

INTERNSHIP REPORT

*A report submitted in partial fulfillment of the requirements for the Award of Degree
of*

**BACHELOR OF TECHNOLOGY
IN
ARTIFICIAL INTELLIGENCE & DATA SCIENCE ENGINEERING
by,**

Aawaiz Patel

PRN-2162231995043

Under the supervision of

Niranjan Pandey

Infosys Springboard

(Duration: 5th March, 2024 to 15th May, 2024)



**DEPARTMENT OF ARTIFICIAL INTELLIGENCE & DATA SCIENCE
ENGINEERING**

Pradnya Niketan Education Society, Pune.

**NAGESH KARAJAGI ORCHID COLLEGE OF ENGINEERING &
TECHNOLOGY, SOLAPUR.**

2023-2024



Pradnya Niketan Education Society , Pune.
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Certificate

This is to certify that the “**Internship Report**” submitted by **Mr. Aawaiz patel** (PRN:2162231995043) is work done by him and submitted during **2023 – 2024** academic year, in partial fulfillment of the requirements for the award of the degree of **BACHELOR OF TECHNOLOGY in ARTIFICIAL INTELLIGENCE & DATA SCIENCE ENGINEERING, SOLAPUR** at **Infosys Springboard**.

Date of Submission:

Prof. N. B. Aherwadi.
(Internship Coordinator)

Dr. M. B. Patil.
(Head of Department)

CERTIFICATE



PROGRAM COMPLETION CERTIFICATE

The certificate is awarded to

Aawaiz Patel

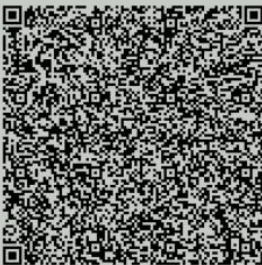
for successfully completing the program

Machine Learning

on June 1, 2024



Congratulations! You make us proud!



Issued on: Saturday, November 30, 2024
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Thirumala Arohi
Executive Vice President and Global Head
Education, Training & Assessment (ETA)
Infosys Limited

ACKNOWLEDGEMENT

I express my sincere gratitude for the opportunity to complete my internship and compile this report. Firstly, I am thankful to N.K. Orchid College of Engineering & Technology, Solapur, for providing a platform for practical learning experiences like internships.

Special thanks to **Prof. N. B. Aherwadi**, the internship coordinator, for his invaluable guidance and unwavering support throughout the internship process. My heartfelt gratitude to **Dr. M. B. Patil**, Head of the Department, for his continuous encouragement and support during my academic journey. I also extend my sincere appreciation to the Placement Cell Head, **Dr. R. R. Patil**, for facilitating the internship opportunities and providing guidance during the placement process.

I am deeply thankful to Infosys Springboard for exceptional mentorship during the **Machine Learning** internship. The insightful lectures and expert knowledge greatly enhanced my understanding of Java programming and its practical applications.

In conclusion, my heartfelt thanks to everyone who directly or indirectly contributed to my internship experience, academic journey, and the successful completion of this report. Your support and guidance have been instrumental in my growth and learning.

Warm regards,
Aawaiz Patel
Department of Artificial Intelligence & Data Science
NKOCET

WEEKLY OVERVIEW

Week 1:

1 ST WEEK	DATE	DAY	NAME OF THE TOPIC/MODULE COMPLETED
	01/02/24	Monday	Introduction to Machine Learning concepts
	02/02/24	Tuesday	Algorithms: Linear Regression
	03/02/24	Wednesday	Algorithms: Logistic Regression
	04/02/24	Thursday	Hands-on exercises using Python and relevant libra
	05/02/24	Friday	Supervised Learning: Practical examples and case studies

Week 2:

2 ND WEEK	DATE	DAY	NAME OF THE TOPIC/MODULE COMPLETED
	08/02/24	Monday	Introduction to Unsupervised Learning
	09/02/24	Tuesday	Clustering: K-means
	10/02/24	Wednesday	Clustering: Hierarchical
	11/02/24	Thursday	Dimensionality Reduction: PCA
	12/02/24	Friday	Supervised Learning: Practical examples and case studies

Week 3:

