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**CLOUD COMPUTING AND WEB SERVICES
COURSEWORK 2**

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1. Introduction

In this study, two well-known Google Cloud technologies - Google Cloud Storage and Vertex AI with Auto ML are thoroughly examined, coupled with a comparison to another cloud computing platform, Microsoft Azure. The way businesses store, manage, and use data and machine learning skills has undergone a revolution thanks to the cloud computing industry's constant expansion. In order to meet a variety of purposes, Google Cloud has created a comprehensive suite of cloud services in response to this expanding demand.

The first solution looked at is Google Cloud Storage, which provides an extremely scalable and trustworthy object storage service. It is a popular option for web hosting, content delivery networks, and data archiving because of its features, which include data durability, versioning, and flexible lifecycle management. The second technology, Vertex AI with Auto ML, acts as a single platform for the creation of both machine learning and artificial intelligence. Streamlining the design, training, and deployment of models, enables people to use machine learning effectively without having a deep understanding of data science.

1.1 Aims and Objective

This report's purpose is to investigate and evaluate Google Cloud Storage and Vertex AI with Auto ML while contrasting them with Microsoft Azure, enabling educated cloud technology adoption decisions.

Objective

- To provide a thorough analysis of Google Cloud Storage, taking into account its main features, scalability, data durability, and interoperability with other Google Cloud services.
- To examine the capabilities of Vertex AI with Auto ML, including its role in easing the creation of machine learning, and to look into its automation features for model selection, hyperparameter tuning, and transfer learning.
- To contrast Google Cloud Storage with Azure Blob Storage, its Microsoft Azure counterpart, and evaluate each service's advantages, cost-effectiveness, and support for various storage use cases.
- to compare Microsoft Azure alternatives to Microsoft Azure to assess the performance and cost-effectiveness of Google Cloud Storage and Vertex AI with Auto ML and make wise judgments about cloud technology adoption.

2. Cloud Technology 1

From Cloud Technologies List 1, select the subject of "*Google Cloud Storage*" for the descriptive analysis.

Overview of Google Cloud Storage:

The Google Cloud Storage service is an extremely scalable and reliable object storage option. It offers developers and businesses a quick, effective way to store and retrieve any volume of data (Subashini, *et al.* 2023). With its extensive functionality and global reach, Google Cloud Storage is a popular option for a variety of applications, from small-scale initiatives to major enterprise solutions.

Key characteristics and abilities:

Scalability and effectiveness: The scalability of Google Cloud Storage enables smooth storage extension to handle data growth. It provides low-latency access to things from anywhere by distributing data over numerous geographic locations. High-performance data retrieval and storage capabilities are ensured by this distributed design.

Data Resilience: Data durability is ensured by Google Cloud Storage by automatically copying objects several times both inside and between regions. High data availability and hardware failure protection are provided by this replication approach.

Versioning of objects: The ability to maintain numerous versions of an object over time is supported by object versioning in Google Cloud Storage. For preserving historical data and recovering from unintentional deletions or revisions, this capability is important.

Management of a lifecycle: Users can specify rules for lifecycle management policies to automatically move data to less expensive storage classes or delete objects after a predetermined time frame. Taking into account the data's access patterns and retention needs, this aids in storage cost optimization.

Control of security and access: Data security is protected by access control lists (ACLs) and Identity and Access Management (IAM) policies in Google Cloud Storage. IAM enables granular control over who may access and manage storage containers and objects, protecting the confidentiality and integrity of the data.

Adaptation to Additional Google Cloud Services: In seamlessly integrating with Big Query, Compute Engine, and Dataflow are other Google Cloud services. The utilization of storage data for analytics, calculation, and processing tasks is made possible by this tight integration.

Cases of Use:

A flexible storage option for a variety of use scenarios, Google Cloud Storage includes:

Static Content and Web Hosting: In order to take advantage of Google Cloud Storage's low latency access and global distribution, businesses can host websites and offer static material such as images, videos, and documents directly from it.

Disaster Recovery and Data Backup: It is safe to use Google Cloud Storage to create disaster recovery plans and backup important data. Data availability is ensured even in the case of regional failures because of geographic redundancy.

