

# NeuraViz: A Web Application For Visualizing Artificial Neural Network Structures

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# Artificial Neural Networks

What is supervised learning?

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What is an artificial neural network?

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What is supervised learning?

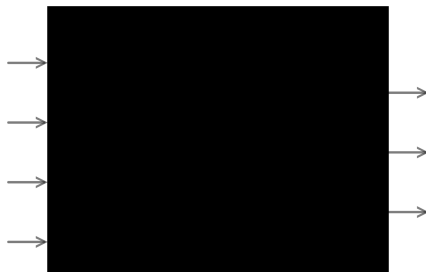
What is an artificial neural network?

```
self.linear_relu_sequential_model = nn.Sequential(  
    nn.Linear(input_size, inner_layer_size),  
    nn.ReLU(),  
    nn.Linear(inner_layer_size, output_size)  
)
```

# Artificial Neural Networks

What is supervised learning?

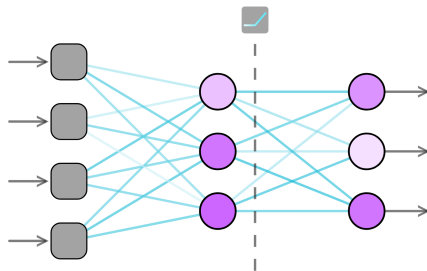
What is an artificial neural network?



# Artificial Neural Networks

What is supervised learning?

What is an artificial neural network?



# NeuraViz

## The Project

- What is it?

# NeuraViz

## The Project

- What is it?
- Why use it?



# NeuraViz

## The Project

- What is it?
- Why use it?

## Goals

- Breadth of supported models

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## The Project

- What is it?
- Why use it?

## Goals

- Breadth of supported models
- Ease of use
- Portability

# Life Cycle Model

## Models

- Waterfall

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- Iterative

# Life Cycle Model

## Models

- Waterfall
- Iterative
- Agile (Scrum)

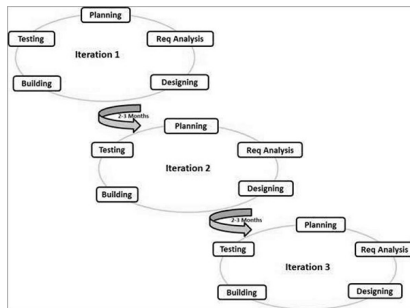


Figure: Agile Model (TutorialsPoint)

# Scrum Tweaks

## ■ Sprint Length:

# Scrum Tweaks

- **Sprint Length:** 1 week



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# Scrum Tweaks

- **Sprint Length:** 1 week
- **Standups:** weekly
- **Retrospectives:** integrated into standups

# Process Technologies

Projects / NeuraViz / Scrum

## Sprint 25

🕒 9 days remaining



Complete sprint



Add people

Quick filters ▾

GROUP BY

Stories ▾

📊 Insights

⚙️ View settings

### BACKLOG 1

#### Add glossary

0%

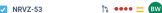
☒ NRVZ-63

+ Create issue

### PROGRAMMING 2

#### Add documentation/help page/landing page

50%

☒ NRVZ-53

#### Make revisions

25%

☒ NRVZ-65

+ Create issue

### TESTING REQUIRED 2

#### Add security section of report

75%

☒ NRVZ-61

#### Add conclusion section of report

50%

☒ NRVZ-62

### DONE



# Requirements

## Functional Requirements

- As a user, I can see the full graph of a valid uploaded model once it finishes processing.
- As a user, I can pan and zoom the model visualization.
- As a user, I can export the graph to  $\text{\LaTeX}$  TikZ syntax.
- Etc.

# Requirements

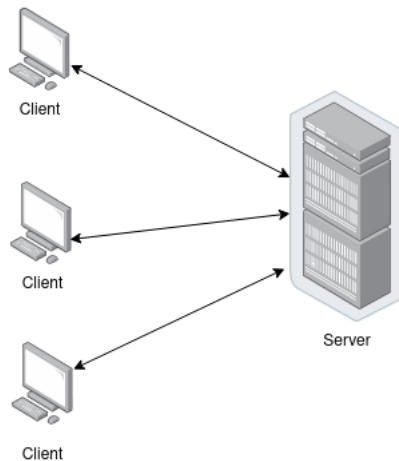
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## Non-Functional Requirements

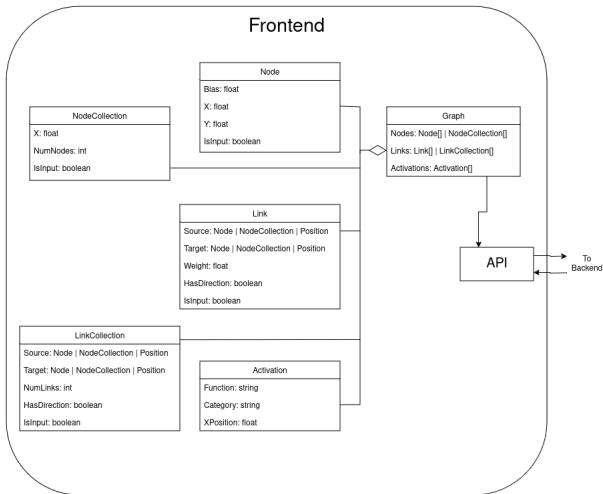
- Large network layers are collapsed if they are too big to reasonably render.
- Invalid models are rejected and not stored on the server unnecessarily.
- Etc.

