

MICHIGAN STATE

UNIVERSITY

Beta Presentation

Visualizing Neural Network Gradients

The Capstone Experience

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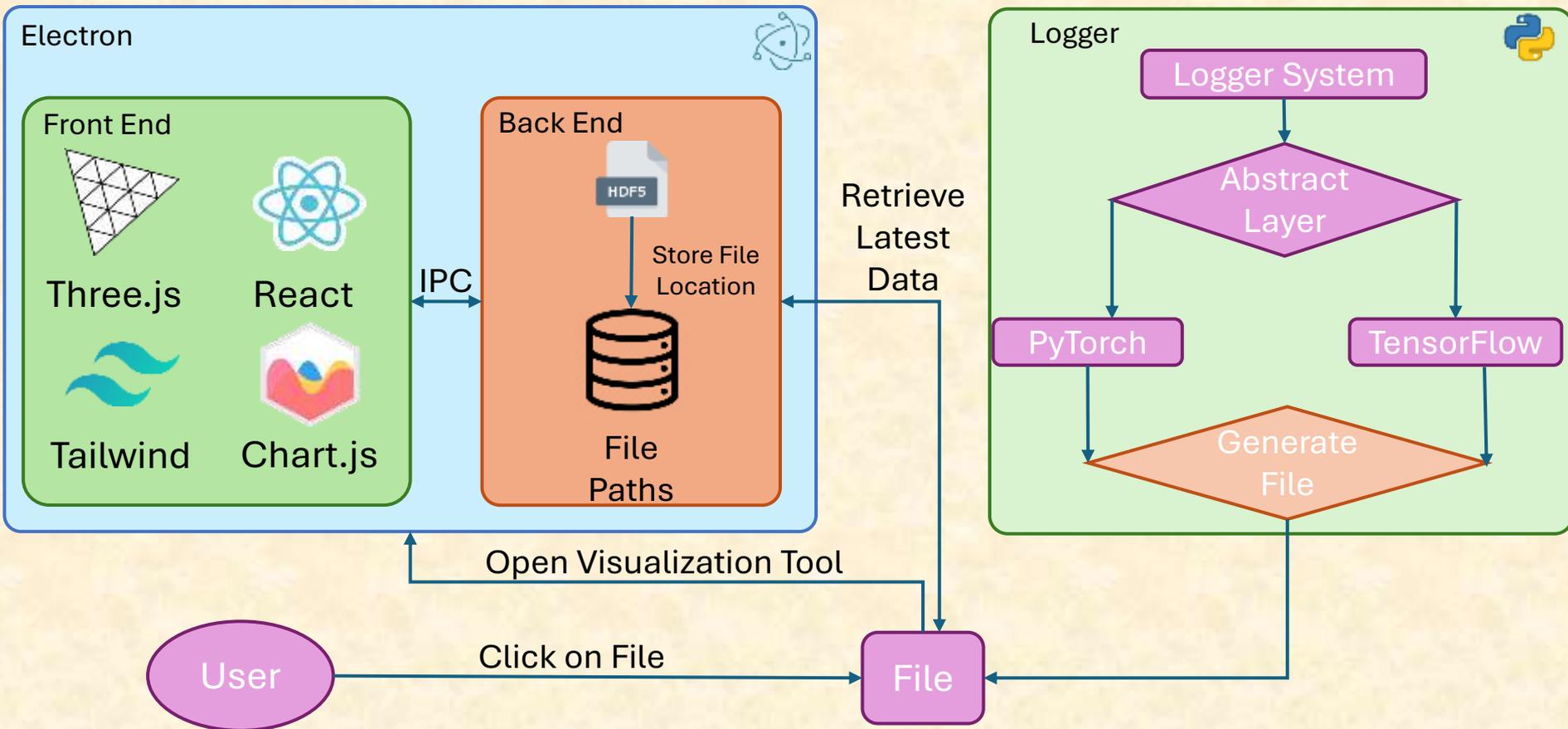
*From Students...
...to Professionals*

Project Overview

- Develop an interactive UI for visualizing the training of machine learning models
- Various ML models operate as “black boxes” and our software allows a better understanding of the behind the scenes of these models
- Engineers working with all types of machine learning will use our service to debug and understand their models better



