Security Analytics, Artificial Intelligence, and Secure Computing) and will invest the effort, labor hours, and determined leadership required to move these new programs from concept to classroom through targeted personnel recruitment, the rigorous USHE approvals process, and the groundbreaking step of establishing joint university curricula.

Educational Outcomes

With DTTI funding, CAI and CNSS will lead the collaborative efforts of all academic partner programs under the Intermountain Intelligence, Industry, and Security Consortium to forge a deep technology workforce development pipeline by expanding existing and constructing new coordinated, complementary, and stackable program offerings within and across UVU and USU. This will be done through:

- Constructing the state's first **Bachelor of Science in Secure Computing** at UVU. The Secure Computing degree will prepare students to enter high-demand career fields filled with exciting challenges. Students will be provided with the skills to reduce vulnerability in the national information infrastructure, protect national and private industry information security, and safeguard industries' proprietary information from hackers. This program will help prepare cyber defense professionals for careers in both Utah's public and private sector.

- Building the nation's first **Master of Anticipatory Intelligence** (MAI) professional degree program at USU as a graduate destination for both USU and UVU students from science, technology, engineering, mathematics, and social science undergraduate disciplines. Partnering CAI with USU's Data Analytics and Information Systems department, this graduate degree will establish skills and intelligence to safeguard innovation and embed security and resilience design in frontline technology development, including through an emphasis in **Security Analytics** to merge advances in data analytics, cybersecurity, machine learning, and geopolitical threat analysis to better anticipate and respond to increasingly sophisticated threats against Utah's emerging technology sector.

- Developing two new **undergraduate certificate** programs at UVU: one in **Security and Emerging Technology**, a second in **Intelligence**; and a new **graduate certificate** program in **Artificial Intelligence.** These multidisciplinary certificate programs will provide UVU undergraduate and graduate students across a wide range of majors and working professionals

with the specialized knowledge base and skill sets necessary to fill in-demand positions in industry.

- Expanding the scale, student intake, and curriculum offerings of CAI and CNSS' respective existing programs in Anticipatory Intelligence and Security Studies to orient specifically to the needs of Utah's deep technology sector. In particular, CAI will scale up USU's **undergraduate minor** and **graduate certificate in Anticipatory Intelligence**, designed to complementarily interlock with the student's primary field of expertise across STEM and social science fields at the undergraduate and graduate level; and CNSS will grow the reach and impact of UVU's existing **undergraduate certificates** and **bachelor's programs in Security Studies**.

- Coordinating a **complementary, interlocking, and non-overlapping curriculum** between CNSS, CAI, and other participating I^{3}SC academic partners at UVU and USU so that undergraduate students at either institution can pursue compelling value-added graduate training at the other institution. Students from both universities will be able to pursue stackable credentials through the I^{3}SC educational pipeline and receive expansionary, non-duplicative training directly preparing them for the Utah workforce.

- Establishing a series of **jointly taught topical courses** between CAI and CNSS that are applicable at both universities and leverage diverse areas of expertise from personnel out of STEM and social science disciplines as well as industry professionals from I^{3}SC's primary employer partners. These joint courses will expose students in both programs to real-time developments in industry intelligence practice and deep technology research and development across a broad horizon.

Funds requested:

Year 1		Year 2		Year 3		
One-Time	Ongoing	One-Time	Ongoing	One-Time	Ongoing	**3-Year Total**
$0	$1,671,300	$0	$1,671,300	$0	$1,671,300	$5,013,900

Utah Valley University
An Automated Drone-Based System with AI Training for Online Condition Monitoring, Fault Diagnosis, and Reliability Prediction of Wind Turbine Blades

Overview:
Wind energy has played an increasingly vital role in renewable power generation since the beginning of 21st century. The global installed wind power capacity recorded an exponential increase over the last two decades. Despite this growth, wind power is nowhere close to competing with fossil fuels due to major hurdles such as the high number of system failures and the relatively high cost of operation and maintenance. These issues point to inefficiency of the current condition monitoring methods and the call for more efficient and robust health monitoring techniques to decrease unscheduled downtime as well as operation and maintenance costs. To this date, there is no single wind turbine blade real-time monitoring system capable of accurately and efficiently detecting, isolating, and estimating the blades structural damage. Current global techniques do not achieve complete fault characterization, whereas local techniques are costly and time consuming.