3 rd WEEK	DATE	DAY	NAME OF THE TOPIC/MODULE COMPLETED
	15/02/24	Monday	Introduction to Neural Networks
	16/02/24	Tuesday	Deep Learning Concepts
	17/02/24	Wednesday	Implementing Neural Networks using TensorFlow, Keras
	18/02/24	Thursday	Group Discussions on Neural Networks
	19/02/24	Friday	Coding Sessions: Neural Network Projects

Week 4:

4 th WEEK	DATE	DAY	NAME OF THE TOPIC/MODULE COMPLETED
	22/02/24	Monday	Data Preprocessing Techniques
	23/02/24	Tuesday	Model Training Methods
	24/02/24	Wednesday	Model Evaluation Techniques
	25/02/24	Thursday	Project Work: Multilingual Voice-Based Image Cap Generator
	26/02/24	Friday	Intermediate Project Reviews and Feedback

Week 5:

5 th WEEK	DATE	DAY	NAME OF THE TOPIC/MODULE COMPLETED
	29/02/24	Monday	Continuation of Final Project Development
	30/02/24	Tuesday	Integration of Voice Recognition Models
	31/02/24	Wednesday	Integration of Image Captioning Models
	01/03/24	Thursday	Testing and Validation of Models
	02/03/24	Friday	Ensuring Accuracy and Reliability

Week 6:

6 th WEEK	DATE	DAY	NAME OF THE TOPIC/MODULE COMPLETED
	05/03/24	Monday	Final Project Documentation
	06/03/24	Tuesday	Final Project Presentations
	07/03/24	Wednesday	Peer Reviews and Feedback
	08/03/24	Thursday	Project Submission
	09/03/24	Friday	Reflective Session and Wrap-Up

INTRODUCTION

The Machine Learning internship was a transformative experience meticulously designed to provide an in-depth understanding of the rapidly evolving field of machine learning and artificial intelligence. Spanning an extensive 296 hours, the program offered a perfect balance of theoretical knowledge, hands-on practice, and real-world application. This immersive experience not only strengthened my technical expertise but also instilled in me the confidence to tackle complex challenges in the industry.

Throughout this internship, I engaged in a diverse range of learning activities that contributed to a comprehensive understanding of machine learning. These included theoretical lessons that explored foundational concepts, hands-on coding exercises that reinforced practical implementation, and intensive project work that bridged the gap between theory and practice. The curriculum was thoughtfully designed to cover an extensive array of topics, ranging from fundamental machine learning algorithms, such as linear regression and decision trees, to advanced techniques in deep learning, including neural networks, convolutional neural networks (CNNs), and recurrent neural networks (RNNs). This progressive approach ensured a gradual mastery of concepts, allowing me to build a strong foundation before delving into more sophisticated techniques.

The primary objective of this internship was to equip participants with a deep and holistic understanding of machine learning concepts and their real-world applications. The program was structured in a way that facilitated progressive learning—starting with the basics, such as data preprocessing, feature selection, and model evaluation, and gradually moving toward more advanced areas like natural language processing (NLP), computer vision, and reinforcement learning. This step-by-step methodology fostered a seamless transition from theoretical understanding to practical application, ensuring that I not only grasped the core principles but also developed the skills to implement them effectively.

In addition to technical skills, this internship placed great importance on the development of essential soft skills. Collaborative projects provided a platform to work alongside peers, exchange ideas, and tackle challenges as a team, fostering teamwork and effective communication. Peer reviews and presentations further honed my ability to articulate complex ideas clearly and concisely, an invaluable skill in any professional setting. The diverse and dynamic learning

environment, enriched by the guidance of experienced mentors, played a pivotal role in preparing me for the multifaceted challenges of the industry.

The internship also emphasized the development of critical soft skills that are essential for thriving in a professional environment. Presenting our findings, articulating complex ideas, and participating in peer reviews helped me improve my communication skills. Collaborating with peers on challenging tasks fostered my ability to work effectively in teams, while the dynamic learning environment encouraged me to think critically and approach problems from multiple angles. Regular feedback from mentors was instrumental in identifying areas for growth and continuously improving my performance.

A major highlight of the internship was the emphasis on practical implementation. Every concept introduced during theoretical sessions was reinforced with hands-on coding exercises, enabling me to write efficient, well-structured code and solve real-world problems. Working with diverse datasets helped me understand the nuances of data preprocessing, feature engineering, and model evaluation. The challenges of debugging code, tuning hyperparameters, and improving model performance provided invaluable experience that further solidified my technical expertise.