System Architecture



Library/Logger

```
from magnavision import MagnaVision

model = nn.Sequential(
    nn.Linear(2, 2),
    nn.Linear(2, 1)
)
logger = MagnaVision(model, 'torch_fnn.h5', architecture="FNN")

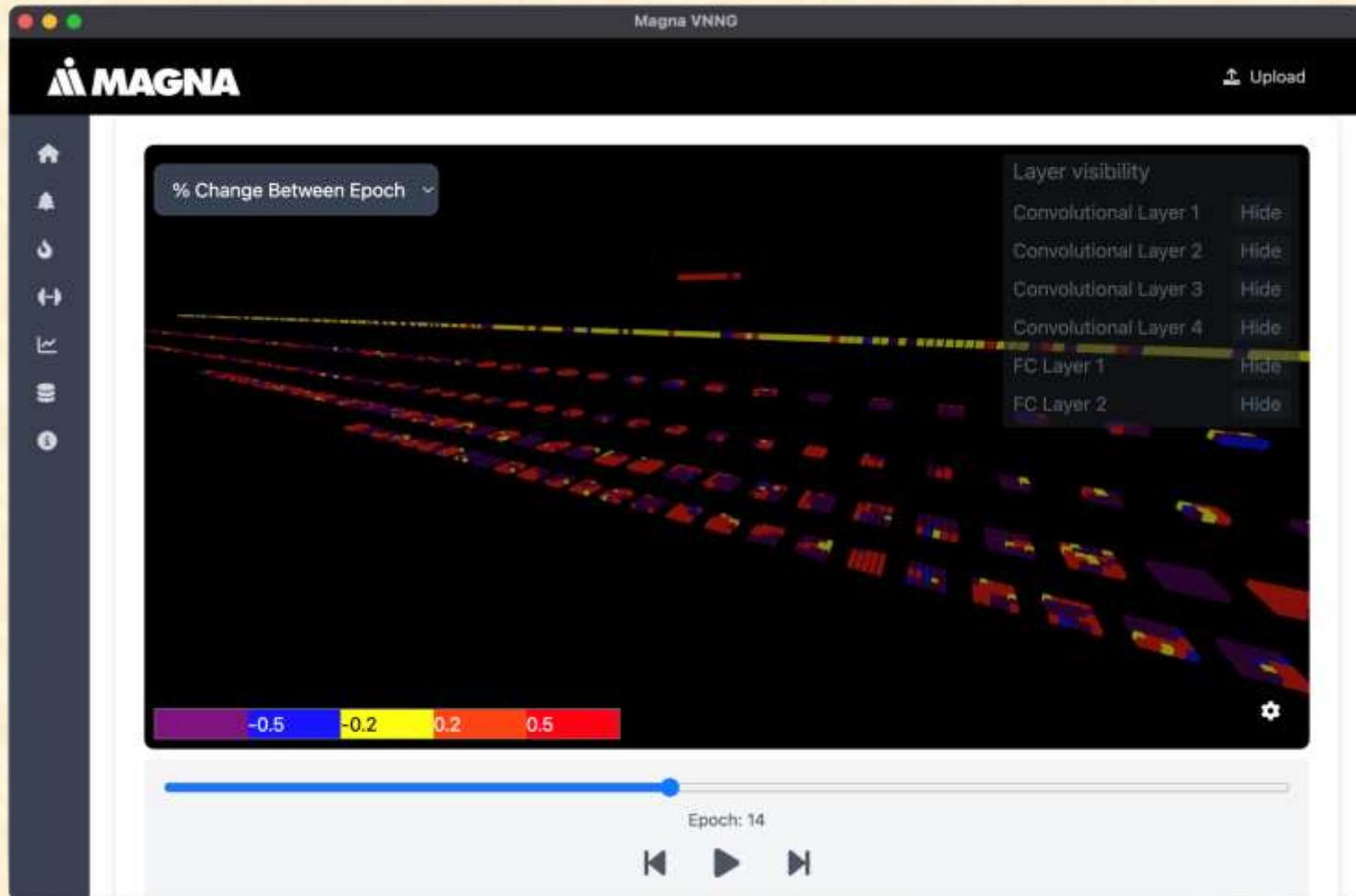
for epoch in range(5):
    # dummy data
    x = torch.randn(5, 2) # 5 samples, 2 input each
    y = torch.randn(5, 1) # 5 samples, 1 output each
    # loss function (Mean Squared Error)
    criterion = nn.MSELoss()
    optimizer = torch.optim.SGD(model.parameters(), lr=0.001)
    # forward pass
    output = model(x)
    loss = criterion(output, y)
    # backward pass (compute gradients)
    loss.backward()
    logger.log(loss)

logger.close()
```

