Diabetes Risk: The Prediction of Diabetes Risk Through Deep Learning

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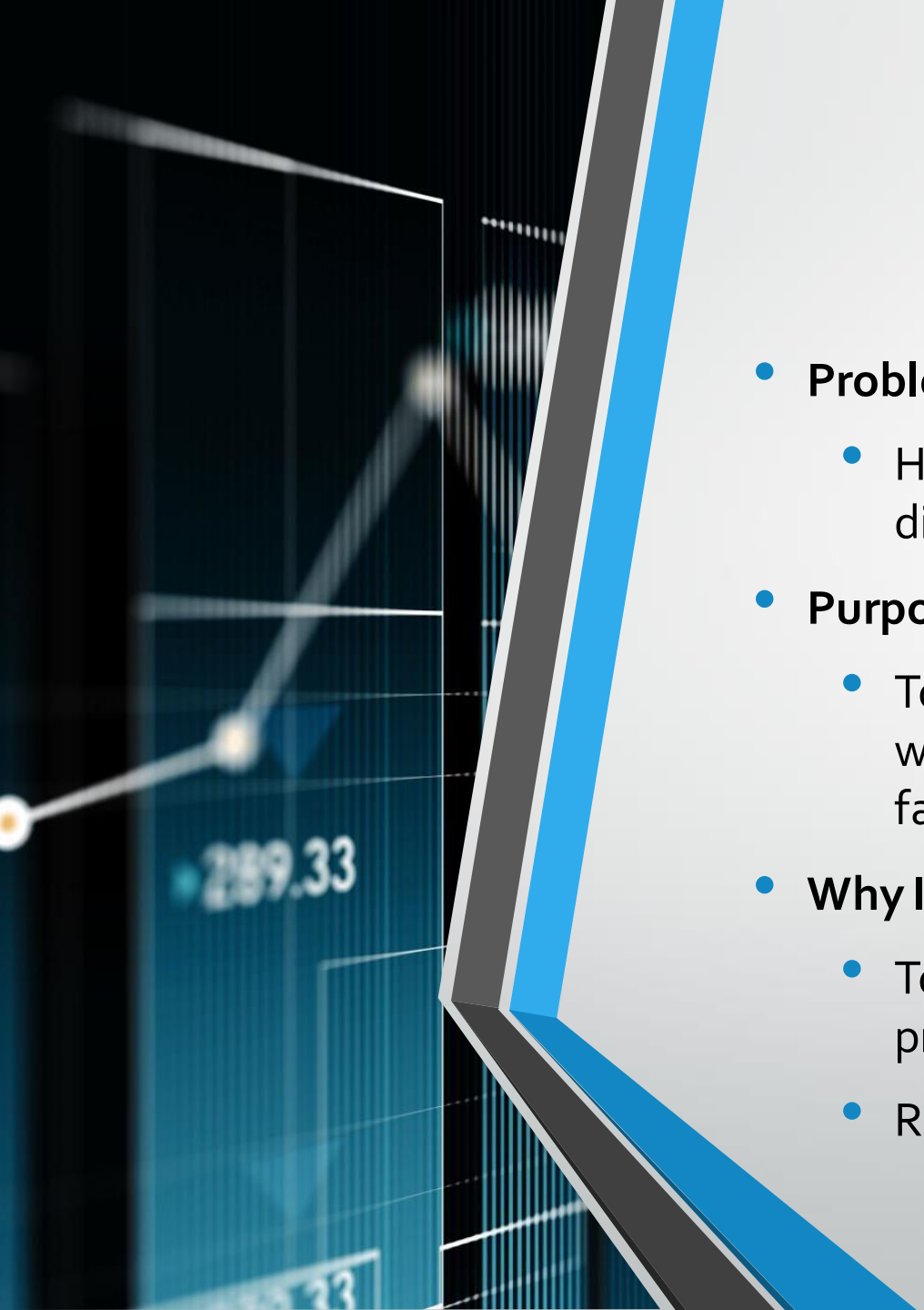


Introduction

- **Problem**
  - How can we predict diabetes based on potential risk factors of diabetes?
- **Purpose**
  - To understand if diabetes risk factors that can help predict whether an individual will acquire diabetes based on those risk factors in the future
- **Why Is it Important?**
  - To potentially acknowledge risk factors that may contribute to predicting diabetes
  - Raise awareness

