COMP9321 – Assignment3
Team FreshCoke

- Aim of the service:

This dataset is related to breast cancer with digit values, which is measured by cancer images. We provide a clear and friendly interface for users to review the collected cancer data. At the same time, users can predict diagnosis (either malignant or benign) by input feature values related to the cancer cell. Thus, users can use this system to study the features of cancer and make predictions.

- The Datasets:

Breast Cancer Wisconsin (Diagnostic) Data Set from Kaggle.
https://www.kaggle.com/uciml/breast-cancer-wisconsin-data

- Communication channel:

Daily communicating through the ‘‘Google Hangouts’’.

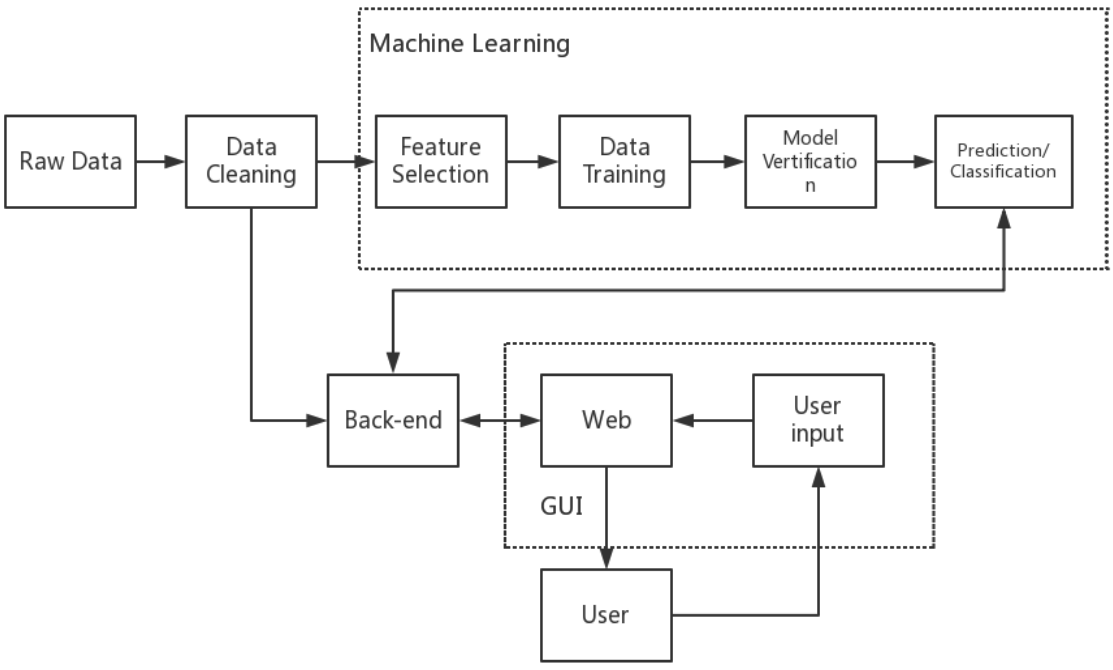
- Code repository:

Code repository on Bitbucket: *https://bitbucket.org/comp9321_freshcoke/comp9321_ass3/src*

- Each member’s role in the project:

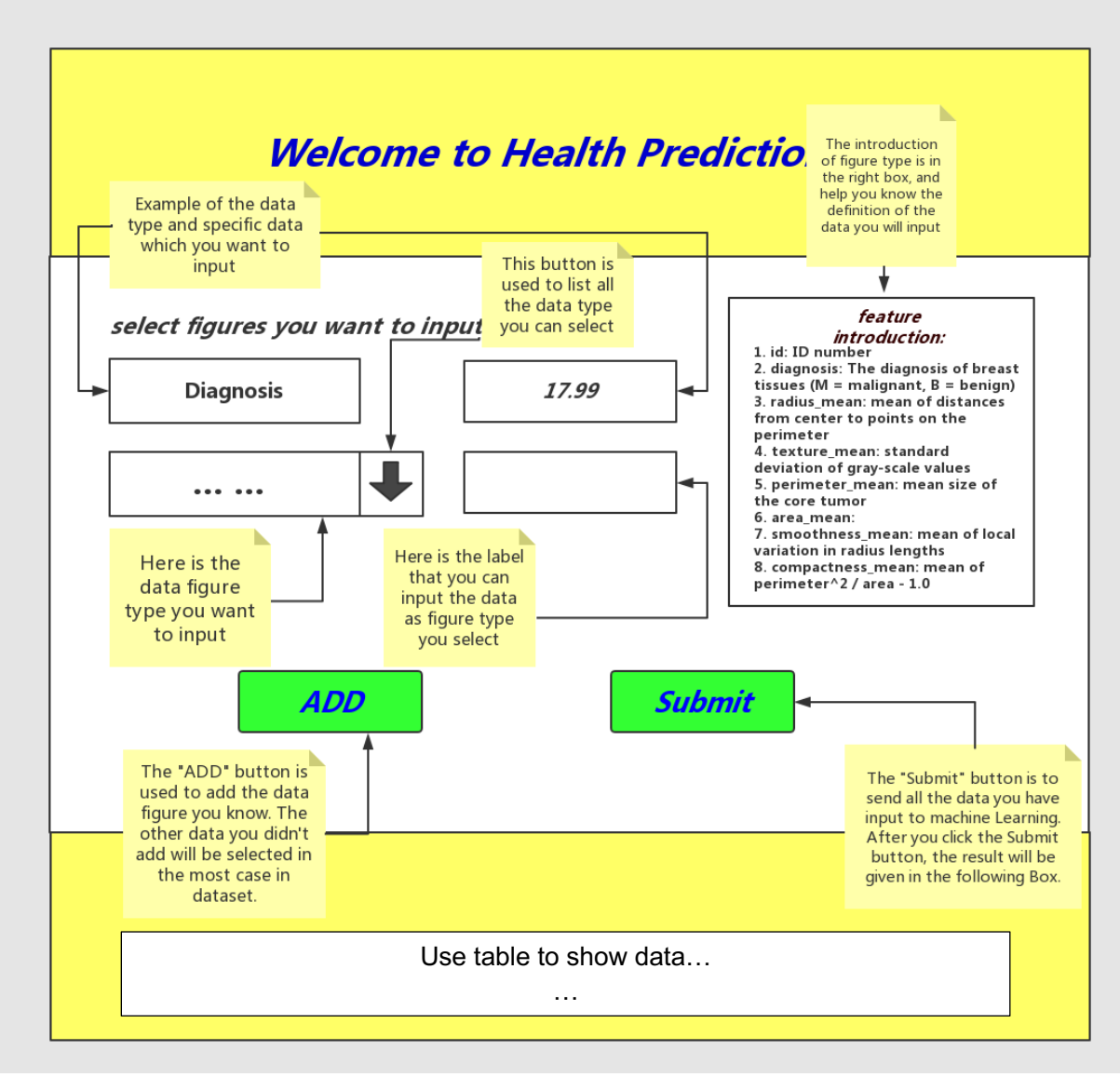
* Machine Learning:
z5140081 - Tianwei zhu; z5084093 - Haoxiang Zhao
* REST APIs:
z5149974- Yuchen Xiao; z5147201 - Zhenyang Lu; z5180103 - Yubo Sun
* Front–end / UI:
z5149974 - Yuchen Xiao; z5147201 - Zhenyang Lu; z5180103 - Yubo Sun

- Project documentation:



Data cleaning: Some datasets contain useless or uncomplete data, we do this step before make use of them.
Feature selection: To provide a more accurate machine learning result (prediction or classification), pre-processing features of data is important.
Data training and model verification: We use Cross-validation to test our model, then modify parameters in ML to reach a reasonable result.
Back-end: Flask is used to support HTML. This part is charge of transmitting data from web page and machine learning.
Web page and user input: There will be a HTML based website, which allow users to review the dataset and input values to make prediction/classification.

- Web design:



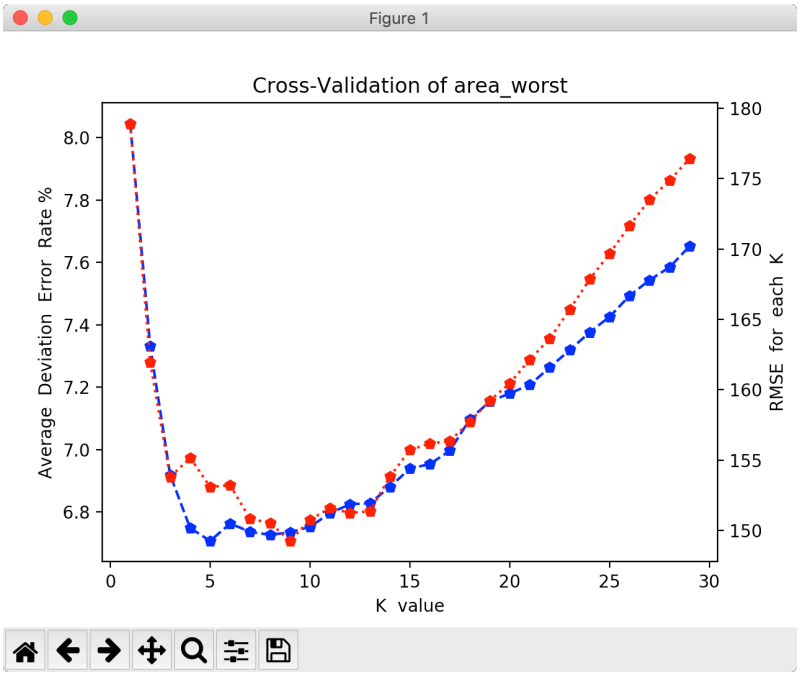
- Machine Learning:

In the classification part, we test different ML models and finally choose SVM (support vector machine) as the model to train the dataset. The SVM cross-one-validation result can reach a high accuracy at **95.43%**.
We have also tried KNN to fit this dataset, but it shows lower accuracy than SVM. Random Forest can achieve a decent as well, but we are more familiar with SVM than this.

In the prediction part, we used K-NN as the algorithm to predict values of the features. Due to the nature of SVM, it is more suitable for classification but not the prediction. It is important to choose the best K number for the KNN to fit datasets, and that is why we use cross-validation again.

```
mr.zhao@zhaohaoxiangdeMacBook-Pro:~/Desktop/9321/ass3$ python cross_validation.py
feature "area_worst"
cross-validation: k=1, error=8.044150672721994, RMSE=178.89476460032583
cross-validation: k=2, error=7.330609229794198, RMSE=161.9456261933638
cross-validation: k=3, error=6.9185879035596045, RMSE=153.8038903287686
cross-validation: k=4, error=6.748459003416059, RMSE=155.1636248638854
cross-validation: k=5, error=6.707362670484963, RMSE=153.09332845297928
cross-validation: k=6, error=6.762698706789777, RMSE=153.21622482437436
cross-validation: k=7, error=6.736660821069288, RMSE=150.8345534757127
cross-validation: k=8, error=6.726643965928064, RMSE=150.5314777916586
cross-validation: k=9, error=6.734799177506511, RMSE=149.26451085686332
cross-validation: k=10, error=6.752679395334056, RMSE=150.7736575418193
cross-validation: k=11, error=6.7961037093872925, RMSE=151.59254405342554
cross-validation: k=12, error=6.824705862605011, RMSE=151.25785971633402
cross-validation: k=13, error=6.828106399403551, RMSE=151.36370649722653
cross-validation: k=14, error=6.880613631109106, RMSE=153.837127380887
cross-validation: k=15, error=6.939007865438975, RMSE=155.7279057485719
cross-validation: k=16, error=6.95367628068367, RMSE=156.17785916567058
cross-validation: k=17, error=6.99645944627709, RMSE=156.35997489613692
cross-validation: k=18, error=7.097427499305356, RMSE=157.73698358582902
cross-validation: k=19, error=7.154011795027131, RMSE=159.22423349938708
cross-validation: k=20, error=7.180147450475778, RMSE=160.4563693595947
```

After calculating error and RMSE (Root Mean Square Error) of 30 different Ks, the best K for feature “Area-Mean” is 9 (lower error and RMSE). Same as “Area-Mean”, we can finally find the best K for our prediction system is 10.



- Table of Tasks (until week 12):

Done	To do
Acquire dataset	Adjust webpage detail (more user friendly)
Data cleaning	UI polish
Machine Learning (classification and prediction)	
RESTful API server	
Back-end frame work	
Web/UI design (structure and layout)	
User Interaction Design	

- Webpage review:

Classification Prediction

Determine whether there is cancer according to other data

Input 5 features to classify diagnosis

Area Mean 143.5 ~ 2501.0

Area SE 6.802 ~ 542.2

Area Worst 185.2 ~ 4254.0

Perimeter Mean 43.79 ~ 188.5

Perimeter Worst 50.41 ~ 251.2

Submit Clear

Classifaction results

Area Mean: None

Area SE: None

Area Worst: None

Perimeter Mean: None

Perimeter Worst: None

Desription of all features

idID: number

Diagnosis: The diagnosis of breast tissues (M = malignant, B = benign)

Radius Mean: mean of distances from center to points on the perimeter

Texture Mean: standard deviation of gray-scale values

Perimeter Mean: mean size of the core tumor

Dataset Show / Hide