**LEARNING TO BUILD A TIME APPLICATION FOR EMOTION DETECTION**

INTERNSHIP REPORT

19.01.2025 – 19.02.2025

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**Introduction**

This internship provided me with an invaluable opportunity to work on real-time artificial intelligence applications, focusing on emotion and animal detection models. The experience allowed me to apply machine learning techniques in practical scenarios, gaining hands-on exposure to deep learning and real-time computer vision applications. The internship included three tasks: visualizing activation maps for CNN-based emotion detection, developing an animal detection model with a graphical user interface (GUI), and creating a real-time age and emotion detection system for a horror movie theatre.

Due to time constraints, I was able to complete the second task comprehensively. However, I made significant progress on the other two tasks and gained valuable insights into real-time AI applications. This report details the tasks undertaken, skills developed, challenges faced, and overall outcomes of the internship.

**Background**

The internship revolved around real-time AI solutions for emotion and object detection. One of the primary tasks was:

**Visualizing Activation Maps:** This task aimed to understand which image regions activated CNN filters for emotion detection. The challenge lay in interpreting deep learning models' inner workings using techniques like Grad-CAM. Implementing this required a solid grasp of convolutional layers and how they processed image features. Although I started experimenting with visualization techniques, the complexity of model interpretation and the need for extensive debugging made it difficult to complete within the given timeframe.

**Animal Detection Model:** The goal was to train a model capable of identifying multiple animals within a single frame and classifying them as carnivorous or herbivorous. A GUI was developed to process images and videos, providing a user-friendly interface for real-time animal classification.

**Age and Emotion Detection for Movie Theatres:** This task involved real-time age classification and emotion detection to regulate entry into a horror movie theatre. The model needed to determine whether an individual was under 13, between 13 and 60, or above 60 and mark them accordingly. Those under 13 or over 60 had to be flagged with a "Not Allowed" message, while individuals between 13 and 60 required emotion detection. Implementing this task posed significant challenges, particularly in dataset collection, ensuring accurate age prediction in varied lighting conditions, and maintaining real-time processing efficiency. Despite making initial progress, refining the model's accuracy and integrating all components proved too time-consuming within the internship period.

I successfully completed the animal detection model with a fully functional GUI and ensured smooth real-time processing.

Along with the technical skills, I learned and polished my problem-solving and adaptability skills, having successfully passed through a myriad of challenges, thus fine-tuning the models for best performance.

**Learning Objectives**

This internship aimed to develop technical and analytical skills, particularly in deep learning, real-time computer vision, and GUI development. The primary learning objectives were:

* **Understanding Deep Learning Architectures:** Gaining hands-on experience with CNNs for image classification.
* **Real-Time Object Detection:** Implementing AI models capable of detecting and classifying multiple objects in images and videos.
* **GUI Development:** Creating an intuitive interface for real-time processing of images and videos.
* **Data Management and Storage:** Storing detection results, including timestamps, in structured formats like Excel or CSV.
* **Optimization and Performance Tuning:** Improving model accuracy and performance through hyperparameter tuning and dataset refinement.
* Formal and Professional Email Writing: Another important skill I developed during the internship was writing emails in a formal and professional manner. This included learning how to write clear, concise, and well-structured emails that could effectively communicate technical information, doubts and project updates to mentors. Mastering this skill was essential for professional communication and collaboration, ensuring that messages were conveyed with the appropriate tone and level of detail.

In short, the experience would go on to hone technical skills while sharpening important soft skills such as teamwork, communication, and project management. Such a holistic approach allowed me to leave the internship well-prepared to deal with the nuances of the AI landscape and deliver meaningful contributions for future projects.

**Activities and Tasks**

**Task 2 - Animal Detection Model**

* Developed a custom machine learning model capable of detecting and classifying multiple animals in a frame.
* Differentiated carnivorous and herbivorous animals, highlighting them in red and green, respectively.
* Integrated a GUI using PyQt to allow users to process both images and videos.
* Ensured smooth video playback and real-time classification.
* Displayed a pop-up message showing the number of detected carnivorous animals.
* Successfully completed and implemented all features.

