

A decorative network diagram in the top-left corner, featuring a complex web of interconnected nodes and lines. Some nodes are highlighted with blue circles, and others with solid blue dots. The lines are thin and grey, creating a subtle background pattern.

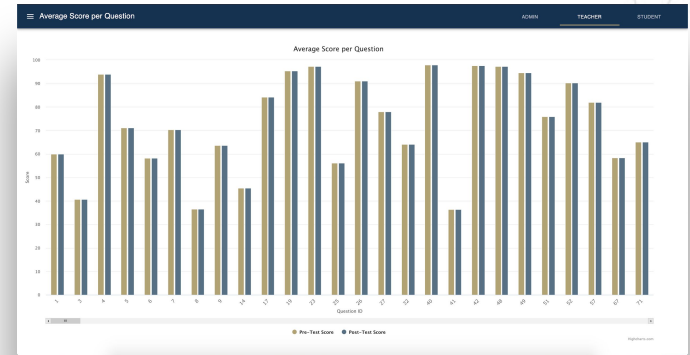
IRS.V3.0

Bryan, Bala, Colin, Jared

A decorative network diagram in the bottom-right corner, mirroring the top-left design. It consists of a network of nodes and lines, with several nodes highlighted in blue. The overall aesthetic is clean and modern, using a light blue and grey color palette.

Introduction to IRSv3

- ⦿ IRS is a system for teachers, TAs and students to get feedback on the ITS system
- ⦿ IRS creates informative data visualizations for every user of ITS system, which informs decision making



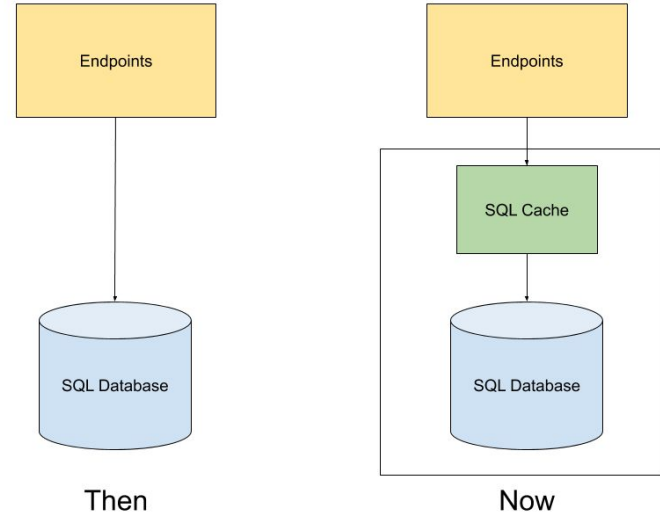
Goals

- ◎ Main Goal was to add to Student, Teacher tabs in order to increase level of user interaction
- ◎ New capabilities include:
 - Student review functionalities (for better practice)
 - Score Prediction based on duration using ML

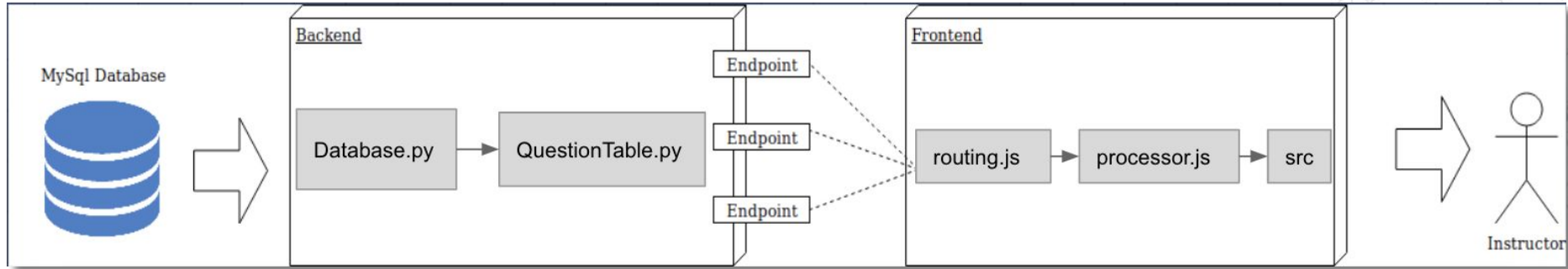


Backend Approach - Caching

- Do less calculations at runtime
- Cache Results
 - Increase runtime speed
 - Requires initial run
- Multiple Quick Endpoints
- Heavily Parameterized
- Simplified Queries



