



Center of Excellence in **R**esearch and **E**ducation for Big Military **D**ata **I**nTelligence (**CREDIT** Center) An Overview

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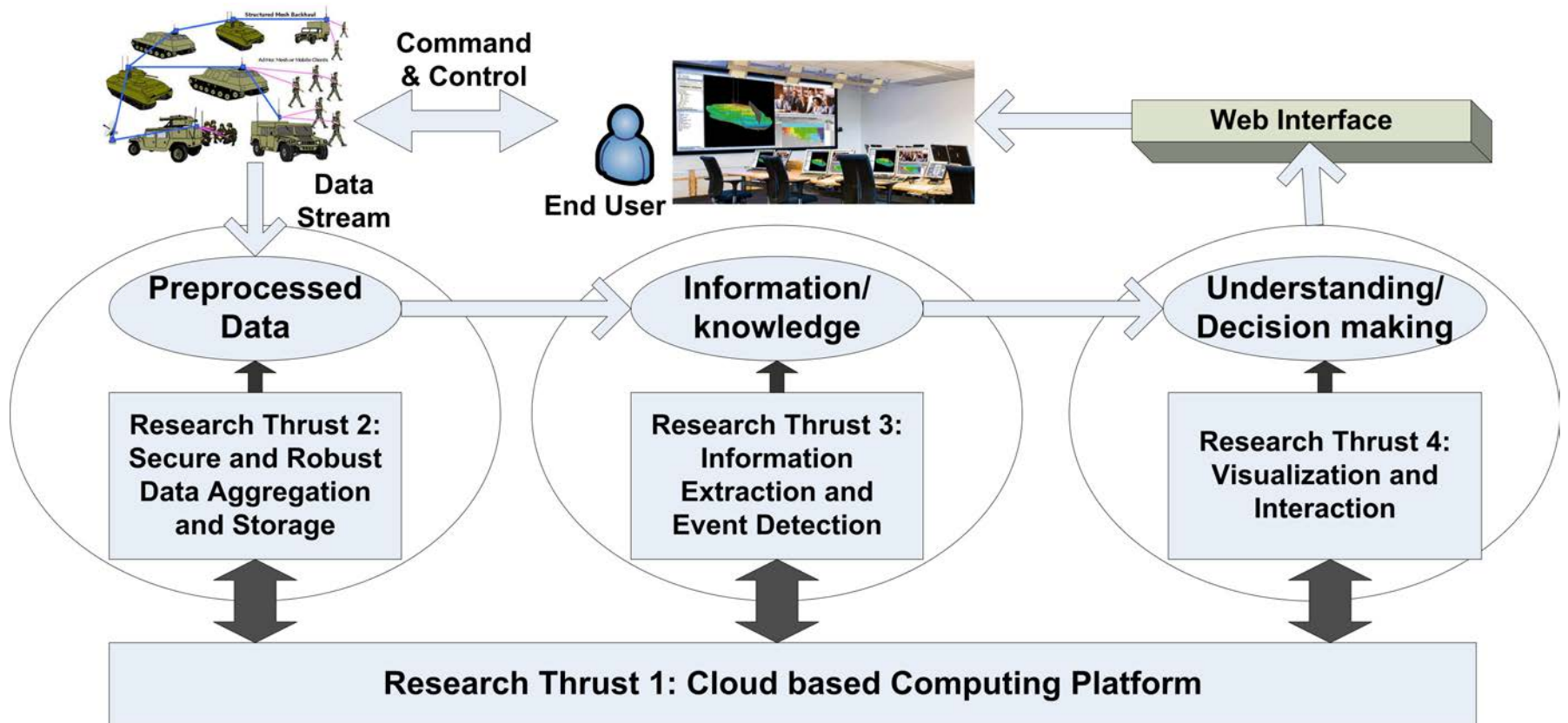
Overview of CREDIT Center



- **Mission:** accelerate research and education in predictive analytics for science and engineering to transform our ability to effectively address and solve many complex problems posed by big data; train next generation data scientists and engineers
- A multidisciplinary team from PVAMU collaborating with partners from other institutions and the DoD Labs
- Program managers: Mrs. Evelyn Kent, DOD HBCU/MI Program Director; Dr. Timothy S. Kroecker, AFRL Program Manager