Utah already has five wind farms operating with about 390 megawatts of generating capacity, which produced about 15% of Utah's renewable electricity in 2020. With the growing demand for renewable energy and local wind resources, Utah is on the verge of significant wind energy resource development. Communities across Utah, Idaho and Wyoming are adopting sustainable energy with the help of Rocky Mountain Power programs. These communities are leading collaborative efforts to create a healthier future for the community and other species. By embracing technology and working in partnership with Rocky Mountain Energy, Utah strives to become 100% carbon free in the future.
This proposal creates a multidisciplinary project related to the design, construction, and commissioning of an automated windmill to be used for data collection, data analysis using machine learning techniques, fault diagnosis and reliability of wind turbine blades. This exercise provides a work-based learning

opportunity for students and participation in the annual collegiate competition organized by the Department of Energy (DoE) along with the National Renewable Energy lab (NREL). The knowledge and experience that the students gain from this combined experience will serve the industry mainly in Utah by preparing the students for various areas with the increasing demands of the job market in machine learning and data analysis, remote sensing, software development, signal and image processing, renewable energy, unmanned aerial vehicles, construction, structural and thermal stress analysis, and many more.

Educational Outcomes:
There is no specific certificate or degree directly associated with this proposal, but the experiments and outcomes of this project provide excellent work-based learning opportunities and can be used in several electrical and computer engineering (ECE) courses at UVU including Introduction to ECE, Control Systems, Machine Learning, Probability and Statistics, Signals and Systems, Digital Signal Processing, Energy Conversion, Embedded Systems, Engineering Analysis, and Power Systems Engineering. In addition, the design, vibration, and structural stability techniques established in this exercise can be implemented in various courses in mechanical courses for solid modeling, machine design, computer aided engineering, vibration, machine dynamics, etc.

Funds Requested:

Year 1		Year 2		Year 3		
One-Time	Ongoing	One-Time	Ongoing	One-Time	Ongoing	**3-Year Total**
$78,990	$338,098	$7,000	$376,502	$0	$0	$800,590

The University of Utah
Automated Drone-Based System with AI Training

Overview:
Deep learning allows the identification of objects in images, translating languages and driving cars autonomously. Deep Learning is rapidly gaining application across all industries due to the availability of adequate computing power (e.g., GPU's) and large data sets to train with. This is true from sensor data processing to database analytics to fraud detection in banks. Utah currently has a large number of unfilled well-paying jobs in this area. This proposal is for a program to provide education in this area to engineering and science graduate students beyond those with computing background. The Deep Learning Certificate Program will provide working knowledge of the use of state-of-the-art deep learning technology as a graduate student certificate program. Students are prepared for jobs such as machine vision engineer, computer vision architect, analytics manager, machine learning modeling engineer, deep learning engineer, deep learning scientist and many more.

Educational Outcomes:
Students earn a 15 credit-hour certificate that can be achieved as a stackable certificate on top of a regular graduate degree. Full-time students can complete in two semesters; part-time students can complete certificate in three or more semesters (within three years).

Funds Requested:

Year 1		Year 2		Year 3		
One-Time	Ongoing	One-Time	Ongoing	One-Time	Ongoing	**3-Year Total**
$160,000	$85,400	$0	$85,400	$0	$85,400	$416,200