Endpoints



- ⊙ Information to frontend in a json format
- ⊙ Why? server-client boundaries
- ⊙ Consistency of Output -> Postman and Debugging
- ⊙ Endpoints -> pull from cached information

Review Question Endpoint (Postman Visualization)

`/get_review_questions`

```
"3164": {
  "answers": {
    "answer1": "<latex>2 - j6</latex>",
    "answer2": "<latex>2 + j6</latex>",
    "answer3": "<latex>6 + j2</latex>",
    "answer4": "<latex>3 + j</latex>"
  },
  "assignment": "",
  "chapter": "1",
  "qText": "Find the 
```

Data Analysis Endpoints (Postman Visualization)

/get_linear_question_ids

```
{  
  "0":  
  "2":  
  "4":  
  "5":  
  "6":  
  "7":  
  "8":  
  "9":  
  "16":  
  "17":  
  "19":  
  "22":  
  "23":  
  "25":  
  "26":  
  "27":  
  "32":  
  "35":  
  "38":
```

/get_linear_question

```
{  
  "3180": {  
    "qid": [  
      "3180"  
    ],  
    "x_all": [  
      0.0,  
      0.030003000300030003,  
      0.060006000600060005,  
      0.09000900090009001,  
      0.12001200120012001,  
      0.15001500150015,  
      0.18001800180018002,  
      0.21002100210021002,
```

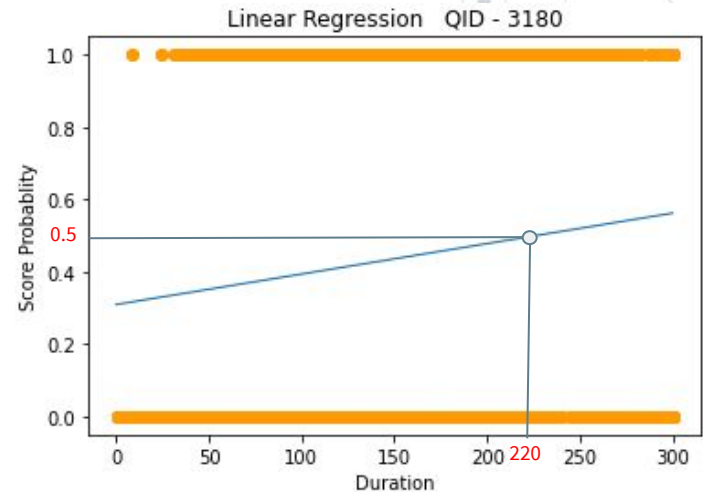
```
    "y_all": [  
      0.3095144156264112,  
      0.3095396759529335,  
      0.3095649362794559,  
      0.30959019660597825,  
      0.30961545693250064,  
      0.309640717259023,  
      0.30966597758554537,  
      0.3096912379120677,
```

/get_histogram_question

```
{  
  "1022": {  
    "duration_failed": "{\\"468252\\":116,\\"468253\\":76,  
      \\"468255\\":22,\\"468269\\":211,\\"468276\\":1003,  
      \\"468284\\":49,\\"468288\\":16,\\"468289\\":244,  
      \\"468299\\":217,\\"468304\\":44,\\"468329\\":46,  
      \\"468332\\":119,\\"468333\\":1,\\"468352\\":5,\\"468363\\":55,  
      \\"468369\\":79,\\"468373\\":93,\\"468379\\":56,\\"468398\\":3,  
      \\"468411\\":61,\\"468413\\":83,\\"468415\\":302,  
      \\"468416\\":55,\\"468428\\":231,\\"468435\\":39,  
      \\"468438\\":43,\\"468439\\":51,\\"468445\\":34,  
      \\"468455\\":108,\\"468459\\":111,\\"468463\\":37,  
      \\"468467\\":247,\\"468484\\":75,\\"468489\\":97,  
      \\"468493\\":66,\\"468500\\":36,\\"468502\\":77,  
      \\"468503\\":22,\\"468504\\":50,\\"468505\\":55,  
      \\"468506\\":90,\\"468530\\":15,\\"468531\\":9,\\"468535\\":8,  
      \\"468537\\":59,\\"468540\\":107,\\"468545\\":83,  
      \\"468546\\":53,\\"468549\\":19,\\"468552\\":40,  
      \\"468565\\":31,\\"468569\\":89,\\"468575\\":327,
```