Synergy among Research Thrusts

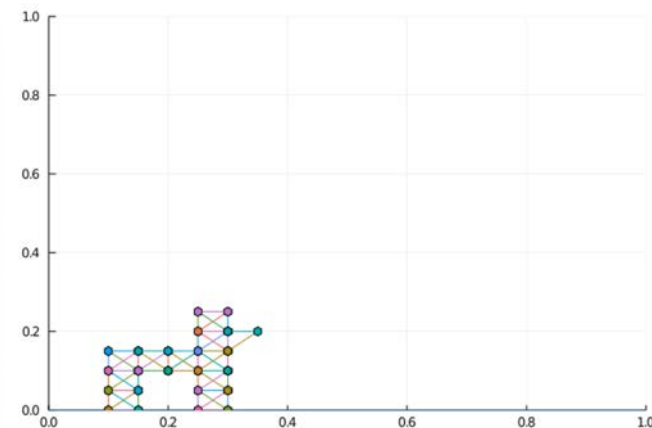
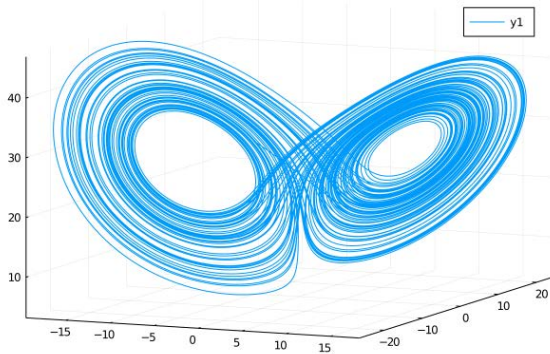




Sample Research Projects: Physics Guided Deep Learning

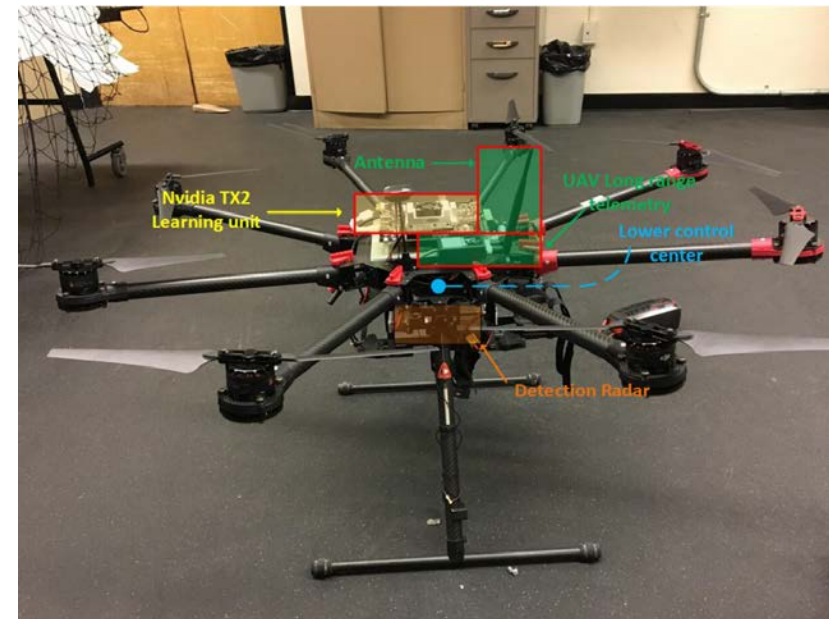
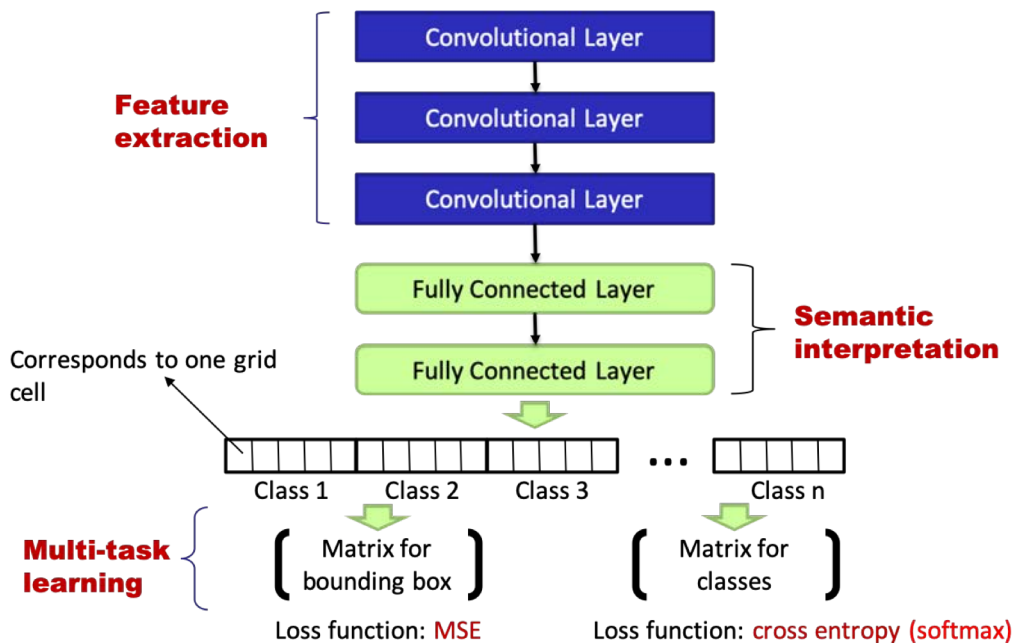