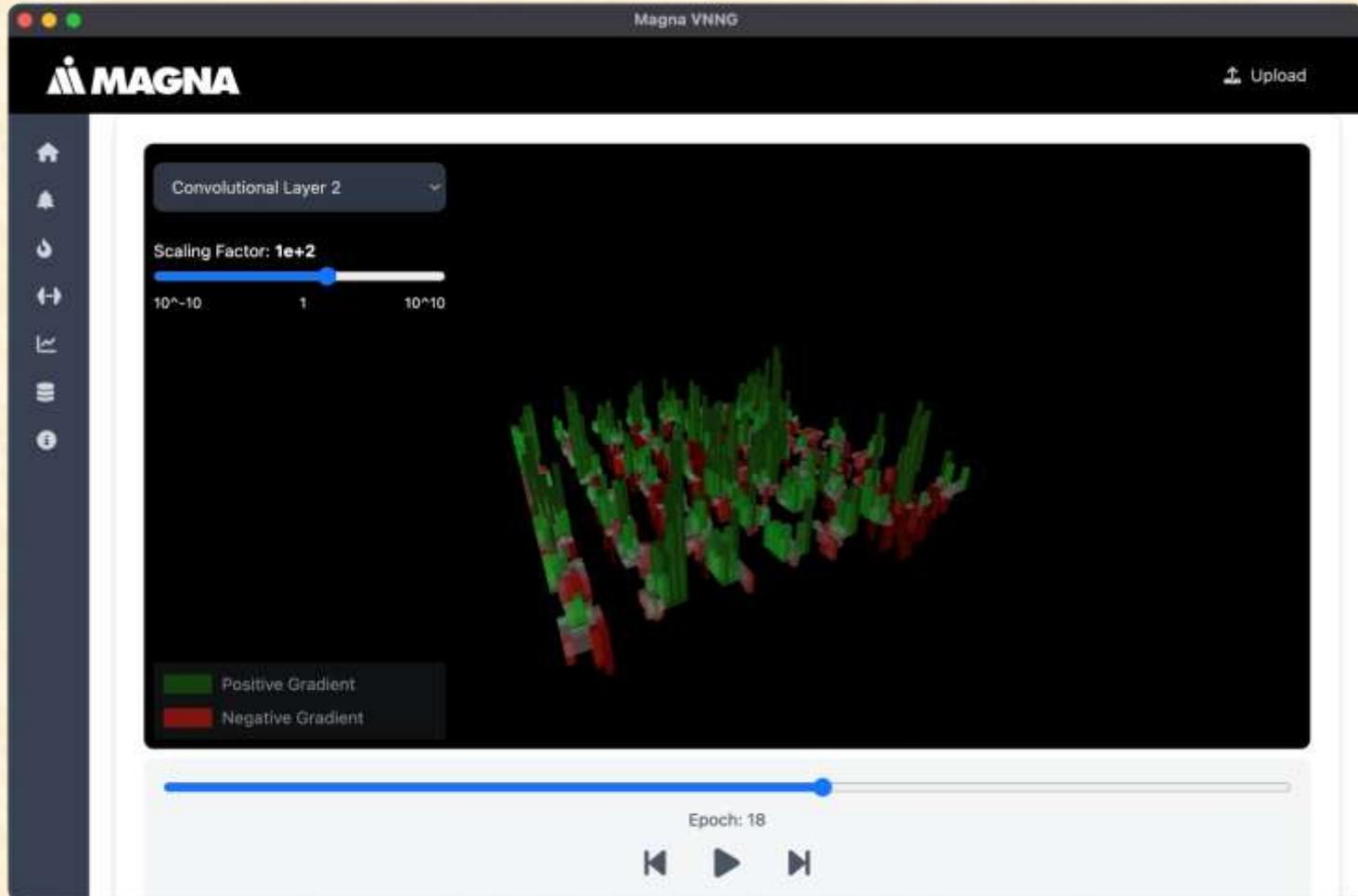
MacBook



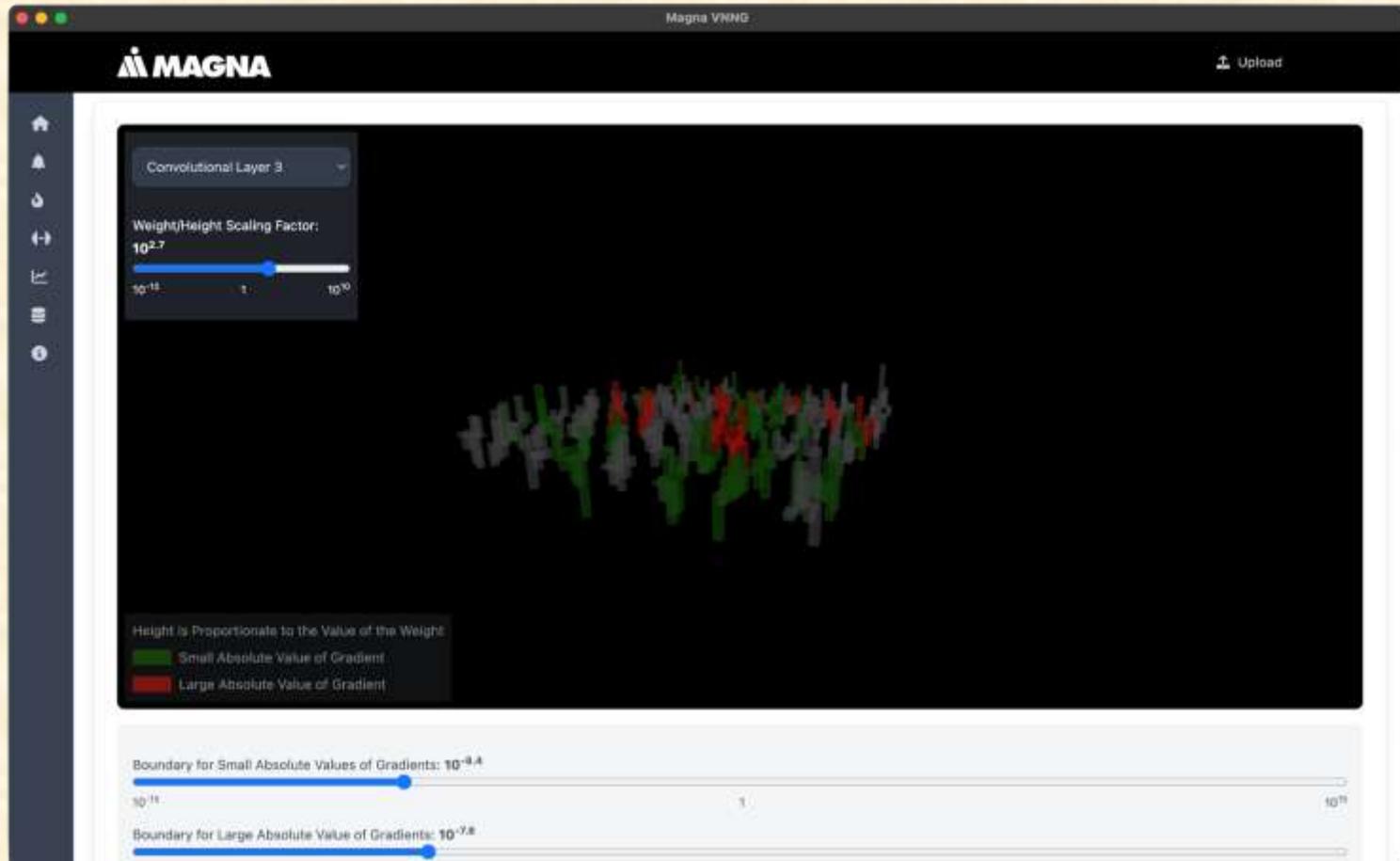
Multilayer



Heatmap



Weight Gradient



Data View

The screenshot shows the MAGNA VNNG interface. The title bar reads "Magna VNNG". The main header displays the file name "vanishing_pytorch_fixed2.h5" and includes "Copy Path" and "Home" buttons. Below the header, it shows "CNN", "Loaded", "PyTorch", and "Epochs: 30".