A major highlight of the internship was the emphasis on practical implementation. Every concept introduced during theoretical sessions was reinforced with hands-on coding exercises, enabling me to write efficient, well-structured code and solve real-world problems. Working with diverse datasets helped me understand the nuances of data preprocessing, feature engineering, and model evaluation. The challenges of debugging code, tuning hyperparameters, and improving model performance provided invaluable experience that further solidified my technical expertise.

Beyond the technical and soft skills, this internship instilled in me a deeper appreciation for the ethical and societal implications of artificial intelligence. Discussions about responsible AI practices, fairness in algorithms, and the importance of unbiased datasets broadened my understanding of the impact of technology on society. This perspective has inspired me to approach future projects with not only technical rigor but also a sense of responsibility.

Overall, this internship was a comprehensive and transformative learning journey that has profoundly shaped my understanding of machine learning and artificial intelligence. It equipped me with the technical expertise, problem-solving acumen, and communication skills necessary to thrive in this field. I am confident that the knowledge and experiences gained during these 296 hours have prepared me to take on the challenges of the ever-evolving AI landscape, contribute to innovative projects, and make meaningful advancements in technology.

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TECHNOLOGY

During the internship, I utilized several technologies and tools essential for machine learning and data science. Key technologies included:

Python: The primary programming language used for all coding exercises and projects. Libraries such as NumPy, pandas, and Matplotlib were extensively used for data manipulation and visualization.

TensorFlow and Keras: These frameworks were employed for building and training neural networks. They provided a robust platform for implementing complex deep learning models.

OpenCV: Used for image processing tasks in the final project, enabling real-time video capture and image manipulation.

Pygame: Utilized for sound playback in the drowsiness detection project, demonstrating an integration of machine learning with multimedia processing.

Jupyter Notebooks: Served as the main environment for writing and executing code, allowing for interactive development and easy sharing of results.

Seaborn: An advanced visualization library that complemented Matplotlib, enabling the creation of aesthetically pleasing and informative statistical plots to explore and present data.

PyTorch: Used alongside TensorFlow to gain additional exposure to deep learning frameworks. PyTorch's dynamic computation graph allowed for flexibility in experimenting with complex architectures and research-oriented workflows.

Kaggle Datasets: Leveraged for sourcing real-world datasets to practice and implement machine learning algorithms. Kaggle also served as a platform to explore competitions and benchmark solutions.

CODING

Significant coding was done throughout the internship, with a focus on implementing machine learning algorithms and developing projects. Key coding tasks included:

- Writing scripts for data preprocessing, including handling missing values, normalization, and data augmentation.
- Implementing machine learning algorithms such as linear regression, logistic regression, K-means clustering, and PCA.
- Developing neural network models using TensorFlow and Keras, including defining network architecture, compiling models, and training with datasets.
- Integrating voice recognition and image captioning models in the final project, involving complex data pipelines and real-time processing.
- Writing utility functions for model evaluation, including accuracy calculation, confusion matrices, and ROC curves.