Information archiving: For long-term data archiving, compliance, and data retention needs, users can use Google Cloud Storage's reasonably priced storage classes, like Nearline and Cold line.

Integration of Content Delivery Networks (CDN): Organizations can distribute content to end users with better performance and lower latency by combining Google Cloud Storage with a CDN.

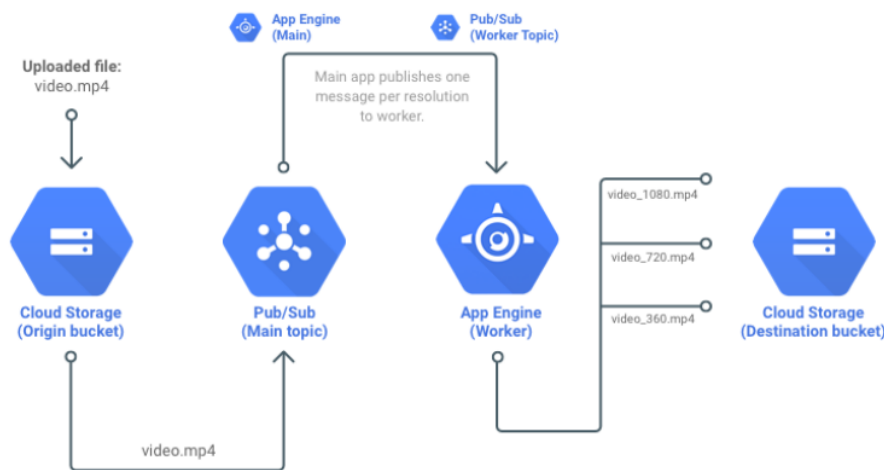


Figure 1: Google Cloud Storage structure

(Source: Hunter, 2019)

The above image represents the format of utilizing cloud storage in a specific manner. Its global distribution, data durability, and integration with other Google Cloud services make it an enticing choice for enterprises seeking a reliable and scalable storage solution. When comparing Google Cloud Storage to the storage service provided by the chosen alternative cloud computing platform, it is essential to take into account factors like data access patterns, geographic availability, pricing, and compatibility with existing infrastructure and applications.

Comparative Analysis:

The cost of Google Cloud Storage is reasonable, and it is simple to integrate with a wide range of platforms and apps thanks to its clear RESTful API. Individual use case needs, the overall cloud strategy, and issues related to data residency and compliance will determine whether to use Google Cloud Storage or the storage service of the alternative platform. A robust object storage service, Google Cloud Storage can handle a variety of storage requirements, from small-scale apps to enterprise-grade data management. For businesses looking for a dependable and scalable storage solution, its global distribution, data durability, and connectivity with other Google Cloud services make it an appealing option. It is crucial to take into account aspects like data access patterns, geographic availability, pricing, and compatibility with current infrastructure and applications when comparing Google Cloud Storage to the storage service offered by the selected alternative cloud computing platform.

3. Cloud Technology 2

The researcher for this part chooses the “*Vertex AI and Auto ML*”.

Part 1

Vertex AI:

Google Cloud provides Vertex AI as a unified and integrated platform for the creation and use of machine learning (ML) and artificial intelligence (AI). The goal is to make the process of creating, training, and deploying ML models at scale easier and quicker. Vertex AI provides a multitude of tools and services to support the entire ML lifecycle, from data preparation to model deployment and monitoring.

Common Platform:

Vertex AI makes it simpler for data scientists and developers to access and administer all the required tools and services from a single interface by combining multiple ML and AI components into a unified platform.

Integration and Preparation of Data:

Tools are available from Vertex AI for preprocessing and integrating data from many sources, such as Big Query, Google Cloud Storage, and others (Opara, *et al.* 2022). As a result, data preparation is made easier and data integration into the ML workflow is made simple.

Integration of Auto ML:

For automatic model training and optimization, users of Vertex AI can access Auto ML services. Users can benefit from Auto ML's automation features thanks to this integration without having to switch between various platforms.

Custom Model Creation:

Data scientists can create unique ML models with Vertex AI by utilizing well-liked frameworks like TensorFlow and sci-kit-learn. Because of this versatility, advanced users can create models that are customized for certain use situations.

