FALL 2025 – COS 397 COMPUTER SCIENCE CAPSTONE PROJECT PROPOSALS

Project Title: Agriculture and Forestry Research Equipment Inventory

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Brief Description (approximately 500 words)

The Maine Agricultural and Forest Experiment Station (MAFES) operates six experimental research farms around the state of Maine that serve as essential platforms for applied agricultural research. University of Maine scientists utilize these farms for wide-ranging research on a multitude of crops. Such as, developing new potato, apple and peach varieties, investigating the effects of increased temperature on wild blueberry production, and developing new organic farming techniques for weed and pest management. To facilitate that research, The Maine Agricultural and Forest Experiment Station maintains a large inventory of equipment ranging from large tractors and plowing implements to small-scale soil samplers and water quality meters. Due to increasing constraints on budgets, efficient use of this equipment is a high priority for the experiment station and UMaine researchers.

To aid in this, we propose to develop an inventory and equipment tracking software that can be used across the six research farms and hundreds of acres of forest currently managed by MAFES and its staff. This program would allow for a full inventory of all farm and forestry research equipment, including basic information, current maintenance status and schedule, operational requirements, and frequency of use. Additionally, it would serve as a reservation system for each piece of equipment. Ideally, this software would be easily accessible by all MAFES faculty and students, and serve as the first place to look before purchasing new equipment to meet research needs. Further, this new system can serve as the test-case for wider implementation across colleges, units, and eventually the university. For example, the newly formed PFAS Center of Excellence, will also be in need of inventory tracking software.

To complete this project, students would meet regularly with MAFES Directors, farm superintendents and research staff to develop a program that meets the needs of all parties. There is significant room for creativity in developing this system, as our current model is rudimentary and outdated. Currently, we rely on a master excel spreadsheet for record keeping and word of mouth notifications for user reservations. Further, we struggle from a lack of widespread awareness of the scope of equipment available for researchers to use at each of our farms. Agricultural production is quickly modernizing, and we welcome the help of the Computer Science Capstone students in aiding the MAFES farms. Students would have direct input and the freedom to take this in any direction they determine best fits the needs of the farm staff and researchers.

Goals for the project (approximately 50 words)

Develop software for the management and tracking of agriculture and forest equipment of all sizes. The software should be easily accessible by research and farm staff at the University and serve as the first resource for maintenance records, availability, and reservations.

External Schedules / Deadlines (conferences paper deadline? Meetings?) [if any]:

None applicable

Learning Objectives for student teams:

-Explore current marketed softwares for inventory tracking and management
-Work collaboratively with end-user/client (MAFES) to develop a new software/application from scratch.
-Develop project scope and timeline
-Determine best practices for tracking equipment use, wear-and-tear, and required maintenance
-Develop reservation system and associated permissions structure
-Determine how best to set-up real-time alerts/notifications for ongoing applications.
-Training non-technical end users (research staff and farm superintendents) in the software/application

Expected Project Experiences (select from the list, check all that apply):

x	Problem definition
x	Project scope definition
☐	Design and implementation of research methodology
☐	Use of applied statistics
☐	Data analysis
x	Workflow analysis
x	Development of functional specifications
☐	Identification of and negotiation for needed project resources
☐	Examination of an unfamiliar technical area
☐	Identification of others' technical expertise
x	Identification and evaluation of alternatives
☐	Development and presentation of recommendations
x	Responsibility and accountability for a discrete product
x	Role definition in a task group and participation in group dynamics
☐	Observation of supervisory activities (*e.g.*, personnel assignment, training, development of procedural guidelines)
☐	Observation of management styles
x	Observation of organizational politics

☐	Preparation of a manuscript for publication

Recommended experience (What operating system is required? What programming language? Other skills?):

Application should be web-based. Other specifications can be developed by Computer Science Capstone team.

Expected Outputs/Products and likely requirements (specific programming language, programming framework, operating system, integration with existing software, web-based requirements, *etc.*):

Web-based inventory management system. Should be easily accessible and updateable, and reflect changes in near real time. A built in permissions/notification structure for equipment reservations and/or maintenance requests would be helpful.

Past experiences by the client (If software already exists, what is wrong? What has worked in previous versions, and what has not?):

Current industry systems are generally expensive and meant for large business inventories of thousands of pieces of equipment.
Our current efforts have been done in Google Docs - which is fine for general inventory, but does not allow for tracking, checking out, checking in, plans for maintenance, etc.

Proposed Testing Plan (How will the team test their product? Do you have recommended/required testing strategies? What resources are available (test platform, stand-alone network, *etc.*)? Is test data available?):

MAFES staff will put together the inventory for the students including make/model/year, use frequency etc. Much of this data is already accessible and can make great test data for the program. MAFES staff can assist in developing training scenarios for the program. Best strategies can be determined by computer science capstone team in conjunction with MAFES staff.

Benefits to U Maine:

This program would give the College of Earth, Life, and Health Sciences and MAFES a better handle of its hundreds of pieces of research equipment. By keeping a more up-to-date inventory,

researchers and students can better utilize the resources of MAFES to accomplish their research objectives. It will also allow MAFES to monitor equipment for potential maintenance issues that can be addressed before a catastrophic failure occurs

Additionally, current tracking of all UMaine property, especially those of higher dollar values is done with spreadsheets/google sheets. The program/application developed here could easily be transferable to more and more equipment/departments, etc. Further, MAFES plans to put this system forward as a solution to the inventory management needs of other centers and departments, such as the newly formed PFAS Center of Excellence. By having a more clear and streamlined system, researchers and students will have a better idea of what equipment is available for use and be able to have better access to that equipment.

Project Sponsor(s):
College of Earth, Life, and Health Sciences(ELH), and the Maine Agricultural and Forest Experiment Station (MAFES)

Other Resource People: Six farm Superintendents who actively manage the equipment, numerous professors and researchers who actively use the farm and forest equipment. Associate and Assistant Directors of the Experiment Station.

Software/server access required:

Microsoft suite