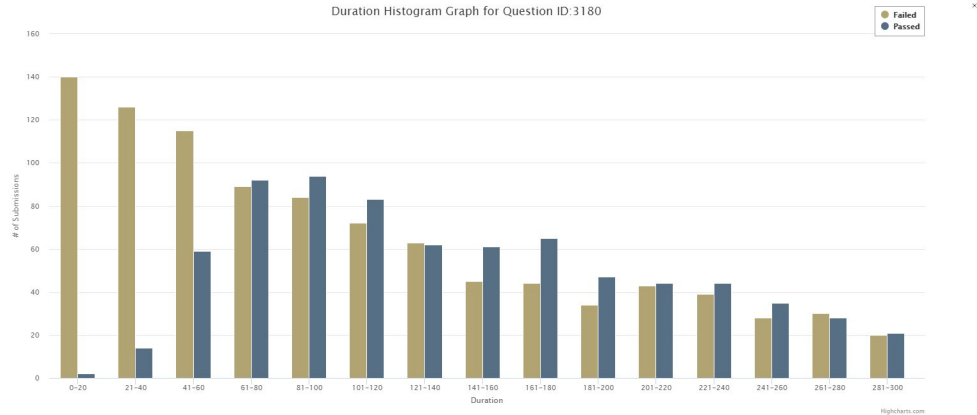
Linear Regression Algorithm

- Linear regression is used to predict the probability of getting a question correct based on duration (time).
- X-axis \rightarrow Duration
- Y-axis \rightarrow Score Probability



Histograms

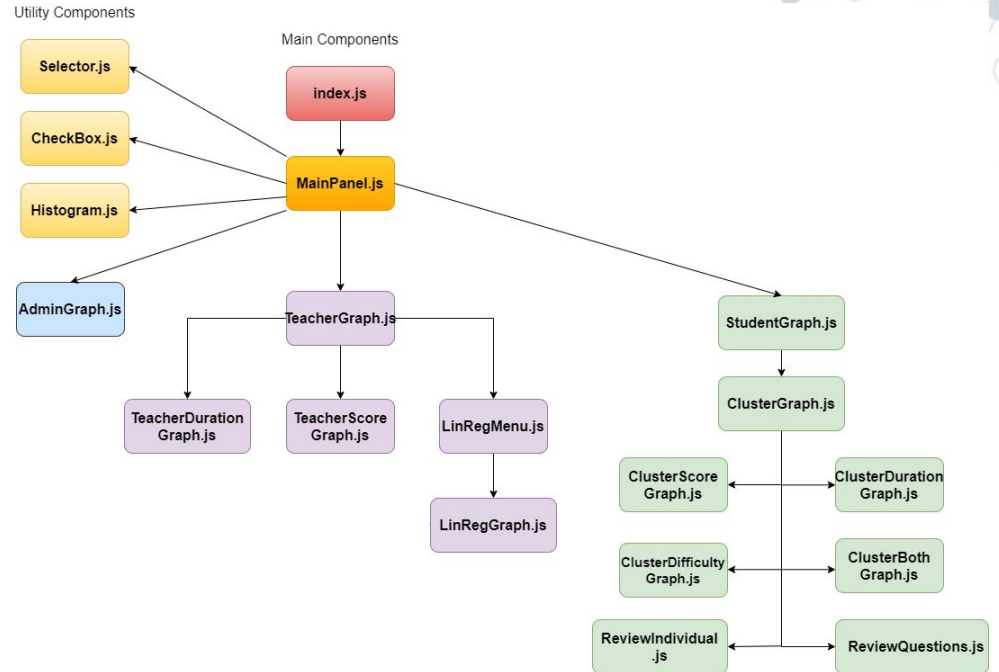
- Our double-bar histogram shows the number of students who passed and who failed a question at certain durations
- This graph will show how long it takes most students to get a question correct
- It will also show how that compares with the number of students who got the question wrong