Approach: Data

- **Dataset:** "Diabetes Risk Prediction"
  - Diabetes Database: https://www.kaggle.com/datasets/rcratos/diabetes-risk-prediction
  - Categorical Data; Binary

Approach: Data

	Age	Gender	Polyuria	Polydipsia	sudden weight loss	weakness	Polyphagia	Genital thrush	visual blurring	Itching	Irritability	delayed healing
0	40	Male	No	Yes	No	Yes	No	No	No	Yes	No	Yes
1	58	Male	No	No	No	Yes	No	No	Yes	No	No	No
2	41	Male	Yes	No	No	Yes	Yes	No	No	Yes	No	Yes
3	45	Male	No	No	Yes	Yes	Yes	Yes	No	Yes	No	Yes
4	60	Male	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes

Approach: Data Cleaning

- **Data Cleaning :**
  - Simplified the Data
    - Convert labels into binary values (e.g. Yes = 1, No = 0)
    - Removed unnecessary features for prediction
    - Remove unimportant features

Approach: Data

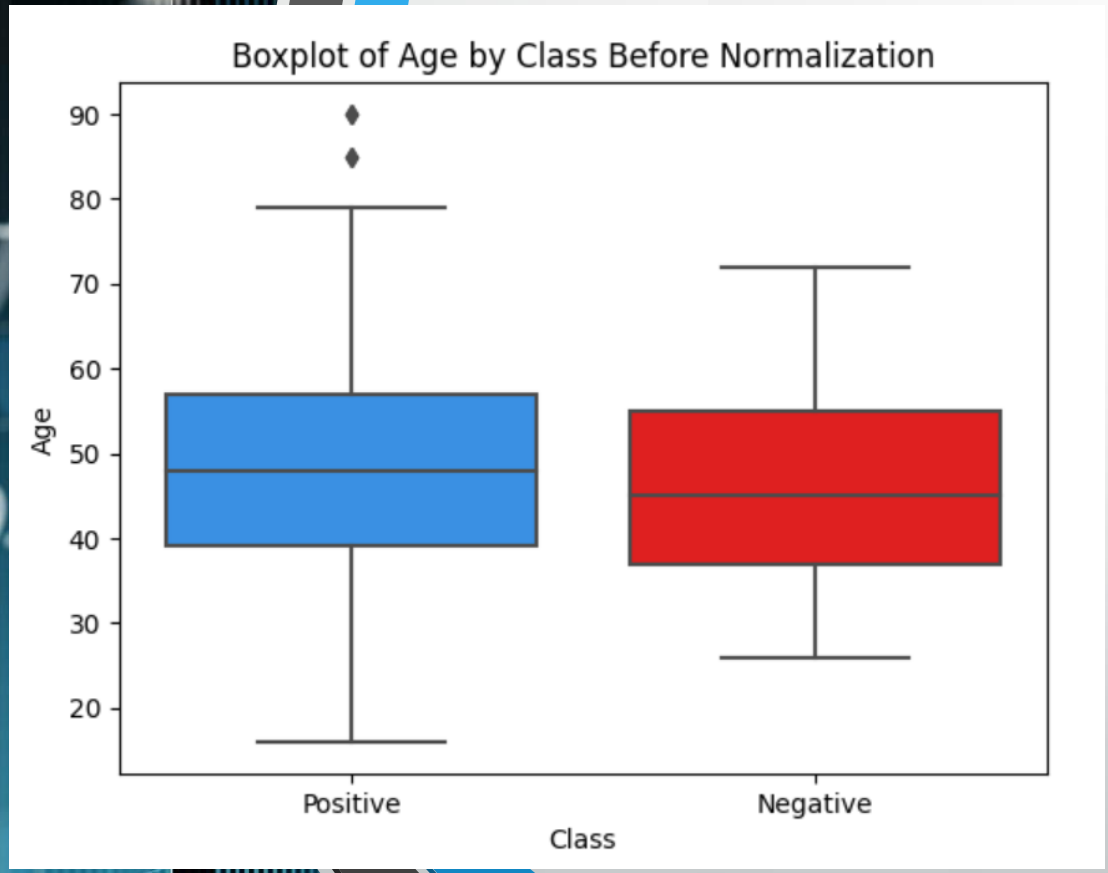
	Age	Gender	Polyuria	Polydipsia	sudden weight loss	weakness	Polyphagia	Genital thrush	visual blurring	Itching	Irritability	delayed healing	partial paresis	muscle stiffness	Alopecia	Obesity	class
0	40	1	0	1	0	1	0	0	0	1	0	1	0	1	1	1	1
1	58	1	0	0	0	1	0	0	1	0	0	0	1	0	1	0	1
2	41	1	1	0	0	1	1	0	0	1	0	1	0	1	1	0	1
3	45	1	0	0	1	1	1	1	0	1	0	1	0	0	0	0	1
4	60	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
515	39	0	1	1	1	0	1	0	0	1	0	1	1	0	0	0	1
516	48	0	1	1	1	1	1	0	0	1	1	1	1	0	0	0	1
517	58	0	1	1	1	1	1	0	1	0	0	0	1	1	0	1	1
518	32	0	0	0	0	1	0	0	1	1	0	1	0	0	1	0	0
519	42	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