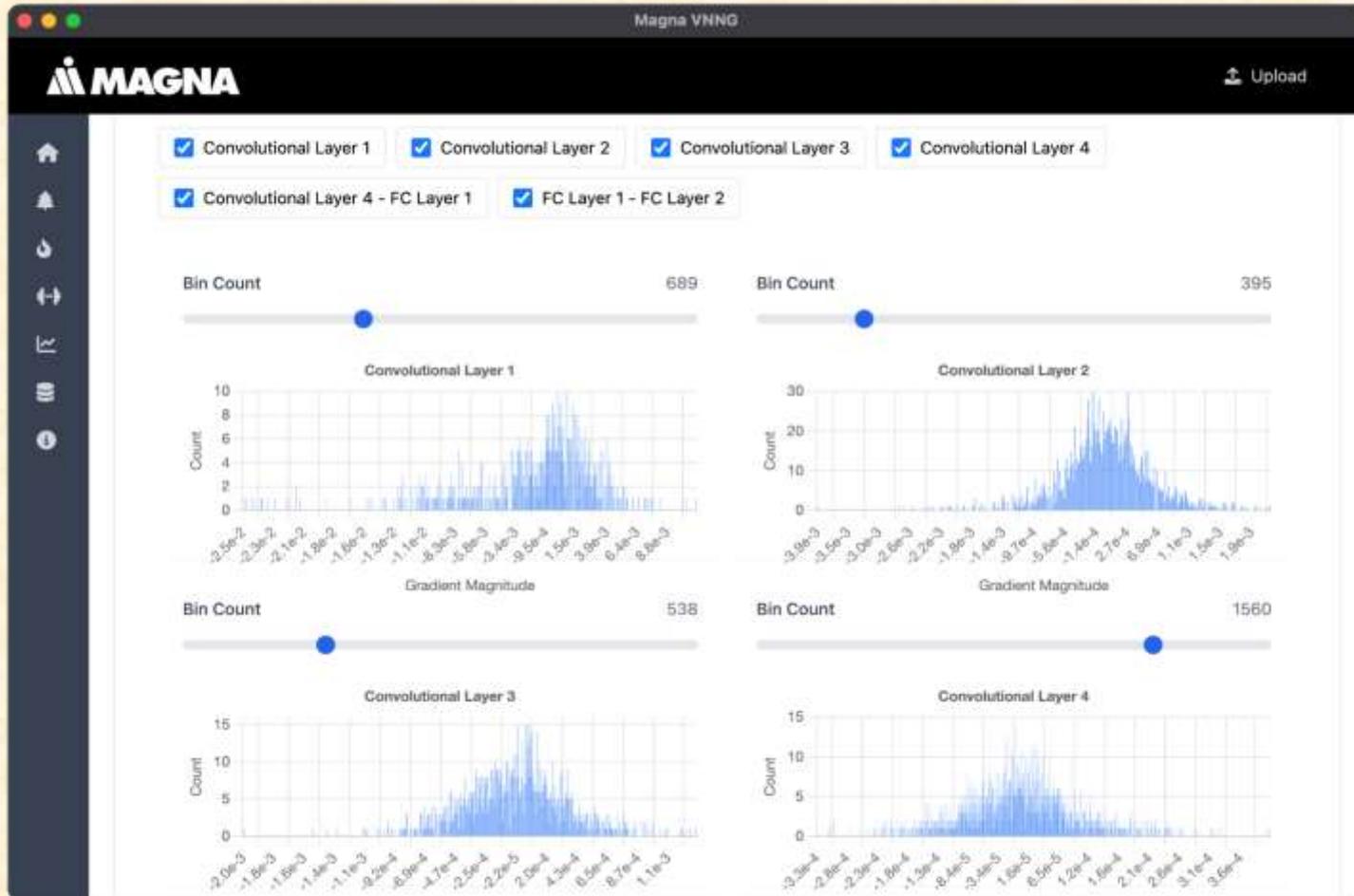
The interface is divided into two main sections:

- File Keys:** A sidebar on the left with a tree view showing "epoch_18" expanded, containing "Bias", "Gradients", and "Weights". Under "Weights", there are "Convolutional Layer 1-4" and "FC Layer 1-2".
- Matrix Data View:** The main area on the right. It has three buttons: "Matrix" (selected), "Line", and "Export Data". Below these buttons, there are controls for "Adjust Column Width: 200px" with a slider and "Number Format: Auto" with a dropdown menu. A table displays the matrix data:

	1
1	64
2	5
3	5



Distribution



What's left to do?

- Features
- Stretch Goals
 - Scalability
 - Control System
- Other Tasks
 - Incorporate Feedback from PhD Students
 - Typing Errors
 - Styling
 - Further Testing
 - Detail the Guide
 - Adjust Averaging



Questions?

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