**COVID-19 Research Dashboard - Software and Cloud Stack Summary**

**Overview**

The COVID-19 Research Dashboard provides an interactive and comprehensive overview of COVID-19-related research. It showcases significant publications, key research topics, leading research organizations, and trends in research activity over time. This dashboard is developed using Plotly Dash, styled with the Darkly Bootstrap theme, and deployed on Google App Engine.

**Software Stack**

1. **Python**: The primary programming language used for developing the dashboard.
2. **Plotly Dash**: The main framework for building the interactive web application.
3. **Dash Bootstrap Components**: For styling the dashboard using Bootstrap themes.
4. **BERTopic**: For topic modeling to analyze and visualize research topics.
5. **Pandas**: For data manipulation and analysis.
6. **scikit-learn**: For data preprocessing tasks, such as normalization.
7. **Google Cloud SDK**: For managing GCP services from the command line.

**Cloud Stack**

1. **Google App Engine**: The platform-as-a-service (PaaS) used for deploying and managing the dashboard application.
   * **Environment**: Python 3.8 runtime environment is used to host the application.
   * **Deployment**: The application is packaged and deployed using the GCP App Engine.
2. **Google Cloud Storage**: Used for storing static assets such as the word cloud image.
3. **Google Cloud Logging**: For logging and monitoring the application performance and health.

**Summary**

This dashboard leverages Python and Plotly Dash for interactive web applications, Google App Engine for scalable deployment, and various Python libraries for data processing and visualization. The result is a user-friendly platform providing valuable insights into COVID-19 research trends, organizations, and key topics.