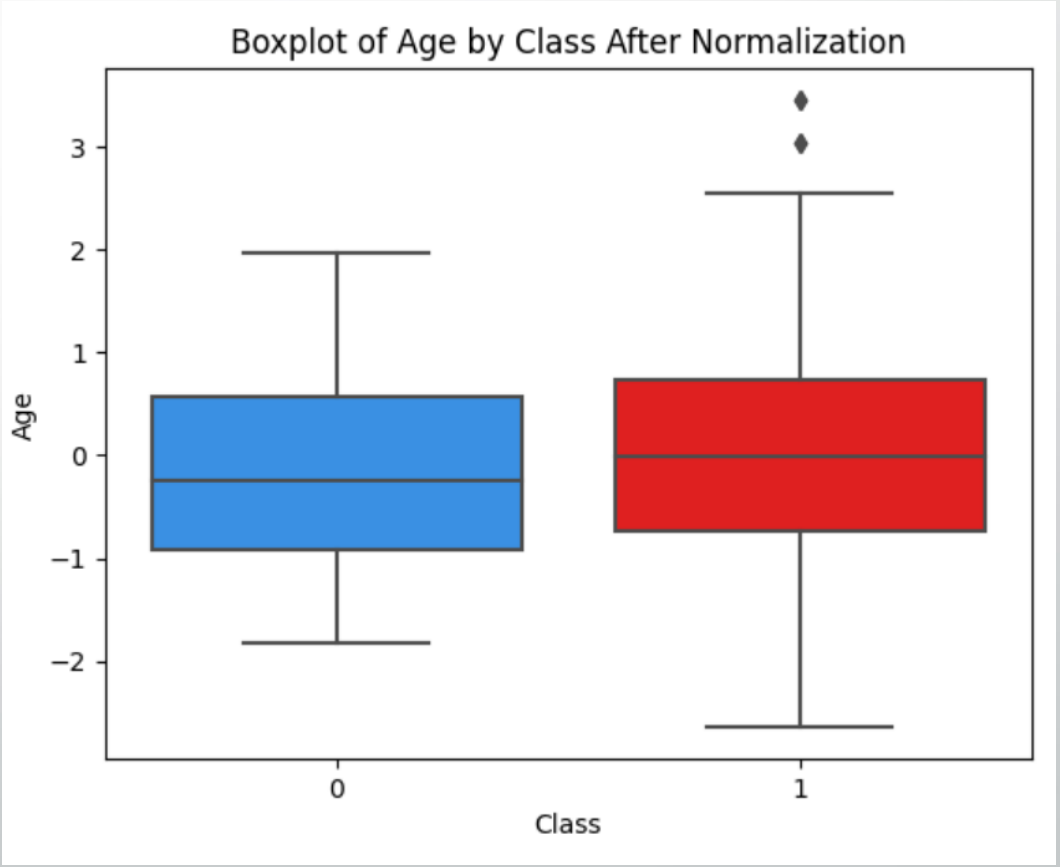
520 rows × 17 columns

Approach: Exploratory Data Analysis

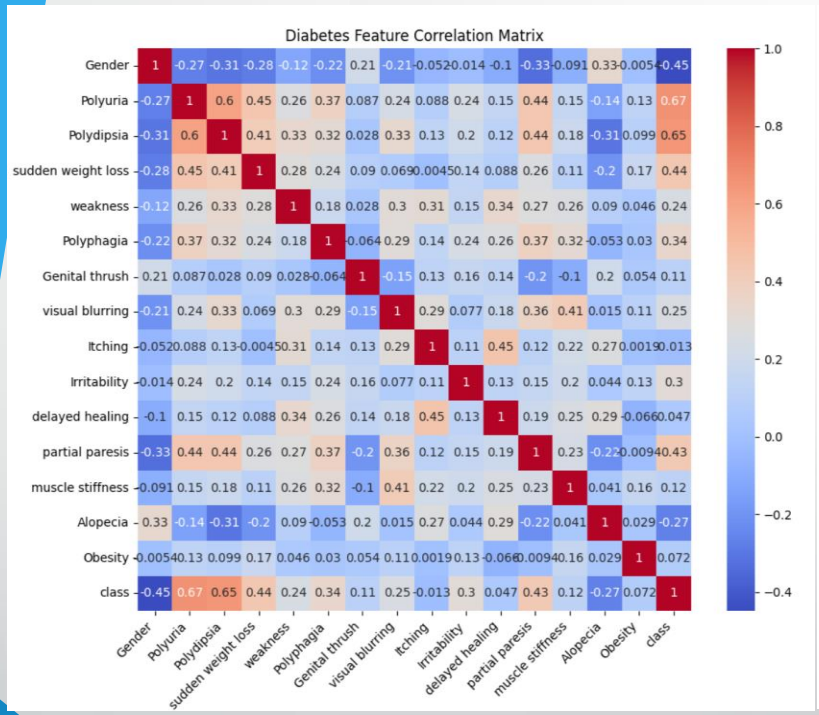
- **Exploratory Data Analysis :**
  - Used Bar Plots to show classifications of diabetes in respect to other features