- **Apply scientific principles to data-driven AI models**
 - Physics-Informed Neural Networks, Neural ODE, Hamiltonian Neural Networks, Universal Differential Equations
 - Ensure the AI models to follow the well-established scientific principles
 - Deep Integration of AI and scientific computing to build the trustworthy and fair AI models
 - Incorporating physics and decision making into deep learning via implicit layers
 - Data-driven models and differentiable programming for optimal control in mechanics and robots
 - research at the interface of machine learning and optimization focuses on establishing connections between continuous dynamical systems and gradient-based optimization methods



Sample Research Projects: Deep learning in stand-alone resource-constrained system

- Deep Learning in Resource-Constrained Embedded Systems



DJI drone with NVIDIA Jetson TX2 (collaboration with UNR)



CREDIT Attacks SARS-CoV-2



- **The COVID-19 pandemic continues to have a devastating impact on the health and well-being of the global population. By taking advantage of the research capabilities in big data analytics and deep learning, the team of the CREDIT Center is actively performing research to help support the fight on COVID-19.**
- **Research publications:**
 - 1) U. Victor, X. Dong, X. Li, P. Obiomon, and L. Qian (2020). “Effective COVID-19 Screening using Chest Radiography Images via Deep Learning”, *The Workshop on Computing for Pandemics (COMPandemics2020)*.
 - 2) S. Reza, X. Dong, and L. Qian (2021). “Robust Face Mask Detection using Deep Learning on IoT Devices,” submitted to *IEEE ICC Workshop on COVI-COM*.
 - 3) L. Nwuso, X. Li, L. Qian, S. Kim, X. Dong (2021). “Semi-supervised Learning for COVID-19 Image Classification via ResNet,” submitted to *IEEE TRANSACTIONS ON MEDICAL IMAGING*.
- **GPU optimized simulation tool (Autodock4, partner Stony Brook University)**
 - Simulates the binding of coronavirus molecules with proteins through docking
 - Important part of search for a vaccine for the COVID-19 disease
- **Class projects**



CREDIT Center Computing Facility



- **Cloud Computing Lab**
 - Multiple CPU clusters, including servers donated by IBM
- **Deep Learning Lab**
 - NVIDIA GPU clusters, GPU workstations, edge computing devices
 - Large storage servers
 - Power servers donated by IBM and PowerEdge servers donated by Dell
- **Upgraded several other labs**





Students Participation



- Engage many students (undergraduate, MS, PhD) in research
- All graduates hold high-tech jobs (e.g., DoD Labs, Intel, IBM, Microsoft, Dell, Visa, etc.)
- Train ROTC students (navy midshipmen and army cadets)
- 5-year BS/MS program
- K-12
- Intern at government agencies and industry





Sample Student Achievements



- The CREDIT team including six graduate research assistants participated the AI Tracks at Sea Challenge organized by the US Navy in Fall 2020. **The CREDIT team won the FIRST place out of 31 participating universities including top research universities across the country.** The official announcement is available at the Government website: <https://www.challenge.gov/challenge/AI-tracks-at-sea/#description>
- Many students from CREDIT center presented their research works at NSBE and one of our graduate students won first place in the Showcase Track for the Technical Research Exhibition at NSBE 2019
- The CREDIT team won the FIRST place in IEEE Big Data Competition organized by the IEEE Big Data Initiative in Oct 2016.

