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IT4010 – Research Project - 2024

Topic Assessment Form

Project ID: 24-25J-085

1. Topic (12 words max)

Integrated Veterinary Application for Enhanced Cow Health Management

2. Research group the project belongs to

Software Systems & Technologies (SST)

3. Research area the project belongs to

Machine Learning (ML)

4. If a continuation of a previous project:

Project ID	
Year	

5. Brief description of the research problem including references (200 – 500 words max) – references not included in word count.

The health management of cows is a critical aspect of livestock farming, directly influencing productivity, economic viability, and animal welfare. Despite advancements in veterinary medicine, many cow owners still face challenges in timely disease detection, effective care practices, and efficient communication with veterinarians. These issues are exacerbated by the lack of accessible and comprehensive technological solutions tailored to the specific needs of cow health management.

One of the primary issues is the late diagnosis of diseases. Cows frequently exhibit modest signs that go unrecognized until the illness worsens, resulting in higher mortality rates and huge economic losses. [2] Early diagnosis is critical for effective disease treatment and prevention in herds, but traditional approaches are labor-intensive and need specialist knowledge that not all cow owners have. [1]

Keeping thorough medical records and controlling diet and nutrition are also essential for the general health of cows. Good nutrition has a direct impact on growth, reproduction, and milk output, yet many farmers find it difficult to monitor and modify their diet plans. [5] Monitoring cow health requires thorough health records that include medical treatments and vaccination histories, but manual record-keeping is prone to mistakes and inefficiencies. [4]

The absence of an encouraging community and efficient lines of communication between vets and cattle owners is another serious problem. Cow owners frequently labor alone, losing out on important peer support and knowledge exchange. Furthermore, interactions with vets are frequently restricted to in-person meetings, which can postpone assistance in an emergency. [3]

Meeting these limitations requires a comprehensive veterinary application that uses state-of-the-art technologies to improve disease detection, care procedures, and communication. To provide a comprehensive solution for cattle health management, the proposed application intends to incorporate AI-based diagnostic capabilities and personalized health record management. The program aims to increase the productivity of cattle management and increase the general well-being of cattle by promoting efficient care practices and improving early diagnosis.

References

[1] J. M. E. G. M. J. &. H. C. D. Statham, "A longitudinal cohort study of the associations between lameness and milk yield in dairy cows," 2015. [Online]. Available: https://pubmed.ncbi.nlm.nih.gov/24183787/.

[2] B. J. H. H. Chester-Jones, "Relationships between early-life growth, intake, and birth season with first-lactation performance of Holstein dairy cows," 2017. [Online]. Available: https://www.journalofdairyscience.org/article/S0022-0302(17)30220-5/pdf.

[3] M. G. A. H. W. B. K. E. L. M. A. G. v. K. T J Devries, "Associations of dairy cow behavior, barn hygiene, cow hygiene, and risk of elevated somatic cell count," 2012. [Online]. Available: https://pubmed.ncbi.nlm.nih.gov/22884345/.

[4] J. F. Mee, "Prevalence and risk factors for dystocia in dairy cattle: a review," 2008. [Online]. Available: https://pubmed.ncbi.nlm.nih.gov/18328750/.

[5] C. M. A. D. J. D. G.-W. G. Curtis, "The impact of early life nutrition and housing on growth and reproduction in dairy cattle," ncbi, 2018. [Online]. Available: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5812595/.

6. Brief description of the nature of the solution including a conceptual diagram (250 words max)

Nature of the Solution

Our proposed solution is a comprehensive veterinary application designed to enhance the health management and care practices for cows. This application leverages advanced technologies such as artificial intelligence, cloud computing, and community-driven features to address the current challenges faced by cow owners and veterinarians.

Key Features

I. AI-Driven Diagnostic Tools
   - The application includes AI-based image and symptom analysis tools to detect common cow diseases early. By analyzing uploaded images or reported symptoms, the system provides potential diagnoses and recommended actions.