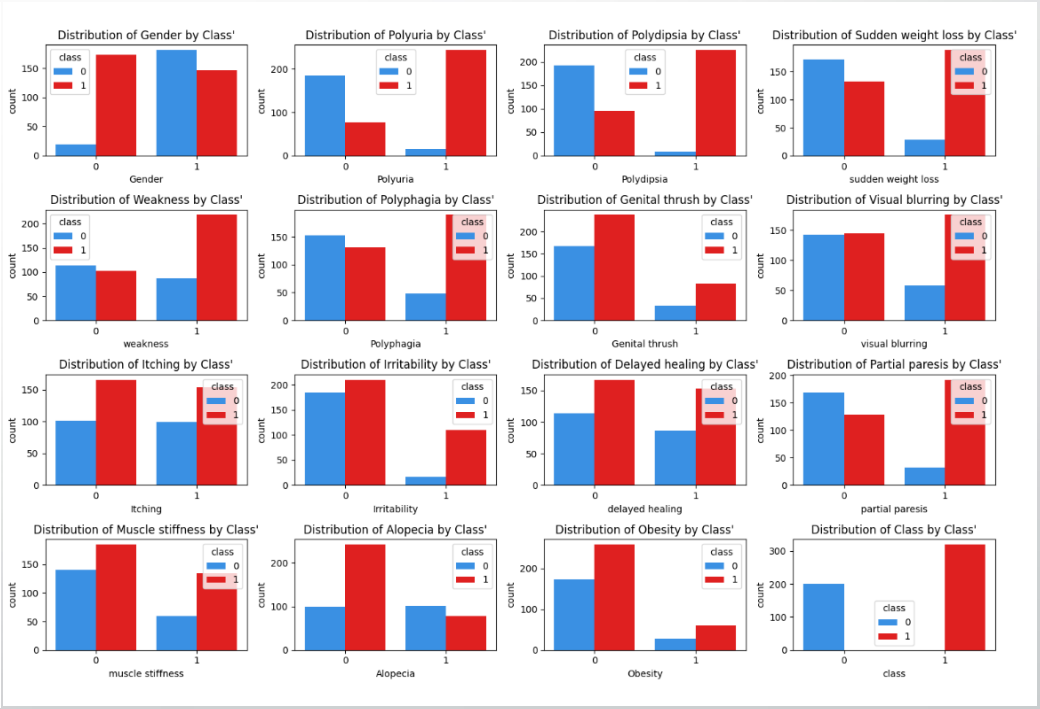
Approach: Data Cleaning





Approach: Data Cleaning





Approach: Data Cleaning

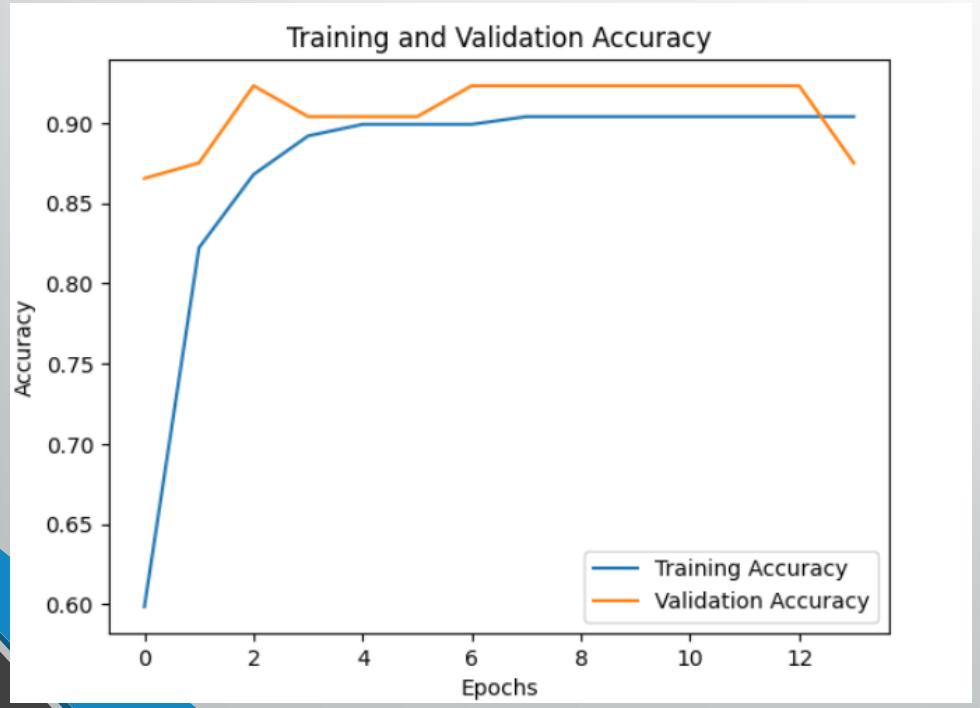
	Polyuria	Polydipsia	Gender	sudden weight loss	partial paresis
0	0	1	1	0	0
1	0	0	1	0	1
2	1	0	1	0	0
3	0	0	1	1	0
4	1	1	1	1	1
...	...	...	...	...	...
515	1	1	0	1	1
516	1	1	0	1	1