The University of Utah

Graduate Program in Secure Computing

Overview:
The School of Computing in the College of Engineering at the University of Utah requests support from the State of Utah for creating two rigorous, high quality graduate programs in secure computing towards building a superior cybersecurity workforce that will prepare our nation to not only deal with the ever-increasing cyber threats but definitively, establish it as the world leader in cyber space. Importantly, there is a critical demand for secure computing experts in industry and various federal organizations. We propose a new **Graduate Certificate in Secure Computing (GCSC)** as well as a new **Master of Science degree in Secure Computing (MSSC)**. The MSSC degree can be **stacked** upon the GCSC. Students enrolled in the GCSC will be required to complete five newly designed courses in secure computing, a total of 15 credit hours. With the skills acquired in our GCSC program, students will become immediately employable in industry for cybersecurity positions. These students will have the option to come back to complete another 15 credits hours and get the MSSC degree. Students enrolling directly for the MSSC degree will automatically become eligible for the graduate certificate. The two new programs will be designed specifically for students with an undergraduate degree in computer science or related fields or with equivalent work experience. The **GCSC program** will also be **available online**.

Educational Outcomes:
15-credit graduate certificate in Secure Computing and Master of Science degree in Secure Computing.

Funding Requested:

Year 1		Year 2		Year 3		
One-Time	Ongoing	One-Time	Ongoing	One-Time	Ongoing	**3-Year Total**
$125,000	$177,787	$0	$181,921	$0	$186,179	$670,887

The University of Utah
Bringing Fairness in AI to the Forefront of Education

Overview:
Artificial Intelligence (AI) systems have been used for predicting different risks – financial, business, medical, and legal risks – and have been argued to perform better than human experts. The main focus of AI systems has been to predict accurately, but research shows that sometimes they end up discriminating against protected groups. A lack of focus on equity can adversely impact the well-being of millions of people as well as pose legal and ethical challenges for the organization.

Therefore, to educate students, both at the graduate and undergraduate level, we aim to develop interdisciplinary courses and educational modules on fair AI, respectively within the David Eccles School of Business and the School of Computing at the University of Utah. These courses will include, in particular, fairness modules while considering different types of business and social decisions. These fairness modules will be integrated within undergraduate and professional graduate courses, as well as seminars, discussing the importance of making not just accurate but also equitable decisions. Specifically, two new courses – *Fair Algorithms for Business Decisions* and *Fair Machine Learning* – are to be offered considering the importance of using algorithms that are fair and the different technical and non-technical ways of debiasing algorithms. Initial enrollment of these courses is expected to be between 100 to 150 students.

The *Fair Algorithms for Business Decisions* course is to be offered at the professional graduate level within the David Eccles School of Business. It aims to understand the use of fair algorithms for business decisions, especially as it pertains to the steps that must be monitored while algorithms are designed, developed, and deployed. It trains the next generation of business decision-makers in the organization to create awareness of fair AI for greater employee adoption and to increase consumer trust.

The *Fair Machine Learning* course is to be offered at the undergraduate level at the School of Computing. It studies how to ensure, via algorithmic developments, that biases in both the data and the model do not lead to models that treat individuals unfavorably on the basis of race, gender, income, etc. This course will

enhance the new undergraduate Bachelor of Science degree in Data Science. It will also be offered as part of two certificate programs: Undergraduate Certificate in Data Science and Undergraduate Certificate in Data Fluency. In particular, it complements and/or substitutes the existing *Ethics in Data Science* course as another elective course to discuss ethical issues that may arise from the adoption of AI technologies. The course trains the next generation data scientists for the Utah workforce, who employ, implement, or deploy fairer machine learning tools in the industry.

Research collaborations with nonprofit and for-profit organizations at the State of Utah (one organization is a large financial lender and the other a public organization in the legal system; however, our data sharing and collaboration agreements prevent us from disclosing their identities) will be used to develop use cases that help describe how fair algorithms can be developed, deployed, and how they improve outcomes in society.

Educational Outcomes:
Interdisciplinary courses and modules in AI, including two courses to be offered as part of the Bachelor of Science in Data Science and the UG Certificate in Data Science and UG Certificate in Data Fluency. And also complement or substitute the Ethics in Data Science course as another elective to explore ethical issues arising from the adoption of AI technologies.

