EE/CprE/SE 492 Bi-Weekly Report 1
February 11 - February 18
Team sdmay23-05
Project Title: Livestock Well-being Identification (to be changed)
Client/Advisor: Dr. Ashraf Gaffar

Team Members:
Asad Abdalla - Dev Ops Manager
Rashed Alyammahi - Backend Manager
Mohammed Elbermawy - Client Interaction
Yannick Fumukani - Frontend Manager
Richard Gonzalez - Scrum Master / Team Organizer
Meet Patel - Advisor Interaction
Adam Sweiger - Status Reporter

Weekly Summary
The team's advisor, Dr. Gaffar, pointed the team to a set of research articles on the use of artificial intelligence in diagnosing skin cancer and other areas of healthcare. Each team member read and wrote a summary for one of these articles and then presented the findings to the team. The other main objective for this week was to develop and train a machine-learning model to analyze images of skin moles from the ISIC dataset.

Past Week Accomplishments
- Asad Abdalla: Summarized "The degradation of performance of a state-of-the-art skin image classifier when applied to patient-driven internet search," which found that AI algorithms may perform differently when applied to new data that differs from the training data. The article shows that AI models should be trained on diverse datasets and that models should be developed and used responsibly.
- Rashed Alyammahi:
    - Reconfigured environment to work with Keras on a new computer. In the progress of re-running the image classification tutorial but currently experiencing a few bugs. Will consult Adam for further advice.
    - Summarized Abhishek (2021) "Predicting the clinical management of skin lesions using deep learning" and determined that despite its potential advantages, the technique described in the paper the model has trained on a dataset that is not exhaustive.
- Mohammed Elbermawy: Summarized "A deep learning model based on whole slide images to predict disease-free survival in cutaneous melanoma patients," which used convolutional neural networks (CNN) as prognostic tools to predict the length of

disease-free survival for melanoma patients. The study showed that there is a strong potential in using deep learning as a prognostic tool to enhance healthcare.

- Yannick Fumukani: Summarized "A deep learning system for differential diagnosis of skin diseases," which used a CNN to diagnose various skin diseases. The dataset included over 10,000 images, and an accuracy of over 90% was achieved when differentiating between benign and malignant skin lesions.
- Richard Gonzalez: Summarized "Dermatologist-level classification of skin cancer with deep neural networks," which used deep neural networks to classify benign and malignant skin lesions. A dataset of over 100,00 images was used. The accuracy was comparable to that of dermatologists.
- Meet Patel:
    - Summarized "AI outperformed every dermatologist in dermoscopic melanoma diagnosis, using an optimized deep-CNN architecture with custom mini-batch logic and loss function," which ran a deep-CNN model on over 17,000 images to diagnose melanoma and performed better than dermatologists. Contains information about the architecture of the neural network.
    - Also researched AWS Cloud computing on how to train the data to recognize the images. From the research, still trying to create Sagemaker Notebook. Working on how to create it. After creating it, will upload the images to it so that it can train the model and evaluate the percentage.
- Adam Sweiger: Research article summary and image classification model on ISIC dataset of skin moles
    - Wrote summary for "Human-computer collaboration for skin cancer recognition" research article. This article provides context for the project (using artificial intelligence to improve healthcare diagnostics). Includes useful information about how the neural network used in the study is built and the training process.
    - Developed and trained a machine-learning image classification model to classify skin moles as benign or malignant. 1,000 images of benign skin moles and 1,000 images of malignant skin moles were retrieved from a public ISIC API to form the dataset. 80% of the data was used for training, while 20% was used for validation. The model was adapted from existing image classification examples built with Keras. A data augmentation preprocessor expands the dataset by making random transformations to existing training images. Once developed, the model was trained on the team's Linux virtual machine using an NVIDIA GPU. The model was trained over 50 epochs at an average pace of about 30 seconds per epoch, and the accuracy after 50 epochs was recorded at 87.25%. A higher accuracy could be achieved with more training and/or a larger dataset.

Individual Contributions

Team Member	Contributions	Weekly Hours	Cumulative Hours
Asad Abdalla	Research article summary	3	3
Rashed Alyammahi	Research article summary	4	4
Mohammed Elbermawy	Research article summary	3	3
Yannick Fumukani	Research article summary	3	3
Richard Gonzalez	Research article summary	3	3
Meet Patel	Research article summary, AWS research	5	5
Adam Sweiger	Research article summary, image classification ML model	7	7

Plans for the Upcoming Week

- All team members: Conduct more research into using AWS for training machine learning models
- All team members: Train developed image classification model on the cloud and compare performance to performance on the virtual machine

Summary of Weekly Advisor Meeting

Discussed research articles and objectives for training machine learning models locally and in the cloud.