II. Health Records Management
   - Users can maintain detailed health records for each cow, including vaccination history, medical treatments, and health monitoring data. This feature ensures accurate and up-to-date information is always accessible.

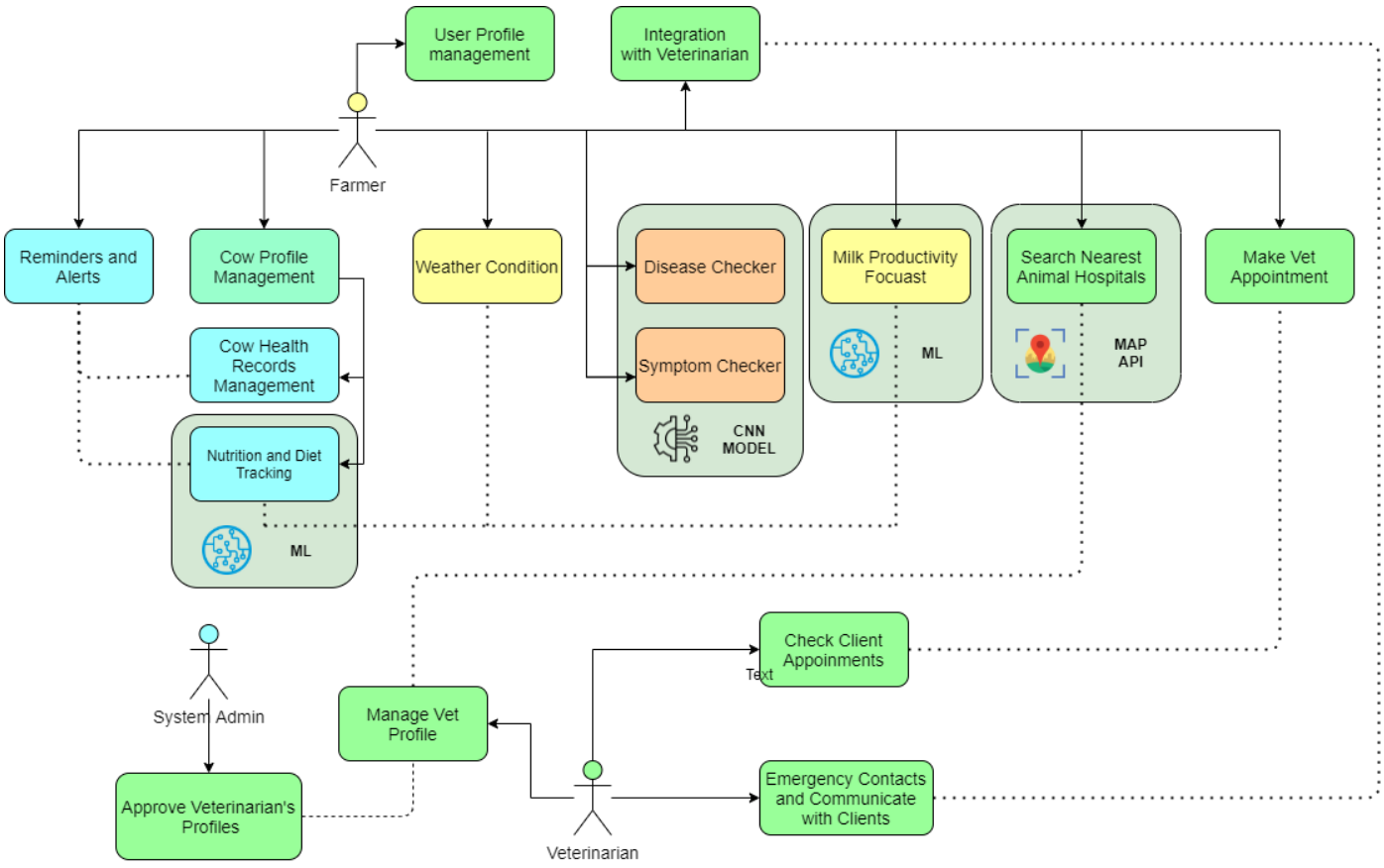
III. Nutrition and Diet Tracking
   - The application offers tools for creating and managing personalized diet plans, logging feed intake, and adjusting diets based on health data to optimize cow nutrition and productivity.