Funding Requested:

Year 1		Year 2		Year 3		
One-Time	Ongoing	One-Time	Ongoing	One-Time	Ongoing	**3-Year Total**
$3,000	$109,153	$0	$113,149	$0	$118,181	$343,483

Utah State University
Stackable Credentials in Data Science

Overview:
Data Science is an interdisciplinary field that includes the management, analysis, and visualization of data to make the best possible evidence-based decisions, and draws primarily from the fields of Statistics and Computer Science. Nearly all of the industry categories listed in the USHE Deep Technology Initiative (Board Policy R430-3.2) involve technologies with Data Science needs – not just to use existing data software, but to create new Data Science tools for novel applications.

Scientists and engineers in today's workforce have vast amounts of data available to them, but too often they do not have sufficient Data Science expertise to make full use of the data. With so much of today's STEM innovation being data-driven, expertise in collecting, analyzing, and operationalizing data is critical to industry success. The integration of Data Science credentials with STEM undergraduate majors and graduate programs will provide these critical skills to not only effectively utilize existing Data Science tools, but, more importantly, develop new and innovative tools to meet evolving industry needs and resources.

A team of faculty members from the Department of Mathematics and Statistics and the Department of Computer Science at Utah State University proposes to formalize a Data Science Advisory Panel of industry professionals to collaborate in the creation of an undergraduate minor in Data Science as well as a graduate certificate in Data Science. These stackable credentials will empower students with the skills necessary to create new data analysis, data management, and data visualization technology tools that are critically needed in various industries in Utah. The primary audience for these credentials will be students in STEM majors who would enter the workforce with core science skills, and these Data Science credentials would strengthen their ability to create Data Science tools and utilize them to add value rather than simply relying on existing Data Science solutions that alone may be inadequate for their employers' needs. The proposed Data Science credential program – through coursework, student seminars, and internships, all applied to critical industry problems – will fill a key gap in workforce preparation by providing Data Science experience, industry partnerships, and mentorship from top researchers and industry professionals.

Students who graduate with one of the proposed Data Science credentials will already have a primary degree in a STEM field, and so would already qualify for occupations in those fields, including in the industries listed in the USHE Deep Technology Initiative, such as artificial intelligence, autonomous vehicles, biotechnology, and robotics. The Data Science credentials would make these graduates more innovative and impactful in their STEM roles. In addition, these credentials would open the door for graduates to work as data scientists, data engineers, business analysts, and machine learning engineers.

Educational Outcomes:
Undergraduate minor in Data Science and graduate certificate in Data Science.

Funding Requested:

Year 1		Year 2		Year 3		
One-Time	Ongoing	One-Time	Ongoing	One-Time	Ongoing	**3-Year Total**
$0	$70,337	$0	$72,827	$0	$75,412	$218,576

Dixie State University
Precision Medicine and Functional Genomics

Overview:
The ability to sequence the human genome cheaply and efficiently has led to advances in genomics over the past decade. Datasets of individual sequenced genomes hold the potential to illuminate long-held questions about several human diseases. The ultimate promise contained within sequencing large numbers of individuals is the ability to predict and prevent human disease. However, before that eventuality can come to fruition, challenges in understanding the data must be overcome. This is an inherently interdisciplinary problem. It requires biologists to understand the role gene mutations play in human disease; bio informaticists to organize, search, and catalog human genomes; mathematicians and statisticians to model and predict mutation outcomes; and computer scientists to develop tools that manage and interprets vast data sets.

The aim of precision medicine is to genetically sequence diseased individuals, understand the role of specific mutations in causing a disorder, and tailor therapies that target the patient's specific mutation. The outcome of this approach often leads to better outcomes with far fewer side effects. Intermountain Precision Genomics (IPG) is a leader in this field, and regularly customizes cancer treatment plans based on knowledge learned from sequencing tumors. In addition to applying precision medicine to cancer patients, IPG is currently sequencing the genomes of preterm infants within neonatal intensive care units (NICU) throughout the Intermountain Healthcare System with the goal of identifying genetic mutations that prevent certain infant patients from thriving.

