PETSCOPE: AN AI AND COMPUTER VISION APPLICATION FOR ANIMAL HEALTH CARE DIAGNOSIS

Marcus Milons
Raymond High School
Bolton, Mississippi

THE PROBLEM: ANIMAL HEALTH ASSESSMENT CHALLENGES

Animal caretakers face critical challenges that cost animal lives, financial resources, and put people at risk. Pet owners, farmers, and animal rescue organizations are challenged daily in observing each and every animal, meaning that subtle symptoms like limping, swelling, changes in breathing patterns, or behavioral shifts can often go unnoticed until animals become seriously ill or die. This problem isn't just inconvenient it's deadly.

According to Arrowquip (2024), grass tetany 'is caused by severe magnesium deficiency that is often associated with springtime pastures rich in nitrogen and low in magnesium' and can be fatal if untreated.

This disease alone causes over 28,000 dairy cattle deaths each year but, because the dairy cattle industry is ten times larger, the real number of annual deaths could reach 280,000. Relying only on human observation is inefficient and costly. What caretakers really need is a smart, easy-to-use system that can monitor animal health in real time using technology they already carry in their pockets.

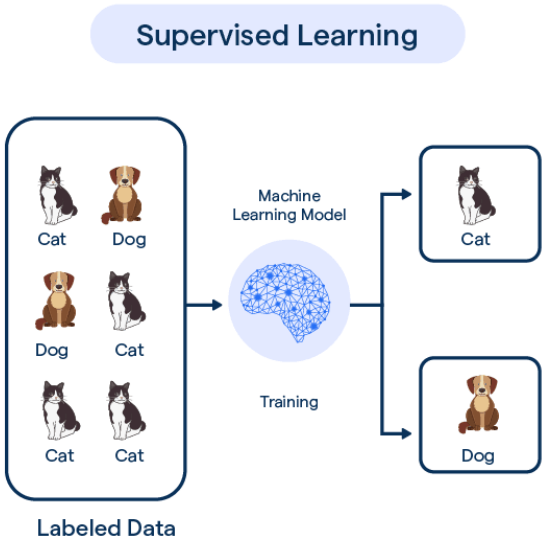
THE SOLUTION: ARTIFICIAL INTELLIGENCE FOR ANIMAL DIAGNOSIS

"diagnosis" refers to the process of identifying a disease, condition, or injury by analyzing signs and symptoms.

The answer to these critical animal health challenges lies in **Artificial Intelligence** (AI) specifically, computer systems trained to recognize patterns, make decisions, and identify symptoms that human observers might miss, unlike the broad, general-purpose AI we see in chatbots. Instead of waiting for a veterinary appointment or guessing whether symptoms are serious, caretakers can receive immediate diagnosis information. This immediate response addresses the core problem of delayed or missed symptom recognition that leads to animal suffering and human injury.

Here's how AI solves the animal health problem:

The key to making AI effective for animal health lies in **Machine Learning** (ML), which enables computers to learn from vast amounts of animal health data and improve their diagnosis accuracy over time. For animal health diagnosis, **Supervised Learning** provides the optimal training method for our AI. This approach uses labeled datasets where human experts have already identified specific conditions, breeds, and symptoms in thousands of images and videos.



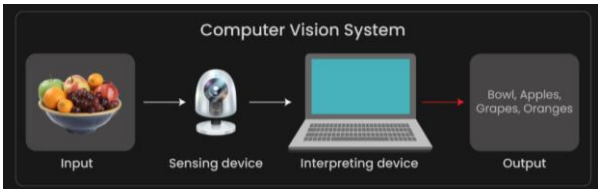
The training model takes the labeled data as input and can identify new, unseen data i.e. cats and dogs that were not a part of the model can be identified by our AI.

In an advanced model, researchers feed the AI system thousands of images labeled with specific information like "Golden Retriever with hip dysplasia showing limping behavior" or "Holstein cow with mastitis showing swollen udder." The AI learns to recognize these patterns and can then identify similar conditions in new animals it hasn't seen before.

To make this diagnosis power usable in the real world, we need a way for AI to "see" the animals, this is where Computer Vision comes in.

COMPUTER VISION: THE EYES OF DIGITAL VETERINARY CARE

Computer Vision (CV) serves as the primary diagnostic tool that transforms smartphone cameras into advanced animal health monitoring devices. Used correctly, this technology provides consistent, and detailed analysis of animal appearance and behavior.



This is how Computer Vision works.

When smartphone cameras capture an image, its digital information gets processed by specialized algorithms designed to analyze images layer by layer, identifying increasingly complex patterns from basic shapes to specific animal features to health indicators.