517	1	1	0	1	1
518	0	0	0	0	0
519	0	0	1	0	0

Approach: Models

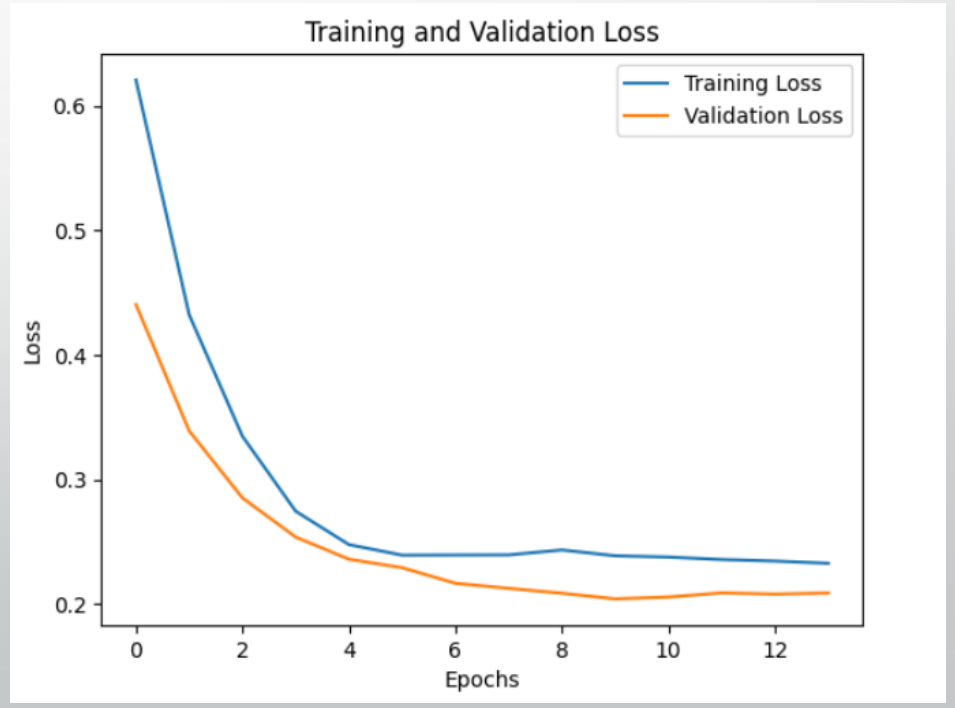
- **Deep Learning:**
  - Convolutional Neural Networks (CNN)
    - Predicts and learns based on layers in relation to sequential variables.
    - Failed to Run
  - Forward Neural Networks
    - Predicts and learns about data with independent features