We are requesting funding through the Emergent Technology Initiative to create the Center for Precision and Functional Genomics. This center will serve as a teaching and research collaboration between Intermountain Precision Genomics, and Dixie State University, and oversee curriculum that recruits students from mathematics, computer science, bioinformatics, and biology into careers in precision medicine and functional genomics.

The college will oversee the creation of the following five certificate programs: Functional Genomics, Genetic Sequencing, Computational Mathematical Modeling, Bioinformatics, and Protein Characterization.

Certificates will build a foundation and develop competencies within specific areas of precision medicine and functional genomics. Certificates are designed to supplement existing degrees currently offered at DSU (Bioinformatics, Biomedical Science, Computer Science, Applied and Computational Mathematics) and will allow students to select specific competencies that would best support their existing degrees and future career interests. Students will be able to complete both a bachelor's degree and a certificate within four years. Certificates are largely lab-based and focus on skill development, providing certificate completers with sufficient knowledge and abilities to qualify for jobs or graduate programs within a given area. Additionally, certificates will be built with a low barrier to entry, allowing students to begin applied lab coursework with minimal prerequisite courses.

Supplementing a degree with one of these proposed certificates will not only build specific skillsets that would qualify students for internships in their area of interest but may also direct students to jobs or graduate programs in this newly discovered field. An additional byproduct of these certificates will be the ability to collaborate at a more profound level in future careers. For example, a student completing a bioinformatics degree supplemented with a functional genomics certificate will be better able to work with functional genomics research groups over the course of their career. Having had exposure to the techniques and processes of biologists, the bioinformaticist will also be able to build better data pipelines and process data used for this application, as well as collaborate with biology researchers.
As a center on campus, the Center for Precision and Functional Genomics will coordinate student recruitment and coordinate efforts between relevant departments within the college and institution. The center will also oversee the partnership between DSU and Intermountain Precision Genomics and promote external grant applications to provide ongoing support for the program. The center will be led by a director who is well positioned to coordinate efforts between all stakeholders.

Educational Outcomes:
Five certificate programs: Functional Genomics, Genetic Sequencing, Computational Mathematical Modeling, Bioinformatics, and Protein Characterization, all of which supplement existing degrees offered at DSU and build competencies within a specific area of functional genomics and precision medicine.

Funding Requested:

Year 1		Year 2		Year 3		
One-Time	Ongoing	One-Time	Ongoing	One-Time	Ongoing	3-Year Total
$354,510	$221,200	$0	$225,920	$0	$230,714	$1,032,344

Weber State University
Autonomous Vehicle Systems Graduate Certificate

Overview:
Weber State University, through the College of Engineering, Applied Science & Technology (EAST), the Department of Automotive Technology and the School of Computing, both departmental units within EAST, are applying for Deep Technology Talent Initiative funding for the development of an Autonomous Vehicle Systems (AVS) Graduate Level Certificate.

While interdisciplinary components come into play in the making of an autonomous vehicle/car (AV or AC), Computer Vision, Artificial Intelligence (AI), and Machine Learning (ML) are few of the very most important components of the autonomous industry. Most of the self-driven actions, analysis and predictions heavily rely on the various models and algorithms that these majors offer. Fortunately, much of the infrastructure for these disciplines are pre-existing at Weber State University. The Computer Science (CS) department conducts three courses in the field of Artificial Intelligence (from basic through advanced); CS 4500, CS 5500/6500. These courses are geared towards implementing intelligent agents. In the ML realm, CS has 5600/6600. Their focus is on language understanding, face recognition, speech synthesis and recognition, object detection, and robotics to name a few. Further, the CS 5600/6600 courses focus on the math and implementation details of various machine learning algorithms.

While these courses are currently not tuned towards AV, most of the algorithms projects or assignments can be set up to gear towards AV on the basis of past seminal work/research that use these coursework algorithms. Much of the project work/assignments of the above coursework algorithms can be tuned towards pedestrian, traffic light and other object detection pertaining to AV navigation. Further, these courses introduce the fundamental principles of deep learning and its applications. Thus, the current courses can contribute in galvanizing up the AV certification.