Computer Vision solves animal health assessment through three critical capabilities.

- It provides precise detection of physical abnormalities that human eyes might miss, such as slight changes in gait that indicate developing lameness, subtle swelling that suggests infection or injury, and skin conditions or wounds that require immediate attention.
- Offers behavioral pattern analysis that identifies changes in movement, posture, or activity levels that signal health problems.
- Enables breed identification that helps predict potential health risks and appropriate care protocols.

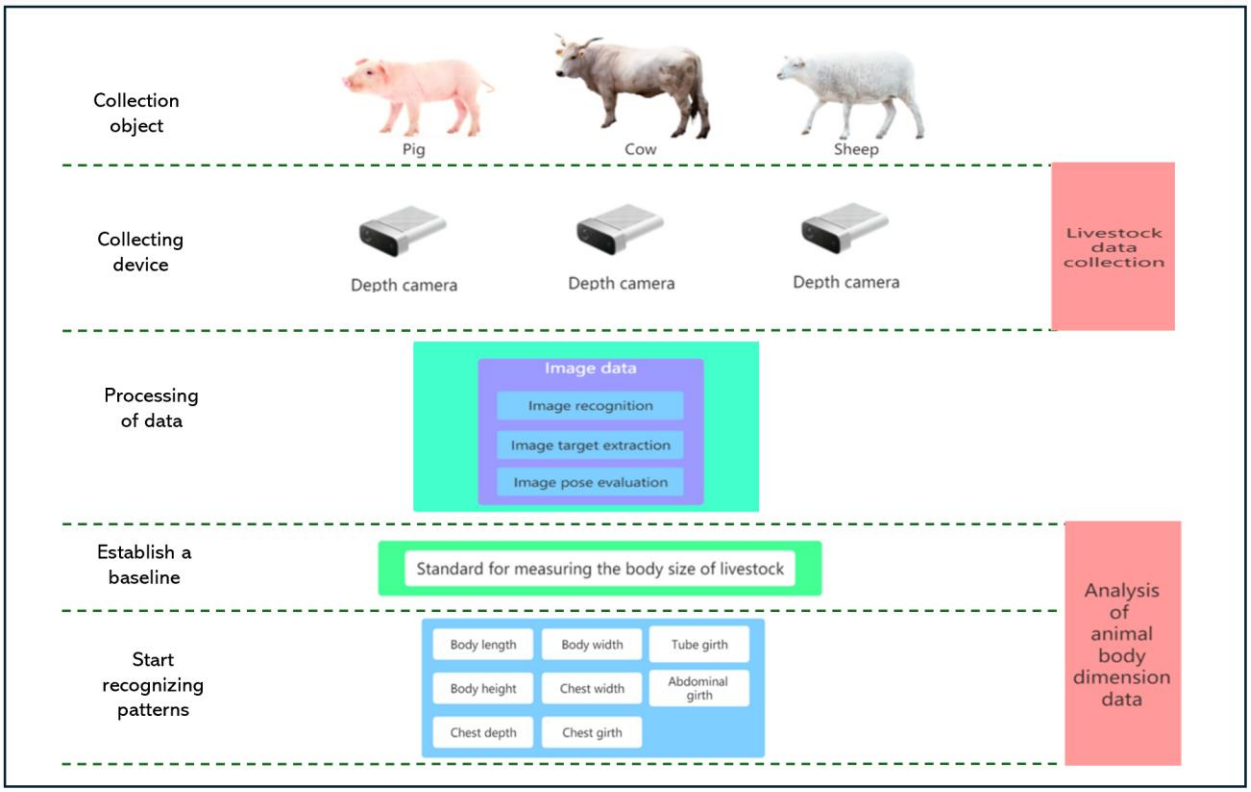
Real-time Computer Vision (RCV) was successfully used to identify and verify vehicle components in automotive production. Applied to animal health, this same technology can continuously monitor livestock in pastures, identifying individual animals, tracking their movement patterns, and alerting caretakers to any animal showing signs of distress, injury, or illness.

Data Schema for CV

The way data is organized and stored becomes crucial for effective animal health diagnosis. A comprehensive data schema for animal health includes:

- Animal identification data: species, breed, age, size
- Physical characteristic data: posture, gait, visible injuries, skin conditions
- Behavioral data: movement patterns, activity levels, interactions,
- Audio data: breathing sounds, vocalizations, distress call

To effectively analyze and interpret this variety of data, especially physical and behavioral traits, CV systems require a well-structured pipeline that connects data collection, processing, and output. The following workflow illustrates how a computer vision system is used to gather livestock body dimension data, from initial image capture using depth cameras to the extraction of standardized body measurements. This structured approach ensures consistent and accurate analysis across different species, forming a vital part of the broader animal health data schema.