Frontend Structure

Utilizing React Components

- Separating tabs
- Distributing functionality as much as possible
- Each file represents one function



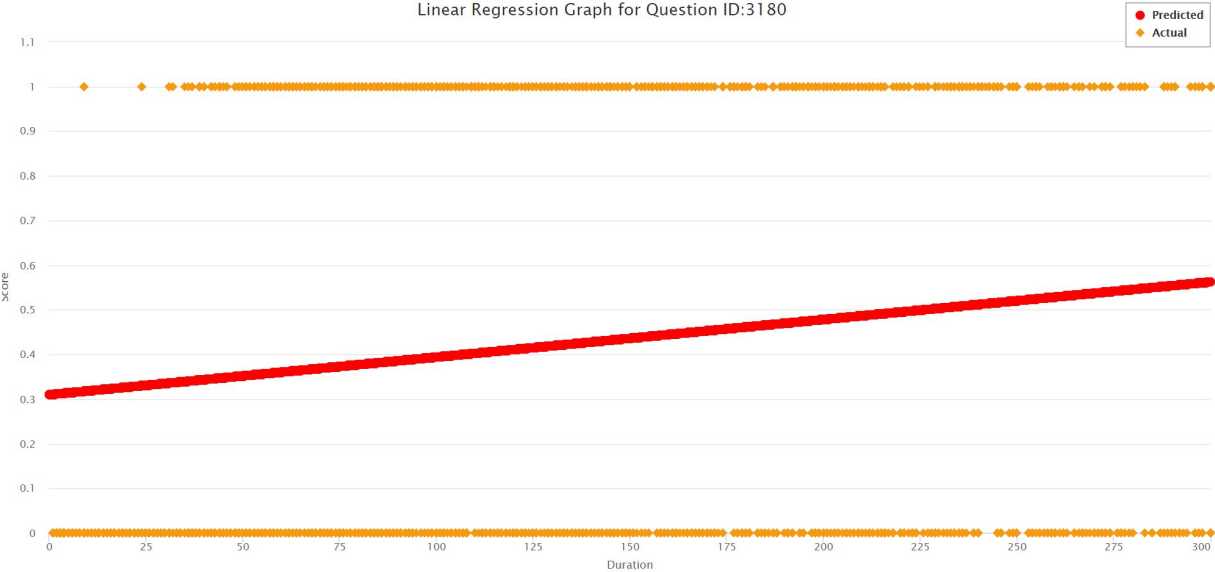
Frontend Part 1. Linear Regression Interface

