CSCI 5410

Assignment 4 – Part A

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Amazon Web Services (AWS) - SageMaker

AWS SageMaker is a framework for programmers and data scientists to oversee the development of machine learning models while omitting some of the usual labor-intensive tasks. It is a cloud machine-learning platform which enables developers to create, train, and deploy machine-learning (ML) models in the cloud [1]. At its highest level of abstraction, SageMaker offers pre-trained ML models that may be used right away and also provides predefine Machine Learning algorithms which users can use to train on their own data. Deploying Machine Learning Models is not a trivial task. SageMaker alleviates the challenges and simplifies the process by using popular algorithms and other tools to accelerate the machine learning process [2]. SageMaker is helpful since many businesses lack the funding to hire professionals and keep resources devoted to Artificial Intelligence (AI) research. Utilizing integrated technologies, AWS SageMaker automates labor-intensive manual procedures while lowering hardware costs and human error.

AWS SageMaker tool bundle includes ML modelling components. Simple SageMaker templates abstract software features. They offer a platform for developing, hosting, training, and deploying ML models in the Amazon public cloud at scale. SageMaker works by simplifying ML modeling into preparation, training and deployment. It creates a fully managed ML instance in Amazon Elastic Compute Cloud (EC2) and executes 'Jupyter' computational processing notebooks which also includes Drivers, packages, and libraries for popular deep learning platforms and frameworks [3]. After building AI models, Developers initiate the training process by specifying the location of data in an Amazon S3 Bucket. SageMaker Model Monitor provides continuous automatic model tuning to find the set of parameters, or hyperparameters, to best optimizes the algorithm [3]. Finally, when the model is ready for deployment, the service automatically operates and scales the cloud infrastructure and uses several graphics processing unit accelerators optimized for ML workloads.

Now, considering the case of "Halifax Bike Rental Application", we as developers can utilize SageMaker to perform predictive analysis and analyze customer trends. For instance, we can make use of Support Vector Machine or XGBoost [4] to determine the make and model of popular Bikes which are rented more often than other Bikes. The organization can then procure more of these popular models leading to improved customer satisfaction. Next, the organization can analyze bike rental patterns such as 'peak hours' when several bikes are required to satisfy the customers' demands and make predictions on when these 'peak hours' occur to stock up more bikes in advance. As an example, let's consider Canada Day, it's a nation-wide holiday and the streets will be filled with funfair. Several residents might want to navigate around a city and view all the events that're taking place. Therefore, it's reasonable to expect that the demand for bikes will be high on that day. The bike rental company can utilize SageMaker's Machine Learning algorithms and bike rental data to predict such days where the demand for bikes is high.

Amazon Web Services (AWS) - Comprehend

Amazon Comprehend is a natural-language processing (NLP) service that employs machine learning to extract useful insights and connections from text [5]. Processing any text file in UTF-8 format is possible with Comprehend. AWS Comprehend collects text data and call transcriptions from data lakes and analyses them to extract key words, entities, and sentiment for analysis. The second analysis step entails identifying activities that result in favorable outcomes for clients. The customer service training is then modified, considering these insights to increase the rate of successful results in a shorter amount of time.

With AWS Comprehend, organizations can mine business and call center analytics to detect customer sentiment and analyze customer interactions and automatically. Businesses can also automate the extraction of insights from packets of legal briefs such as contracts and court records. Organizations can use AWS Comprehend to automatically evaluate customer interactions and mine business and call centre statistics to identify customer

sentiment. Additionally, companies can automate the extraction of insights from stacks of legal papers. The service uses various APIs to discover insights, and these include Key phrase Extraction, Sentiment Analysis, Syntax API, Entity Recognition, Language Detection and Custom Classification [6].

Organizations, such as the owners of the "Halifax Bike Rental Service" have many potential use cases for AWS Comprehend. Based on the input they get via support calls, emails, social media, and other online channels, the organization can determine if consumer sentiment is favorable, indifferent, unfavorable, or mixed. For instance, analysis of customer feedback data can reveal insights about favorable bikes and bike availability zones. If several customers complain about a specific bike model, AWS Comprehend automatically analyzes the feedback and derives an insight that the model in question is unpopular with customers. The organization can then scrape all bikes of that model.

Citations

[1] Woodie, "AWS Takes the 'Muck' Out of ML with SageMaker," *Datanami*, Nov. 29, 2017. https://www.datanami.com/2017/11/29/aws-takes-muck-ml-sagemaker (accessed Jul. 04, 2022).

[2] P. Ponnapalli, "Deploy trained Keras or TensorFlow models using Amazon SageMaker," *Amazon Web Services*, Jan. 30, 2019. https://aws.amazon.com/blogs/machine-learning/deploy-trained-keras-or-tensorflow-models-using-amazon-sagemaker/ (accessed Jul. 02, 2022).

[3] G. Kranz, "What is Amazon SageMaker?," *SearchAWS*, Aug. 14, 2019. https://www.techtarget.com/searchaws/definition/Amazon-SageMaker (accessed Jul. 03, 2022).

[4] "Build, Train, and Deploy Machine Learning Models | Amazon SageMaker," *Amazon Web Services, Inc.*, May 24, 2019. https://aws.amazon.com/sagemaker/ (accessed Jul. 03, 2022).

[5] "Amazon Comprehend - Natural Language Processing (NLP) and Machine Learning (ML)," *Amazon Web Services, Inc.*, Mar. 17, 2019. https://aws.amazon.com/comprehend/ (accessed Jul. 04, 2022).

[6] T. Culverhose, "What is Amazon Comprehend? - Definition from WhatIs.com," *SearchAWS*, Aug. 03, 2018. https://www.techtarget.com/searchaws/definition/Amazon-Comprehend (accessed Jul. 04, 2022).