Using JavaScript, here is an accurate example of what the CV will be attempting to fill out with the visual data it receives.

```javascript
const animalHealthData = {
  identification: {
    species: 'Cow',
    breed: 'Holstein',
    size: 'Large',
    colors: ['Black', 'White'],
    userEnteredData: {
      age: 4 //In Years
    }
  },
  physicalCharacteristics: {
    posture: 'Stiff-legged',
    gait: 'Uncoordinated',
    visibleInjuries: ['Scrapes on legs', 'Bruising
near flank'],
    skinConditions: []
  },
  behaviorData: {
    movementPatterns: ['Erratic', 'Stumbling'],
    activities: ['Hyperactive', 'Sluggish',
'Aggressive']
  },
  audioData: {
    breathingRate: 'Rapid',
    vocalizations: 'Loud bellowing',
    distressCall: true
  }
};
```

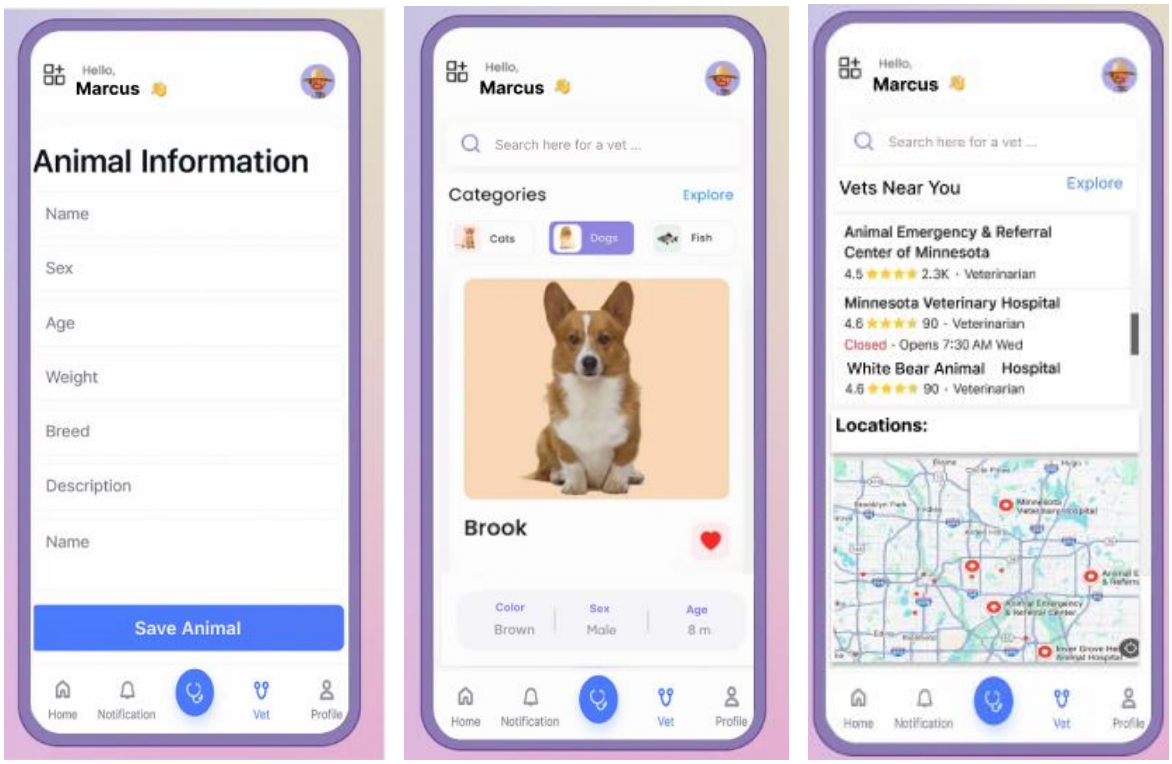
This schema provides detailed information for the AI model that will be used to determine the specific condition of the animal once it has received this information. Once the AI has the structured data from visual inputs, it needs a way to deliver that analysis in the real world. That's where PetScope comes in turning complex AI and computer vision systems into a simple, usable mobile solution.

PETSCOPE: COMPREHENSIVE MOBILE ANIMAL HEALTH SOLUTION

PetScope represents the practical application of these technologies, designed specifically to solve the animal health assessment challenges faced by pet owners, farmers, and animal rescue organizations. This mobile application transforms any smartphone into a sophisticated animal health diagnostic tool, providing immediate access to AI powered veterinary insights.

