

## **Cross Training Future Workforce on Data-Driven Decision Support Tools for Precision Phenotyping**

### **A. Project description:**

I. **Objectives:** The overall goal of this project is to enhance transdisciplinary learning with a major focus in digital agriculture. The specific objectives of this project include:

*Objective 1: Organize a summer training internship program for undergraduate students with background in animal science, crop science, and computer science:* Undergraduate students from Departments of Animal Science, Plant Science, and Computer Science at Texas A&M University-college station, TAMU-Kingsville, and TAMU-Corpus Christi respectively will be enrolled as an intern during Summer 2022. Students will have opportunities to receive course credits for ANSC 494 internship course coordinated by Co-PI at TAMU. Similarly, student from TAMU-K will also receive the course credits for internship course.

Datasets obtained from precision dairy monitoring tools (pedometer) and Unmanned Aerial Systems (UAS) collected from cotton field will be used as two case studies. Students will learn about the data collection procedures in both systems, create a standardized data base, and utilize the database to train and validate machine learning models to predict disease events in dairy cows and yield prediction in cotton. ***The goal is to develop student competency of understanding data generating systems, the database, and utilize it to develop data-driven tools for precision phenotyping.***

An inaugural cohort of three students will be selected for this 10-week program from each of the three representative campuses. Students will attend the weekly training sessions on best practices of handling, management and curation of big data obtained from the two systems. Students will be assigned tasks each week that they are required to complete individually. Each week will end with a debrief session where students reflect on the progress and plan to adjust the approach for the upcoming weeks. This presents the opportunity for shared learning as the cross disciplinary team learns from each other.

*Objective 2: To develop a training manual on big data management in agriculture:* A training manual on the best practices of database management utilizing the resources created during this internship will be developed and tested by the cohort. Based on the student experience and recommendation, final version of the manual will be published for use in future cohorts.

### ***II. Describe how the project will further the aims of the AG2PI and the basis for evaluating the success of the project***

This project aligns perfectly to the overall objective of AG2PI to prepare transdisciplinary community to conduct AG2P research as we prepare the future generation of the scientists with skills necessary to work in AG2P environments. The project is led by early career faculties working to build a cross disciplinary working group in AG2P data. This project will initiate team development across different disciplines and help with the preparation of students to get involved in the research projects.

Assessment of the program will be conducted using pre-, mid-, and post-training surveys. Students understanding of the materials, attitude towards big data, change in career aspirations are among the few information to be collected as indicators of success for this project. Students interest in future AG2P related courses or opportunities will demonstrate success of the program.

### ***III. Expected outcomes and deliverables***

The main outcome of the project is to establish a cross-disciplinary training program. We plan to continue this program beyond the funding period and extend it to regular semester course based on the outcomes from this initial work. Further, this program will be replicable to other departments seeking similar opportunities. By the end of project cycle, a publicly available database with developed analytic tools will be created to train students in the future. A training manual will be prepared that could be used in future semesters. A structured internship program will be developed and continue to offer in the future for students who are interested in big data analytics. Recording of the training sessions will be available for wider audience through online platforms like Youtube. Programming codes developed for data analytics will also be shared using public platform.

### ***IV. Qualifications of the project team***

PI-Dr. Mahendra Bhandari is an Assistant Professor in digital agriculture and is working on the development of decision support systems for crop breeding and precision agriculture. CO-PI Dr. Sushil Paudyal is an Instructional Assistant professor at the Department of Animal Science with expertise in Precision Dairy Management, Sensor technologies, and Robotic milking systems. Dr. Paudyal also coordinates the departmental internship program at TAMU. CO-PI Dr. Yuxia Huang is an Associate Professor at the Department of Computing Science with expertise in geospatial computing science and data analytics at TAMU-CC. Additionally, we will leverage the expertise of Mr. Jose Landivar and TBH Post-Doc (under Dr. Bhandari) on big data analytics and database management. Additional collaborators include Dr. Juan Pineiro who is an extension dairy specialist for Texas A&M AgriLife Extension service with expertise on wearable sensor technologies and associated data management.

### ***V. Proposal timeline***

This project will be conducted from *May 15 to August 15, 2022*, to be counted as a 10-week summer program. Students start the program second week of May with the weekly meetings.

### ***VI. Engaging AG2P scientific communities & underrepresented groups***

The project plans to engage existing AG2P communities as guest speakers and resource personnel as per their availability. This will provide networking opportunities for the students as well. The outcome of this project will be shared through student research conference and TAMUS system pathway conference. Both TAMU-CC and TAMU-K are major Hispanic Serving Institutions (HSI) in Texas, and we will encourage underrepresented minority students and women to participate in this project.