I have developed Image Caption Generator using machine learning,

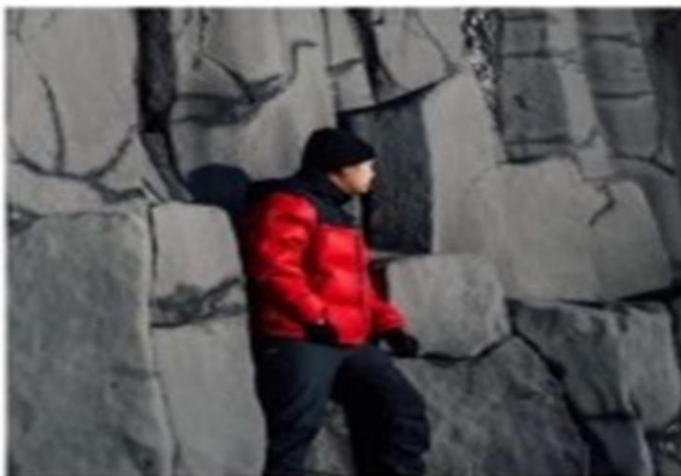
```
1 from flask import Flask, render_template, request, redirect, url_for, send_from_directory
2 from transformers import VisionEncoderDecoderModel, ViTImageProcessor, AutoTokenizer
3 from PIL import Image
4 from googletrans import Translator
5 from gtts import gTTS
6 import os
7 import torch
8
9
10 app = Flask(__name__)
11 app.config['Uploaded_Images'] = 'C:/Users/New/Documents/Uploaded_Images'
12
13 # Initialize the vision model and tokenizer
14 model = VisionEncoderDecoderModel.from_pretrained("nlpconnect/vit-gpt2-image-captioning")
15 feature_extractor = ViTImageProcessor.from_pretrained("nlpconnect/vit-gpt2-image-captioning")
16 tokenizer = AutoTokenizer.from_pretrained("nlpconnect/vit-gpt2-image-captioning")
17
18 device = "cuda" if torch.cuda.is_available() else "cpu"
19 model.to(device)
20
21 @app.route('/')
22 def index():
23     return render_template('mvbicg.html')
24
25 @app.route('/generate', methods=['POST'])
26 def generate_caption():
27     # Check if a file was uploaded
28     if 'image' not in request.files:
29         return redirect(request.url)
30
31     file = request.files['image']
32
```

```

53     return render_template('mvbicg.html', caption=caption, translated_text=translated_text, audio_
49     # Save translated text to audio file
50     audio_file_path = os.path.join(app.config['Uploaded_Images'], 'translated_audio.mp3')
51     save_audio(translated_text, language, audio_file_path)
52
53     return render_template('mvbicg.html', caption=caption, translated_text=translated_text, audio_
54
55 def predict_caption(image_path):
56     image = Image.open(image_path)
57     if image.mode != "RGB":
58         image = image.convert(mode="RGB")
59
60     pixel_values = feature_extractor(images=image, return_tensors="pt").pixel_values
61     pixel_values = pixel_values.to(device)
62
63     output_ids = model.generate(pixel_values)
64     preds = tokenizer.batch_decode(output_ids, skip_special_tokens=True)
65     return preds[0]
66
67 def translate_text(text, target_language):
68     translator = Translator()
69     translated_text = translator.translate(text, dest=target_language)
70     return translated_text.text
71
72 def save_audio(text, language, audio_file_path):
73     gtts_object = gTTS(text=text, lang=language, slow=False)
74     gtts_object.save(audio_file_path)
75
76 if __name__ == '__main__':
77     app.run(debug=False)
78

```

Outputs :



Predicted output -a man in a red jacket is standing on a rock wall

CONCLUSION

This Machine Learning has been a life-changing experience that has profoundly shaped my understanding of artificial intelligence and machine learning. It has not only enhanced my technical skills but also fueled my passion for solving real-world problems through innovative and impactful solutions. The internship provided a perfect blend of theory, practical application, and problem-solving, allowing me to grow both as a learner and as a practitioner in this exciting and rapidly evolving field.

The curriculum was meticulously designed to cover a wide spectrum of machine learning concepts, ranging from basic principles to cutting-edge techniques. Each module was carefully structured to build a strong theoretical foundation, followed by practical, hands-on implementation. These practical sessions allowed me to explore various machine learning models, understand their intricacies, and fine-tune them for optimal performance. I developed a solid understanding of algorithms, data preprocessing techniques, and model evaluation metrics, which proved invaluable throughout the internship

What made this experience particularly rewarding was the emphasis on real-world applications. Through diverse and challenging projects, I had the opportunity to work with real datasets, address practical challenges, and create solutions that had a direct impact. These projects helped me understand the nuances of the machine learning pipeline, from data collection and cleaning to feature engineering, model training, and deployment. This end-to-end exposure not only strengthened my technical expertise but also gave me a sense of accomplishment and confidence in my abilities.

The highlight of this internship was the final project: a multilingual voice-based image caption generator. This ambitious project was the perfect culmination of everything I had learned during the program. It involved integrating advanced technologies like natural language processing, computer vision, and speech recognition to create a system that could generate image captions in multiple languages through voice input. The project was both challenging and exciting, pushing me to think creatively and apply my skills in innovative ways. Its successful completion was a proud moment for me, as it demonstrated the potential of machine learning to bridge linguistic gaps and make technology more inclusive.

Overall, this internship has been an incredible learning journey that has prepared me for a bright future in the field of machine learning and artificial intelligence. It has equipped me with the skills, knowledge, and confidence to tackle complex challenges, contribute to cutting-edge technological advancements, and make a meaningful impact in the industry. I am immensely grateful for this opportunity and look forward to applying what I have learned to create innovative solutions and drive progress in this exciting domain.