The goal is to expose the prospective students to a broad spectrum of components that go into intelligent vehicles. Further, the certification would focus more towards the AV software in comparison to hardware. As part of the certification, we plan to provide a tricky balance of both introductory and advanced concepts that go into an AV that would best use the time and resources a student invests in. We will also

work closely with ASI to ensure that the coursework and certification appropriately meets the industry needs. Keeping these items as a guideline, the 20-credit program can be pursued or distributed into following units:

- Fundamentals of Autonomous Vehicles
- Computer Vision (We can have object detection algorithms here such as lane detection, pedestrian detection, environment etc.)
- AI and Machine Learning Algorithms (Combined, because we will select and tune algorithms from both AI and ML mentioned in Section 2.2 that cater to AV)
- Path Planning (Put as a separate course because we can plan a course for different types of path planning algorithms: graph based, probabilistic, these courses can cover graph-based, sampling-based, and field-based approaches).

Educational Outcomes:
Certificate in Autonomous Vehicle Systems, 20 credits

Funding Requested:

Year 1		Year 2		Year 3		
One-Time	Ongoing	One-Time	Ongoing	One-Time	Ongoing	**3-Year Total**
$0	$290,000	$0	$290,000	$0	$290,000	$870,000

Weber State University
Machine Learning/Data Science

Overview:
To fulfill the grant objectives of placing graduates and interns proficient in the emerging technology fields of Machine Learning, Artificial Intelligence, and Data Science with Utah industry partners, the proposed program includes:

Creation of a Master Level/Post Baccalaureate Certification in Computational Data Science and Machine Learning. This certification is designed for existing students approaching graduation and working professionals interested in continuing their education in these rapidly expanding disciplines. Students earning this certificate will demonstrate proficiency in applying the practical techniques of machine learning such as neural networks, clustering algorithms and deep learning to the computationally intensive problems associated with Data Science investigations, which include data reduction, applied statistical models, cloud computing, and prediction algorithms. The certification will be project-based. Establishing a "Machine Learning & Data Science Research Center" at WSU, which involves a dedicated lab, support for equipment, curriculum development, and intelligent-systems research into algorithmic and technological solutions for large data management and analysis. This environment will support the hands-on training of WSU students on real-world problems introduced in collaboration with our industry partners.

The primary academic objectives of this certification are to help students gain the skills and knowledge necessary to understand the concepts of business intelligence, data analytics, and data science. Students will be able to interpret the tools and techniques related to prescriptive, descriptive, and predictive analytics. In addition, students will understand, assess, and apply computational algorithms utilized in data science investigations.

This can be done through a myriad of ways including descriptive measures and statistical probability that lead to actionable insights on large data sets and analyzing the different testing techniques associated with inferential statistics such as hypothesis testing, two-sample and one-way ANOVA tests, chi-square tests, simple linear regression, and multiple regression.

In addition to the above more historic requirements, students will also be able to assess various aspects of big data analytics by identifying the tools, technology, applications, use cases, and research

directions used in the field as well as identify the best methods of storing and computing large data sets. We will also have a special emphasis on practical use of machine learning.

Our strongest emphasis will be on hands-on projects with industry partners. This will focus on data visualization, capstone projects for data science through probability, statistics, machine learning, programming, data management, and distributed computing and databases.
The Computational Data Science and Machine Learning Certificate is composed of graduate courses that can be completed in two semesters (Fall 2022/Spring 2023). Graduates will be qualified for two main positions: Data Engineer and Machine Learning Engineer/Data Scientist.

Educational Outcomes:
Graduate certificate in Computational Data Science and Machine Learning.

Funding Requested:

Year 1		Year 2		Year 3		
One-Time	Ongoing	One-Time	Ongoing	One-Time	Ongoing	**3-Year Total**
$0	$355,800	$0	$355,800	$0	$355,800	$1,067,400