IV. Milk Production Prediction
   - Development of a predictive model for forecasting milk production based on historical environmental data and other relevant factors. This predictive capability aims to help farmers make informed decisions about herding, nutrition and overall farm productivity.

V. Veterinarian Integration
   - The application facilitates seamless communication between cow owners and veterinarians, including scheduling appointments, managing veterinary profiles, and accessing emergency support.

Conceptual Diagram

Below is a conceptual diagram illustrating the key components and interactions within the veterinary application.



7. Brief description of specialized domain expertise, knowledge, and data requirements (300 words max)

The project integrates expertise in animal nutrition, veterinary medicine, and agricultural science to address the complex issues of cow health management. We ensure that the application includes accurate and effective procedures for disease detection, health record maintenance, and dietary planning by working with veterinarians, animal nutritionists, and agricultural experts. The creation of an intuitive and powerful application that is specifically adapted to the demands of farmers and veterinarians is further supported by our team's specialized skills in machine learning, data analytics, and software development.

The project improves disease diagnosis and milk production prediction by utilizing advanced expertise in machine learning and data science. We apply Convolutional Neural Networks (CNN) to precise image-based disease detection, leveraging the most recent findings and advancements in this domain. In addition, the initiative forecasts milk output using powerful predictive analytics that use historical data and environmental conditions. By using an interdisciplinary approach, the application is guaranteed to push the boundaries of innovation in veterinary care and farm management while still meeting industry requirements.

The success of our initiative is largely dependent on careful data gathering and administration. To train the CNN model for disease detection, we need a large dataset of cow photos that have been labelled with relevant diseases. To guarantee the quality and dependability of the model, a broad range of diseases and disorders must be covered by this dataset. We collect historical environmental data (such as temperature, humidity, and season) and matching milk yield records in order to estimate milk production. For each cow, we also gather comprehensive health records, immunization histories, and nutritional data in order to offer individualized care recommendations. Since privacy of information, consistency, and quality directly affect the application's efficacy and credibility, these must be guaranteed.

8. Objectives and Novelty

Our research project aims to develop and evaluate a comprehensive veterinary application tailored to improve the management and care of cows. The application focuses on enhancing disease detection and prevention through advanced AI-driven diagnostic tools and systematic health records management, facilitating timely and effective treatment interventions. It aims to elevate cow care practices by providing user-friendly features for managing cow profiles, tracking nutrition and diet, and maintaining detailed health records to ensure consistent high-quality care. Moreover, development of a predictive model for forecasting milk production based on historical environmental data and other relevant factors. Finally, it streamlines veterinary communication and services by offering tools for appointment scheduling, managing veterinary profiles, and accessing expert advice and emergency support. The application is designed to enhance cow health and well-being, increase productivity in the agricultural industry, and help cow owners uphold high standards of animal welfare by accomplishing these goals.

Member Name	Sub Objective	Tasks	Novelty
Perera L.P.S.R	Enhance detection and prevention of diseases	• Create and train a CNN model to accurately classify images of cattle diseases, enabling early detection and prevention. • Compile and maintain a detailed list of common cattle diseases, including symptoms and recommended treatments. • Develop an intuitive symptom checker tool that provides potential diagnoses and treatment recommendations based on user-input symptoms.	The use of CNN model for disease detection in cows, specifically tailored for early identification and precise diagnosis, significantly improves the speed and accuracy of disease management in livestock.