Linear Regression Graphs

Question
1022

Question
3180

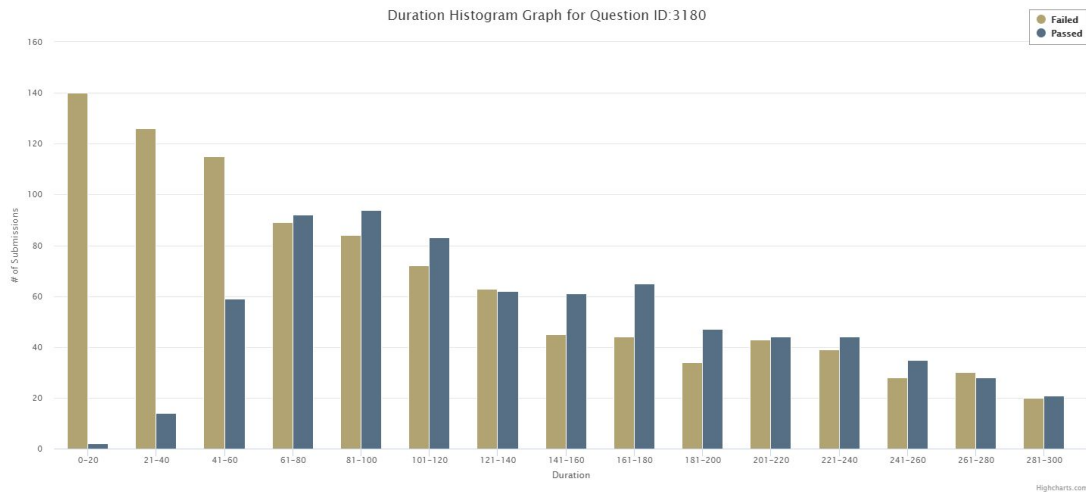
Question
3577



Frontend Part 2. Question Duration Histogram

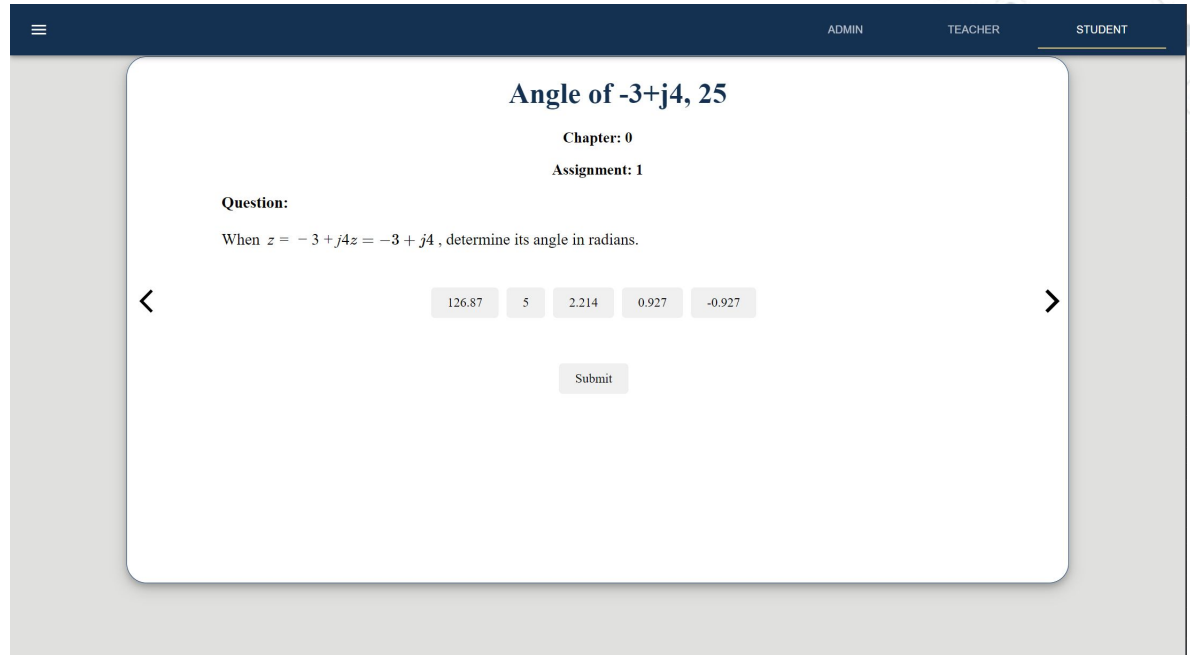
Distribution of Question Durations

Question 1022 Question 3180 Question 3577



Frontend Part 3. Student Review

- Sorting Questions by Chapter/Assignment
- Individual question review



The screenshot shows a user interface for a student review. At the top, there is a dark blue navigation bar with a hamburger menu icon on the left and three user roles: ADMIN, TEACHER, and STUDENT (which is highlighted with a white underline). Below the navigation bar, the main content area is white and contains the following text:

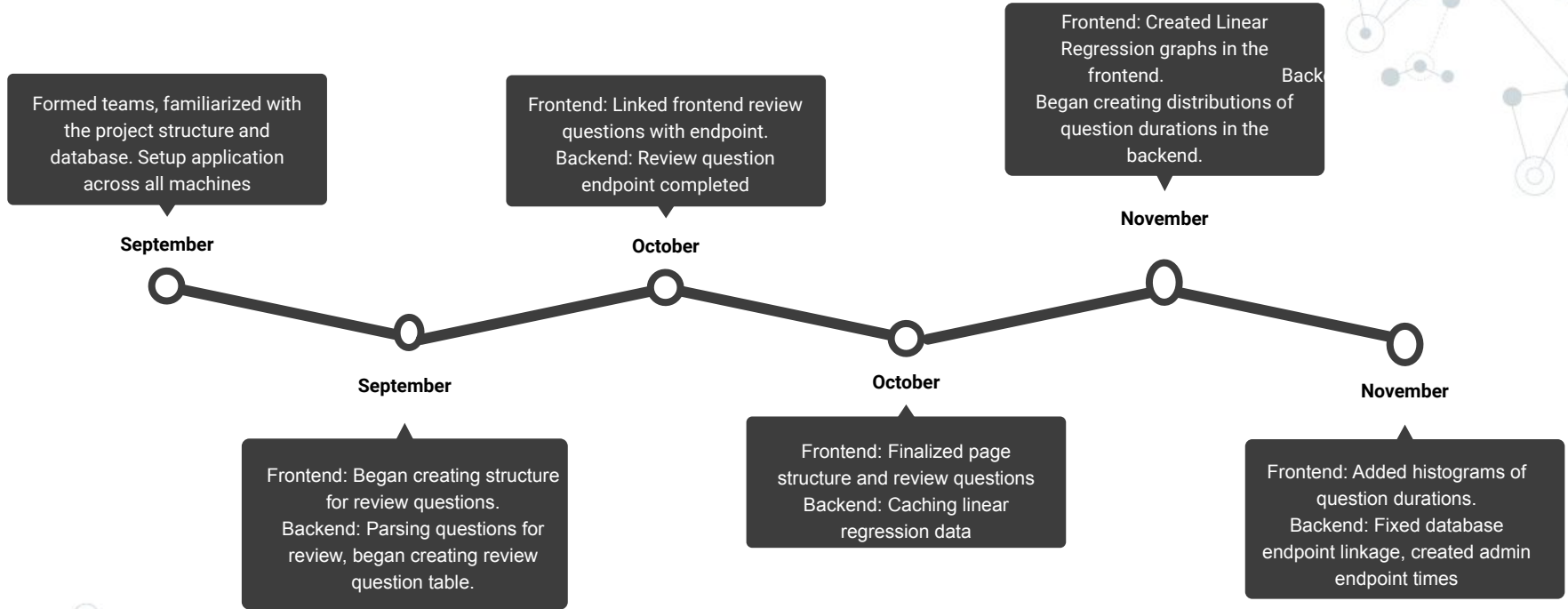
Angle of $-3+j4$, 25

Chapter: 0
Assignment: 1

Question:
When $z = -3 + j4$, determine its angle in radians.

Below the question, there are five input fields containing the values: 126.87, 5, 2.214, 0.927, and -0.927. To the left and right of these fields are left and right arrow icons, respectively. Below the input fields is a "Submit" button.

Progression



Conclusion

- ① Added **review questions** endpoint to allow for student review
- ① Added **linear regression** graphs for duration and score predictions
- ① Added **histograms** with distributions of question durations

Challenges

- ① **Formula formatting** with various libraries
- ① **Plotting** large amounts of data quickly
- ① Determining **valid questions** to add to review
- ① **Logistic Regression** for the dataset didn't work with just duration and score

Future Implementations

- ① Deploy on Server (ex. AWS hosting)
- ① Add more machine learning/data analysis to produce better predictions (such as revisiting Logistic Regression)
- ① Track student profiles and data from answering review questions

Future Improvements

- ⦿ Increase Speed of Linear Regression Graphing
- ⦿ Add Authentication System for students, teachers and admins
- ⦿ Breakdown data by students
- ⦿ Update with live database



open
source

A decorative background featuring a network diagram with nodes and connecting lines. The nodes are represented by circles of varying sizes and colors, including light gray, dark gray, and blue. Some nodes are highlighted with a blue outline. The lines connecting the nodes are thin and light gray. The network is distributed across the top and bottom edges of the slide, framing the central text.

**Visualize on
the Application!**

A decorative background featuring a network diagram of nodes and connections in the corners. The nodes are represented by circles of varying sizes and colors (blue, grey, white), connected by thin lines. The network is more dense in the corners and fades towards the center.

Questions?