

## Introduction

Analysis of medical data has been done for a very long time. In recent years, the use of electronic health data has increased drastically.

This poses the risk of data breaches and other safety issues regarding patient data. So, de-identification is being used to protect sensitive information.

We make an effort to combine data de-identification with analysis of medical data through a cloud-based application

## Objectives

1. Created a Basic Django Framework
2. Enable user input to store patient information
3. Used Google’s HealthCare API<sup>1</sup> to store modular data as a FHIR store into a dataset
4. De-identify the dataset
5. Export data to Google’s BigQuery dataset
6. Perform data cleaning and summarization of the data
7. Display data back to the user

## Questions

- What is FHIR?
  - FHIR stands for Fast Healthcare Interoperability Resources
  - It is the standard structure for communication healthcare information electronically by which the HealthCare community<sup>2</sup>
- Do you conform to HIPAA standards?
  - It is important to note that we are not using any real patient data: if anyone wishes to use our patient app to store real patient data, more steps must be taken to ensure the app is not violating any HIPAA policies.
  - Google’s Cloud Healthcare API supports HIPAA compliance<sup>3</sup>.

## Results

Figure 1—WEB PAGE 1

This picture shows what our HealthCare App displays when users first view our app.

They have the option to input data which is saved to our dataset, or they can “click for current results” which will route them to **Figure 2**

Do NOT upload any real personal information to this Cloud Application

This App is purely for developmental experimentation. Enjoy!

This field is required.

FirstName: John

This field is required.

LastName: Snow

This field is required.

DateOfBirth: 1900-12-31

This field is required.

Age: 60-70

This field is required.

Gender: Female

This field is required.

ProcedureType: FB Removal of Foreign Body from Brain

This field is required.

ProcedureReason: Brain damage

This field is required.