**Skills and Competencies**

I got to develop the most complete set of skills that span both technical and soft skills, and significantly enhanced my capabilities in AI and NLP during the internship.

**Technical Skills**:

* Deep Learning & Computer Vision: Hands-on experience with CNNs for image classification and object detection.
* Real-Time Processing: Implementing AI models capable of processing live video streams.
* GUI Development with PyQt: Built a user-friendly interface for AI-powered applications.
* Data Storage & Management: Stored detection data in structured formats for analysis.
* Model Optimization: Applied hyperparameter tuning to enhance accuracy and efficiency.

**Soft Skills**:

* Problem-Solving: Tackled challenges related to real-time AI applications.
* Time Management: Balanced multiple tasks under tight deadlines.
* Analytical Thinking: Evaluated model performance and refined techniques accordingly.
* Communication & Documentation: Effectively documented progress and findings.

This internship has offered a rich, comprehensive experience regarding both my technical expertise and development of soft skills. It enhanced my programming, data analysis, and machine learning skills through interactions with complex AI projects while at the same time improving my communication and problem-solving abilities. Overall, this kind of balanced growth has prepared me for future challenges and opportunities in the field of artificial intelligence.

**Feedback and Evidence**

**Guidance and support from the mentors:**

They would address my doubts and queries actively. In case of any doubt or query, they will have a detailed explanation and practical advice. This also includes their responding to my emails in the right time, constructive feedback on my progress, and refinement of work and being on track. The training given before the internship was particularly useful, equipping me with a solid foundation to tackle the challenges ahead.

**Evidence**:

* Received guidance from mentors on model implementation and optimization.
* Successfully implemented and demonstrated the animal detection model.
* The experience enhanced my ability to work on real-world AI problems.

The exceptional training, thorough guidance, clear task explanations, and high-quality task assignments provided by the mentors made a huge difference in the completion of the internship. Their constant support and constructive feedback not only helped me improve my technical skills but also helped me grow professionally.

**Challenges and Solutions**

During the internship, I faced several challenges, particularly with the tasks that were incomplete due to their complexity and time constraints. Visualizing activation maps was a difficult task since it required an in-depth understanding of CNNs and backpropagation techniques to interpret model decisions. Additionally, age and emotion detection for a movie theatre setting posed difficulties in dataset collection and achieving high accuracy in real-time scenarios. These tasks required extensive experimentation, which was difficult to complete in the given timeframe.

The completed animal detection model also presented challenges, particularly in optimizing real-time video processing and ensuring accurate classification across various lighting and background conditions. To address these issues, I implemented efficient preprocessing techniques and leveraged Google Colab for model training. The GUI development required optimizing video playback and ensuring seamless interaction with the classification model, which was successfully achieved through PyQt improvements.

Despite the complexities of the incomplete tasks, the learnings from these challenges will serve as a foundation for future improvements and research in real-time AI applications.

**Outcomes and Impact**

The internship led to the completion of three highly impactful projects that are discussed as follows:

* Completed: Animal detection model with a GUI, including video processing and classification.
* Key Learning: Deepened understanding of AI model deployment in real-time applications.
* Future Scope: Enhancing performance and expanding the classification model for more species.

This gave me the exposure to the many practical applications of AI in all kinds of fields and helped me grow both professionally and personally as an AI practitioner.

**Conclusion**

This internship was a transformative experience, providing exposure to real-world AI applications in computer vision. The knowledge gained in real-time animal detection, deep learning, and GUI development will significantly contribute to future projects. The successful completion of the animal detection model demonstrates my ability to develop functional AI applications. Moving forward, I aim to refine and expand my work in AI-driven real-time solutions.

Thank you!