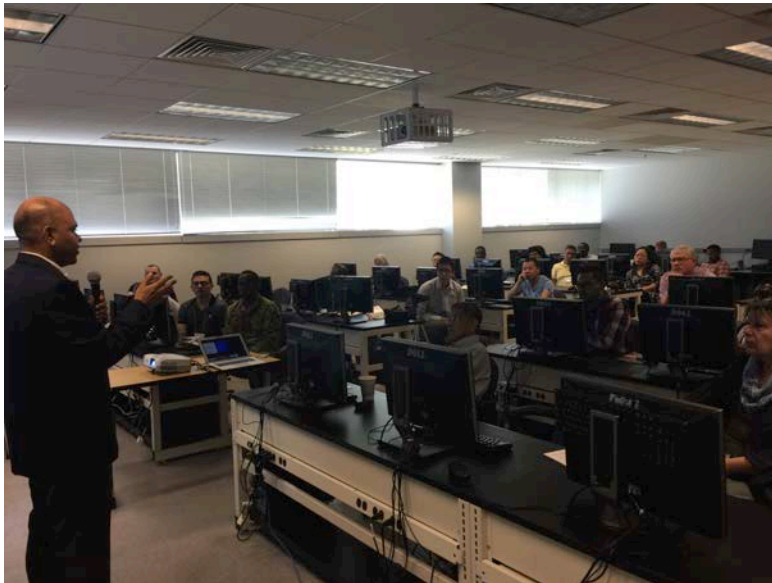




Curriculum Development and Students Training



- Many new courses developed in the area of Big Data Analytics, Deep Learning, and Artificial Intelligence (AI)
- Deep Learning for AI Certificate Program approved by the Texas A&M University System and the Texas Higher Education Coordinating Board
- In the process of developing undergraduate big data analytics certificate program, a set of new undergraduate courses have been approved by the college of engineering
- Provided various trainings to students (e.g., Introduction to Python; Basics of Machine/Deep Learning Platforms and Tools, etc.)





Mission-Critical Big Data Analytics Workshops (MCBDA)



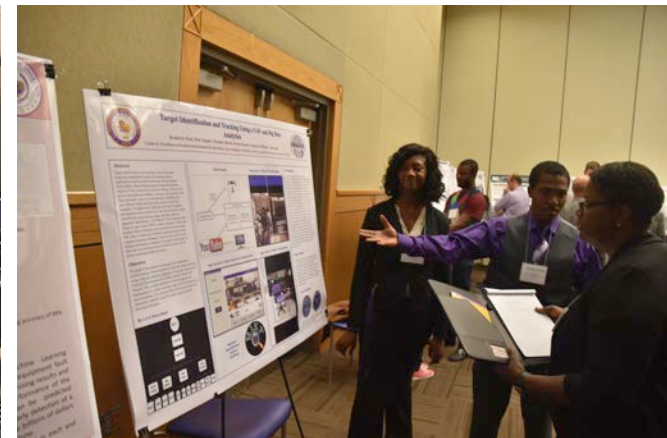
- MCBDA Workshops (16, 17, 18, 19) at PVAMU provided a forum for researchers from government agencies, industries, and academic institutions to address big data challenges, advance our knowledge base, and provide potential solutions to big data analytics in mission-critical applications
- Multiple Keynote speeches, Tutorials, Invited Talks, Technical Paper presentations
- Hands-on Training and lab sessions
- Student posters competition
- **A virtual online version of MCBDA 2021 will be offered this summer! All of you are invited to participate and provide your input and feedback**



Mrs. Kent present certificate to keynote speaker



Lab demonstrations



Student poster competition



Summer Camps



- **CREDIT Summer Camps at PVAMU**
 - 15, 20, 29, 35 high school students participated in 2016, 2017, 2018, 2019, respectively
 - provided selected students with instruction in math, science and engineering similar in content to that encountered by an engineering student
 - During the closing of the program, high school students were showing their interest to join our undergraduate engineering program, and many of them were asking if we will have this summer program next year
 - **A virtual online version of summer camp will be offered this summer! Help us spread the words**





Thanks!



- Please let us know your idea of how to make the virtual online version of 2021 Big Data Workshop (MCBDA) better
- Help us spread the words of the online version of the 2021 summer camp for high school students !
- Questions: please contact Dr. Lijun Qian (liqian@pvamu.edu)
- More information available at:
<http://credit.pvamu.edu>