Managed Instruction:

The resources and infrastructure needed for model training are managed by Vertex AI. Users can scale up or down in response to demand, which eases the load of managing the infrastructure and maximizing savings.

Auto ML:

Auto ML, or Automated Machine Learning, is a branch of Vertex AI that focuses on automating various steps in the creation of machine learning models. Modern automation techniques are used by Auto ML to make ML accessible to users with little background in data science and machine learning.

Selection of Automated Models:

Depending on the dataset and machine learning job at hand, Auto ML automatically chooses the best method and architecture. Users who may lack experience in selecting the best model might save time and effort by doing this.

Tuning a hyperparameter:

The process of hyperparameter tuning, which entails determining the ideal values for various ML model parameters, is automated by auto ML. The model performance is enhanced by this optimization without human interaction.

Adaptive Learning:

Auto ML uses transfer learning, a method that makes use of the expertise obtained from practising a particular skill to enhance performance on a related activity (Sakagianni, *et al.* 2023). Through this method, generalization is improved while model training is accelerated.

Support for Vision, Language, and Tabular Data:

Data of all kinds, including text, pictures, and structured/tabular data, are supported by Auto ML. Due to its adaptability, ML can be used to solve a variety of problems.

Monitoring and Deployment of Models:

Auto ML makes model deployment easier by offering simple-to-use APIs. It also provides model monitoring, which enables users to keep tabs on the performance of the model and make any necessary adjustments over time.

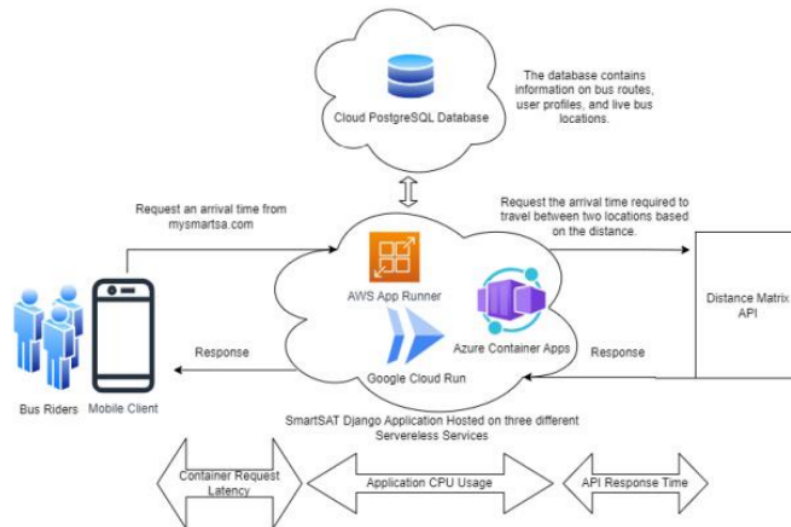


Figure 2: Approaches of Vertex AI and Auto ML

(Source: Abraham, 2023)

The above image helps to know about the entire approaches of **Vertex AI and Auto ML**.

The ML and AI services offered by Google Cloud include the potent Vertex AI and Auto ML technologies (Choi, *et al.* 2023). While Auto ML automates the model creation process and makes machine learning more accessible to a wider audience, Vertex AI offers a unified platform for ML development and deployment that integrates numerous services and tools. Together, these tools enable users to install and construct machine learning models quickly and efficiently, fostering creativity and business insights. Organizations can speed up their AI journey and confidently make data-driven decisions by utilizing Vertex AI and Auto ML.

4. Conclusion

Vertex AI with Auto ML and Google Cloud Storage were two well-known Google Cloud technologies that were thoroughly studied in this study and contrasted with their Microsoft Azure equivalents. As well as, with uses ranging from data archiving to site hosting, Google Cloud Storage has established itself as an incredibly scalable and reliable object storage solution. Businesses looking for a reliable storage solution frequently choose it because of its

primary characteristics, which include data durability, versioning, and flexible lifecycle management. In this study, pitted Google Cloud Storage against Azure Blob Storage, weighing each service's benefits, efficiency, and ability to accommodate a range of storage use cases. Vertex AI with Auto ML was also compared to options offered by Microsoft Azure in terms of performance and cost-effectiveness.

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POOJA JAYSUKHBHAI SANGANI


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