ProcedureOutcome: Unsuccessful

Save

Click for Current Results

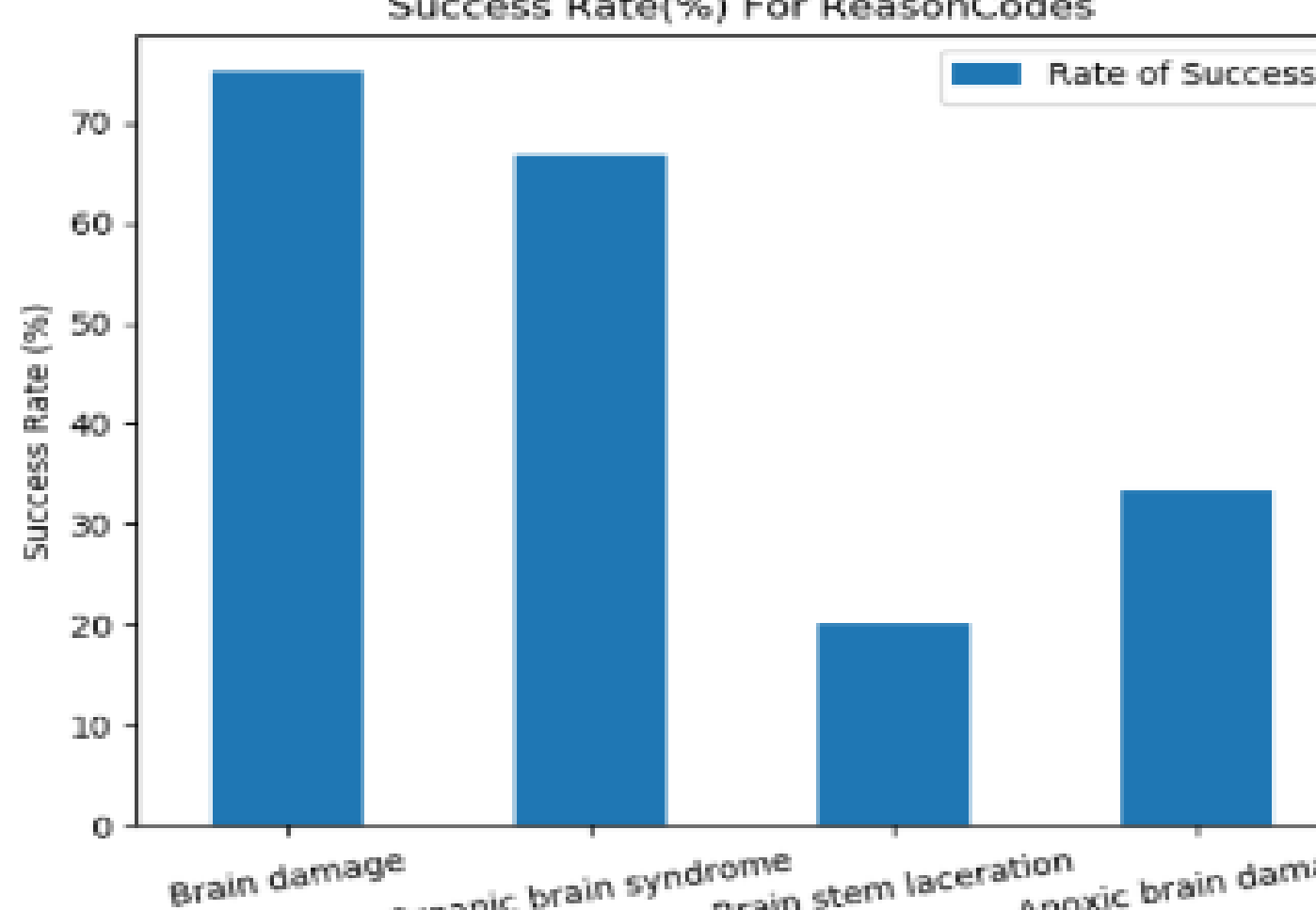
Submit

Figure 2—WEB PAGE 2

This picture shows a plot of the success rate of a procedure given different reasons for having a procedure.

They have the option to “Return to Inputting Patient Information” which routes them to **Figure 1**, or “Input Data to Predict Success Rate” which routes them to **Figure 3**

Success Rate(%) For ReasonCodes



ReasonCode	Rate of Success (%)
Brain damage	70
Organic brain syndrome	65
Brain stem laceration	20
Anoxic brain damage	35

Return to Inputting Patient Information

Submit

Input Data to Predict Success Rate

Submit

Figure 3—WEB PAGE 3

This picture shows how users can input features in order to predict whether the procedure will be successful.

They have the option to “Return to Inputting Patient Information” which routes them to **Figure 1**

Gender: male

ProcedureType: FB-Removal of Foreign Body from Brain

ProcedureReason: Brain damage

ProcedureOutcome: Successful

Save

Predicted Success Rate Outcome after Procedure

51.1598298738797 %

Return to Inputting Patient Information

Submit

- Time is one shortcoming of the application. The app runs slowly, taking nearly 10 seconds to display a plot or display a prediction as shown in the table below.

Type of Display	Average Time (sec)	Standard Deviation (sec)
Plot	7.1919782876968	1.5598146872267
Prediction	9.2735009670258	1.8648272094715

Figure 4 – Time to Load Page

## Conclusion

Our app provides a strong first step towards combining de-identification and data processing with cloud based computing.

There is room to improve how efficiently our app runs by restructuring the templates so that we do not perform repeated operations.

Although we are sometimes limited by the APIs which we chose, they ultimately provide an efficient way to integrate cloud storage with healthcare data standards.

## References

### References

- [1] “Projects, Datasets, and Data Stores | Cloud Healthcare API | Google Cloud.” Google, Google, 24 Apr. 2019, cloud.google.com/healthcare/docs/concepts/projects-datasets-data-stores.
- [2] “FHIR Overview.” Overview - FHIR v4.0.0, 27 Dec. 2018, www.hl7.org/fhir/overview.html.
- [3] “HIPAA Compliance on Google Cloud Platform | GCP Security | Google Cloud.” Google, Google, cloud.google.com/security/compliance/hipaa/.

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