

Term Report

Submission date: 2023/12/18

Surname/Given name (the same on passport)	Mondal Shawan		
Your Job title	Research Intern		
Inst. Name of Internship	University Of Taipei		
Name of PI/Department/School	Dr. Hsueh-Ching Wang		
Date of Internship	2023/11/01	to	2024/01/31
The specific results and performance of internship (within 1000 words)	<p>In the second month of my research internship, the exploration of satellite image processing evolved into a more intricate and hands-on endeavor. This phase was characterized by a deeper application of theoretical knowledge, particularly within the challenging domain of satellite time series data analysis. The journey unfolded as a dynamic blend of theoretical immersion, practical implementation, and collaborative engagement with my mentor, providing invaluable insights into the intricate world of satellite image processing and time series analysis.</p> <p>Embarking on the month's activities, I immersed myself in a comprehensive exploration of deep learning fundamentals. Leveraging various online resources, with YouTube tutorials as invaluable guides, I navigated through the complexities of neural networks. The foundational phase covered essential concepts such as gradient descent, forward and backward</p>		

propagation, activation functions, and loss functions. Moving beyond basics, I dived into intricate elements like learning rate, stochastic gradient descent (SGD), parameters, hyperparameters, epochs, and batch size, gaining profound insights into the intricacies of training neural networks.

This theoretical foundation seamlessly transitioned into the diverse landscape of machine learning techniques. Both supervised and unsupervised learning realms were explored, unraveling the intricacies of classification methods such as linear classifiers, support vector machines (SVM), k-nearest neighbors, and random forests. Simultaneously, regression techniques and clustering algorithms like k-means and expectation-maximization enriched my understanding, providing a comprehensive toolkit for approaching various challenges in machine learning.

The transition from theory to practice marked a significant phase in which I crafted and tested simple Long Short-Term Memory (LSTM) models. This hands-on experience was instrumental in solidifying theoretical knowledge and honing practical skills. Hyperparameter tuning, a crucial aspect of model optimization, became a nuanced skill that empowered me to fine-tune models for optimal performance, setting the stage for the intricate work ahead in satellite image processing.

Shifting focus towards time series data analysis, I delved into the complexities of temporal patterns, leveraging online

resources, particularly YouTube. Concepts such as seasonality, trends, and the identification of abnormal patterns became essential components of my theoretical toolkit. This preparation uniquely positioned me to tackle the distinct challenges presented by satellite time series data, a cornerstone of our research.


The crux of the internship unfolded as I delved into the analysis of satellite images. Generating year-wise prints from 2001 to 2022 provided a comprehensive overview of the dataset. Constructing time series graphs became a powerful tool for visualizing temporal patterns both at a macroscopic level and with finer granularity, diving into monthly variations. This phase of the project added depth to my understanding of satellite image processing, revealing the intricate interplay of factors influencing temporal patterns.

Identifying disruptions in the graphs caused by abnormalities or cloud cover emerged as a critical task. Employing sophisticated techniques, I visually represented discontinuations and clouds, providing crucial insights into specific affected periods. Simultaneously, addressing NaN values in pixels for each month required a strategic approach. Filling these values by calculating the average from non-NaN values in other months successfully reconstructed the time series graph, marking a significant stride in mitigating distortions induced by clouds.

Looking ahead, the trajectory of the project involves exploring alternative methods for image reconstruction, acknowledging and addressing the inherent limitations in the current approach to NaN filling. Additionally, there will be a concerted effort directed towards achieving a smoother graph, mitigating abrupt drops that may signify abnormalities in the vegetation index. This phase of the research adds an exciting dimension to my journey, pushing the boundaries of satellite image processing and paving the way for innovative solutions.

Throughout this intensive phase of learning and implementation, my mentor played a pivotal role in guiding me through the intricacies of the project. Regular discussions clarified doubts and provided practical insights into challenges and potential solutions. The collaborative nature of the internship, coupled with the unique experience of working on a real-world project in satellite image processing, significantly contributed to my growth as an undergraduate student.

Reflecting on my research experience in Taiwan, the rich tapestry of this journey adds a unique dimension to the internship. Working in a practical setting on a project with real-world applications has been an invaluable experience. The guidance and mentorship received, coupled with the immersive learning environment, have made this journey intellectually stimulating and personally transformative. The opportunity to apply theoretical knowledge to address real

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	<p>challenges in satellite image processing and time series analysis has deepened my appreciation for the complexities and potential of this field. The cross-cultural experience in Taiwan has further enriched my perspective, making this internship not just a research endeavor but a holistic learning adventure.</p>
<b>Approval by PI</b>	<p>() (2023/12/19)</p>