Dissanayake D.M.W.B.T	Enhance Cow Care Practices	• Develop user-friendly interfaces for managing cow profiles, including health records, vaccination history, and medical treatments. • Implement features for nutrition and diet tracking, allowing personalized diet plans and monitoring feed intake. • Create tools for setting reminders and alerts for important tasks such as vaccinations and vet check-ups.	The integration of personalized nutrition and diet tracking, combined with comprehensive health records management, provides a holistic approach to cow care that is easily accessible and manageable for cow owners
Ekanayake E.M.D.T	Enhancing Dairy Farm Efficiency through Predictive Analytics and Farmer Feedback Integration	• To develop a predictive model for milk production, we gather historical milk production records, environmental data, nutritional information, herd data, and farm management practices. The data is then cleaned, preprocessed, and analyzed to identify trends and correlations. • Utilize advanced machine learning algorithms such as regression models, neural networks, or ensemble methods to develop a predictive model	This component combines predictive analytics with farmer feedback to improve dairy farm management. By using historical data and advanced machine learning, it optimizes milk production and farm efficiency. Continuous farmer input refines the model, making it more accurate and adaptable to changing conditions on the farm.

		for milk production. Train the model on historical data to establish baseline predictions. • Analyze farmer feedback into the model through iterative updates and adjustments to enhance its predictive capabilities over time.	
Hettiarachchi V.E	Streamline Veterinary Communication and Services	• Implement features for scheduling and managing veterinary appointments. • Develop communication tools that allow cow owners to contact veterinarians for advice, consultations, and emergency support including nearest 24-hour vet clinics and animal hospitals. • Provide a system so that vets may keep track of appointments, update their profiles, and interact with customers.	Providing fast veterinary care and knowledgeable support through the seamless integration of appointment scheduling and communication systems between veterinarians and cattle owners improves the effectiveness of managing livestock health overall.

9. Supervisor checklist

a) Does the chosen research topic possess a comprehensive scope suitable for a final-year project?

Yes	X	No	

b) Does the proposed topic exhibit novelty?

Yes	X	No	

c) Do you believe they have the capability to successfully execute the proposed project?

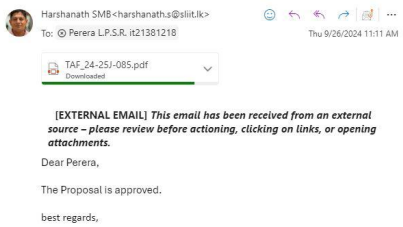
Yes	X	No	

d) Do the proposed sub-objectives reflect the students' areas of specialization?

Yes	X	No	

e) Supervisor's Evaluation and Recommendation for the Research topic:

Approved to continue the Proposed Project.


Harshanath SM8<harshanath.s@sliit.lk>
To: Perera L.P.S.R. it21381218
Thu 9/26/2024 11:11 AM
TAF_24-25J-085.pdf
Downloaded
[EXTERNAL EMAIL] *This email has been received from an external source – please review before actioning, clicking on links, or opening attachments.*
Dear Perera,
The Proposal is approved.
best regards,

10. Supervisor details

	Title	First Name	Last Name	Signature
Supervisor	Mr	Buddika Harshanath	S M	
Co-Supervisor	Ms	Manori	Gamage	23/06/2024
External Supervisor				
Summary of external supervisor's (if any) experience and expertise				

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Topic Assessment Form

<u>This part is to be filled by the Topic Screening Panel members.</u>

Acceptable: Mark/Select as necessary

Topic Assessment Accepted	
Topic Assessment Accepted with minor changes (should be followed up by the supervisor)*	
Topic Assessment to be Resubmitted with major changes*	
Topic Assessment Rejected. Topic must be changed	

* Detailed comments given below

Comments

The Review Panel Details

Member's Name	Signature

*__Important__:

1. According to the comments given by the panel, make the necessary modifications and get the approval by the **Supervisor** or the **Same Panel**.
2. If the project topic is rejected, identify a new topic, and follow the same procedure until the topic is approved by the assessment panel.