The application addresses the core problem through three integrated input methods:

- Video analysis combines frame and movement assessment over time, capturing posture and behavior problems that indicate health problems. Live feeds can be used to track ailment indicators in real time.
- Photo analysis provides a detailed examination of physical traits, skin conditions, and visible injuries, addressing the issue of subtle symptom detection.
- Audio processing analyzes animal vocalizations, breathing patterns, and distress sounds that indicate pain, stress, or respiratory issues.



Integration With Existing Agricultural Equipment

For farm operations, PetScope integrates with existing agricultural equipment and monitoring systems. The cow scratcher monitoring feature demonstrates this integration perfectly.

Many farms use automated cow scratchers that allow cattle to groom themselves. When cows use the scratcher, the PetScope system would analyze their posture, movement, and any visible health conditions. Cows that avoid the scratcher or show difficulty reaching it may indicate mobility problems or injury that require attention.

PetScope can analyze footage from fixed cameras positioned near these scratchers to monitor individual cow health.

PetScope's diagnosis process works by having users point their smartphone or camera at their animal or upload existing photos and videos. The computer vision system immediately analyzes the visual data, identifying the animal's species and breed, checking for visible injuries, swelling, or skin conditions, assessing posture and movement patterns, and evaluating overall body condition. Being not only useful but dynamic, PetScope has specialized features that are designed to assist users in a different way depending on their urban or rural setting.

PRACTICAL APPLICATIONS: CITY vs RURAL IMPLEMENTATION

In urban environments, PetScope primarily serves individual pet owners who need immediate guidance about their animal's health. Pet owners in the city often face the challenge of distinguishing between major and minor issues. PetScope solves this by providing instant triage assessment, helping owners make informed decisions about when to seek professional care. Including PetScope’s ability to maintain the detailed health histories of an animal that can be easily shared with veterinarians, particularly useful for pet owners who move frequently or use multiple veterinary services.

Rural applications of PetScope address complex challenges where veterinary services are often distant and costly, and livestock health directly impacts economic livelihood. PetScope becomes

especially valuable for farmers managing large herds across vast areas by offering scalable monitoring solutions, smart alerts, and actionable analytics. When connected to live cameras, PetScope provides herd management tools that track animal health over time, generate reports for veterinary consultations, and integrate seamlessly with existing farm infrastructure and management software. GPS integration further enhances functionality by allowing farmers to quickly locate animals showing signs of illness across large pastures.

Platforms like the Vosker V300 Ultimate already provide live streaming capabilities from remote locations with solar power and cellular connectivity, making them perfect for monitoring distant pastures.

PetScope can utilize these existing live feed systems, analyzing the streaming data to identify animals in distress and track individual animal health over time.

Early disease detection becomes critical in rural settings where diseases can spread rapidly through herds. PetScope's continuous monitoring can identify the first animal showing symptoms of contagious diseases, enabling immediate isolation and treatment before the condition spreads to the entire herd. This early detection capability can save farmers thousands of dollars in lost livestock and veterinary bills.

FUTURE IMPLICATIONS AND SCALABILITY

PetScope represents just the beginning of AI powered animal health care. As the technology develops, integration possibilities expand to include automated feeding systems that adjust portions based on detected health conditions, smart barn environments that modify temperature and humidity based on animal comfort indicators, integration with veterinary practice management systems for seamless care coordination, and development of specialized modules for different animal types and specific health conditions.

CONCLUSION

Animal health has long faced challenges, but technology now offers a solution. PetScope uses AI, Computer Vision, and Machine Learning to give quick, accurate health checks using tools caretakers already have, like smartphones. It solves major issues such as missed symptoms, delayed assessments, costly vet visits, and risky animal handling. By offering expert level analysis through a phone, PetScope makes quality animal care more accessible and can save both animal and human lives. PetScope is the future of animal care being smart, easy to use, and always available.

REFERENCES

https://pmc.ncbi.nlm.nih.gov/articles/PMC7649994/

https://www.ibm.com/think/topics/natural-language-processing

https://www.ibm.com/think/topics/supervised-learning

https://www.robotron.de/en/rcv

https://www.vosker.com/product/v150-twin-pack/?attribute_pa_v150-twin-pack=v150-twin-pack-us&utm_source=bing&utm_medium=cpc&utm_term=www.vosker.com&device=c&network=o&placement=&matchtype=b&campaign_id=533051367&ad_group_id=1355700497288919&msclkid=55750306735f141bc0e36b59422c891c&utm_campaign=PMAX%20%7C%20USA%20%7C%20V150%20Twin%20Pack&utm_content=V150%20Twin%20Pack%20%7C%20FARM

https://builtin.com/artificial-intelligence/types-of-artificial-intelligence

https://github.com/marcusj15/animal_health_ai_research_2025