# Web Application

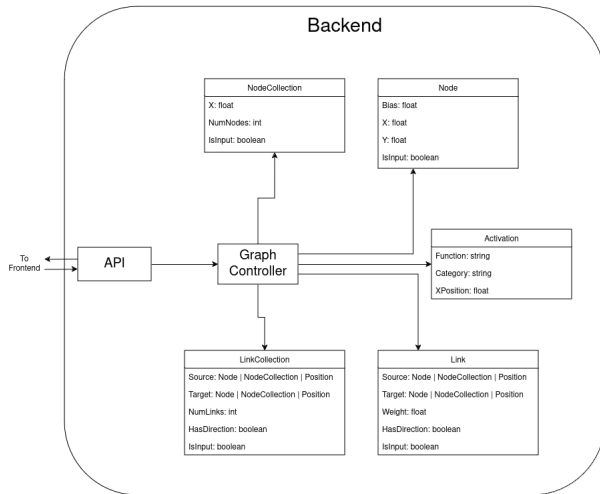




# Frontend Design



# Backend Design

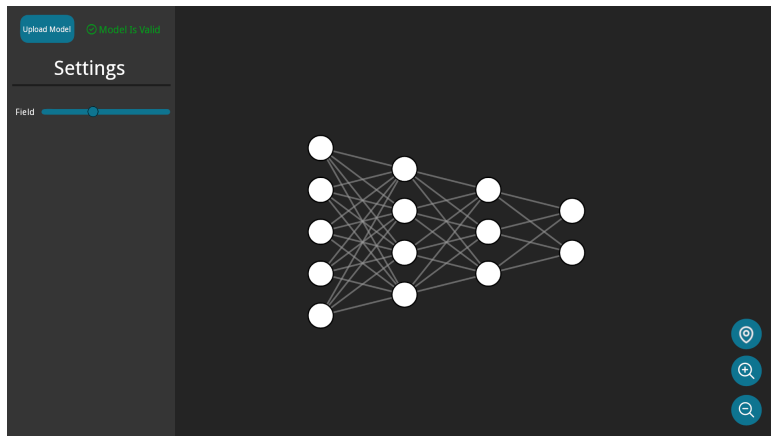


## Database & Sessions

- `_id`
- `graphs`
  - `nodes`
  - `edges`
  - `activations`
- `last_used`



# User Interface



# User Interface

Select Model:

STE\_IRts\_Large\_Even\_La...

gpt4.keras

☒ Model is valid

---


Settings

☐ Dark Mode


---

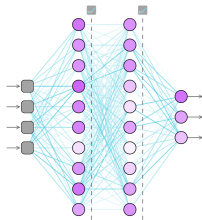
Key

Weights/Links

Lower  Higher

Biases/Nodes

Lower  Higher



# Frontend Technologies & Graph Generation

- Svelte
- Flowbite
- D3.js

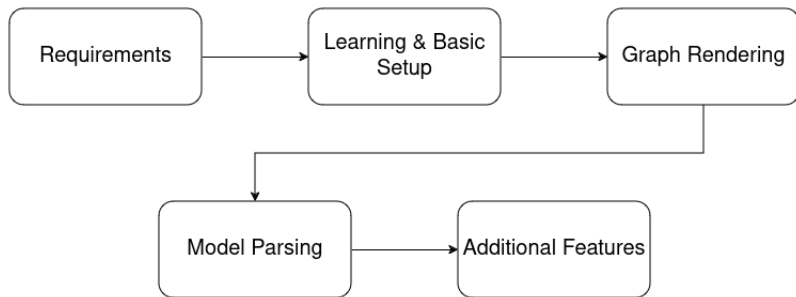


## Backend Technologies & Model Parsing

- Quart
- Keras
- PyTorch



# Development





# Deployment

- Ubuntu 22.04 LTS
- PM2
- GitHub Actions



# Testing

- Frontend Unit Testing

# Testing

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- Backend Unit Testing

# Testing

- Frontend Unit Testing
- Backend Unit Testing
- Regression and Integration Testing

# Security

## Web Application Security

- HTTPS
- White-List Parsing

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- HTTPS
- White-List Parsing

## Session Management

- Anonymous
- Data Pruning

# Challenges

- Lack of framework documentation

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- Information filtering



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- Lack of framework documentation
- Information filtering
- Time management

# Future Work

- Complex network types

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- Additional frameworks

# Future Work

- Complex network types
- Additional frameworks
- Animations

# Thank you

## Questions

# Sources

- [https://www.tutorialspoint.com/sdlc/sdlc\\_agile\\_model.htm](https://www.tutorialspoint.com/sdlc/sdlc_agile_model.htm)
- <https://www.mongodb.com>
- [https://en.wikipedia.org/wiki/File:Svelte\\_Logo.svg](https://en.wikipedia.org/wiki/File:Svelte_Logo.svg)
- <https://flowbite.com/>
- <https://github.com/d3/d3-logo/blob/master/d3.png>
- [https://github.com/koddr/quart-logo/blob/master/src/png/quart\\_short\\_logo\\_color.png](https://github.com/koddr/quart-logo/blob/master/src/png/quart_short_logo_color.png)
- [https://en.wikipedia.org/wiki/File:Keras\\_logo.svg](https://en.wikipedia.org/wiki/File:Keras_logo.svg)
- <https://pytorch.org/>
- <https://ubuntu.com/>
- <https://pm2.io/>
- <https://github.com/>