Computer Vision Project Report

Task 2: Computer Vision Project

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I'm excited to share the details of my Computer Vision project, which I embarked upon as part of my internship at InternCareer. My journey through this project was both challenging and exhilarating as I dove deep into the world of image classification for medical diagnostics. Let’s walk through the steps and see what I discovered.

1. Project Selection

For this project, I decided to focus on **image classification for medical diagnostics**, specifically identifying pneumonia from chest X-ray images. This task not only has significant practical implications but also provided a rich ground for applying and honing my skills in computer vision and deep learning.

2. Data Collection

I utilized the **Chest X-ray Images (Pneumonia)** dataset, available on Kaggle. This dataset is well-suited for the task as it contains labeled chest X-ray images categorized into two classes: normal and pneumonia. The dataset was split into training, validation, and testing sets, each stored in separate folders.

3. Preprocessing

Preprocessing is a critical step in any machine learning project. Here’s what I did:

- **Resizing**: All images were resized to 224x224 pixels to ensure uniformity and compatibility with the pre-trained models I used.
- **Normalizing**: The pixel values were scaled to a range of 0 to 1, which helps in faster convergence during training.
- **Augmentation**: I applied various augmentations like rotation, width and height shifts, shear, zoom, and horizontal flips. These augmentations help in generalizing the model better by simulating various real-world scenarios.

4. Model Development

For developing the model, I employed a **Convolutional Neural Network (CNN)** using TensorFlow and Keras. Here’s a brief overview of the architecture:

- **Convolutional Layers**: Three convolutional layers with increasing filter sizes (32, 64, 128) to extract features from the images.
- **MaxPooling Layers**: To reduce the spatial dimensions and computational load.
- **Flatten Layer**: To convert the 3D feature maps into a 1D feature vector.
- **Dense Layers**: Fully connected layers for classification, with a final sigmoid activation for binary classification (normal or pneumonia).
- **Dropout Layer**: To prevent overfitting by randomly dropping some neurons during training.

5. Training and Evaluation

I trained the model on the training dataset and validated it on the validation dataset. The model was compiled with the Adam optimizer and binary cross-entropy loss. Here's a summary of the training:

- **Epochs**: 10
- **Batch Size**: 32
- **Training Accuracy**: 90%
- **Validation Accuracy**: 88%

The evaluation on the test dataset gave the following metrics:

- **Test Loss**: 0.2854
- **Test Accuracy**: 89%

These results indicate that the model performs quite well in distinguishing between normal and pneumonia-affected chest X-rays.

6. Results Presentation

Here's a detailed presentation of the results:

Model Accuracy

The model achieved an impressive accuracy of 89% on the test dataset. This high level of accuracy suggests that the model is effective at identifying pneumonia from chest X-ray images.

Visualizations

I used matplotlib to visualize the training and validation accuracy and loss over epochs. The plots showed a consistent increase in accuracy and a decrease in loss, indicating that the model was learning effectively.

Insights

- **Training and Validation Curves**: The training and validation accuracy curves showed convergence, suggesting that the model was neither overfitting nor underfitting.

- **Sample Predictions**: I visualized some sample predictions to see how the model performed on individual images. The model correctly classified most of the images, providing confidence in its real-world applicability.

Conclusion

Working on this project was a fantastic learning experience. It was rewarding to see how computer vision can be applied to critical areas like medical diagnostics. The journey from data collection to model evaluation was filled with learning, challenges, and insights.

I'm thrilled with the results and the practical impact this project could have. A special thanks to InternCareer for providing this opportunity. I'm looking forward to applying these skills to more real-world problems and continuing my journey in the fascinating field of AI and computer vision.

Thank you for reading, and I hope you found this report as exciting as I found working on the project!

Warm regards,
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References

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