Approach: Models

FNN Accuracy Plot

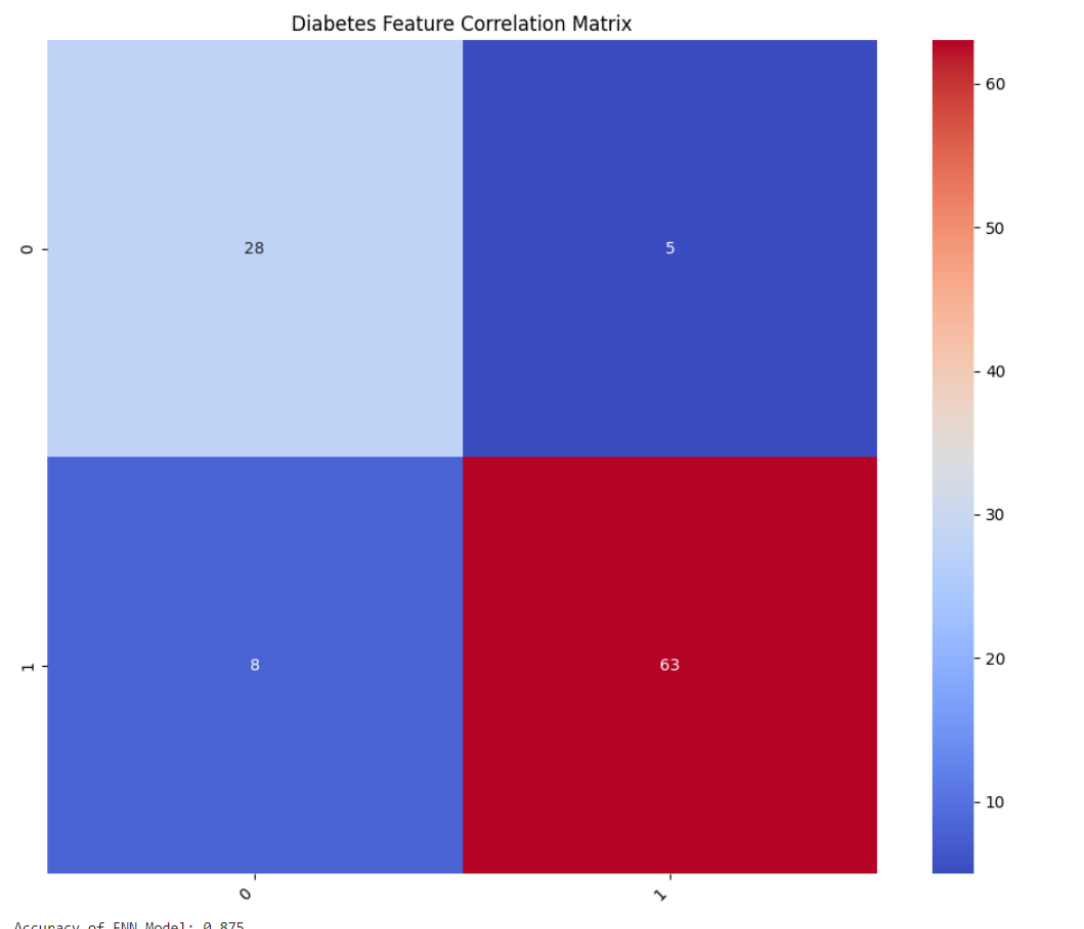


FNN Loss Plot



Approach: Models

Confusion Matrix



Results

- **Evaluation:**
  - CNN
    - Does Not Apply to this Data
  - FNN
    - Somewhat accurate, needs improvement
    - Diabetes are predictable based on the risk factors of
      - Polyuria
      - Polydipsia
      - Gender
      - sudden weight loss
      - partial paresis

Conclusion

- **CNN** does not work with this kind of data but **FNN** does
- **Diabetes** is predictable via deep learning, especially for
  - Polyuria
  - Polydipsia
  - Gender
  - sudden weight loss
  - partial paresis