
Dwight Look College of
ENGINEERING
TEXAS A&M UNIVERSITY

# Team 64: Enhancing User Detection
## Bi-Weekly Update 1

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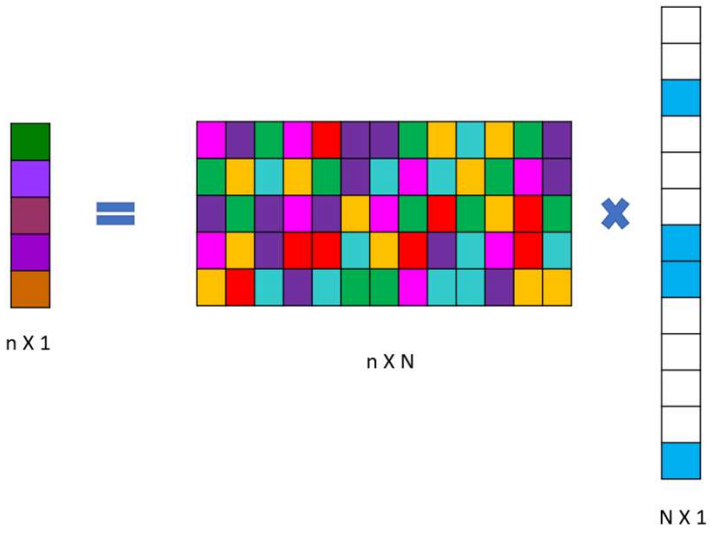
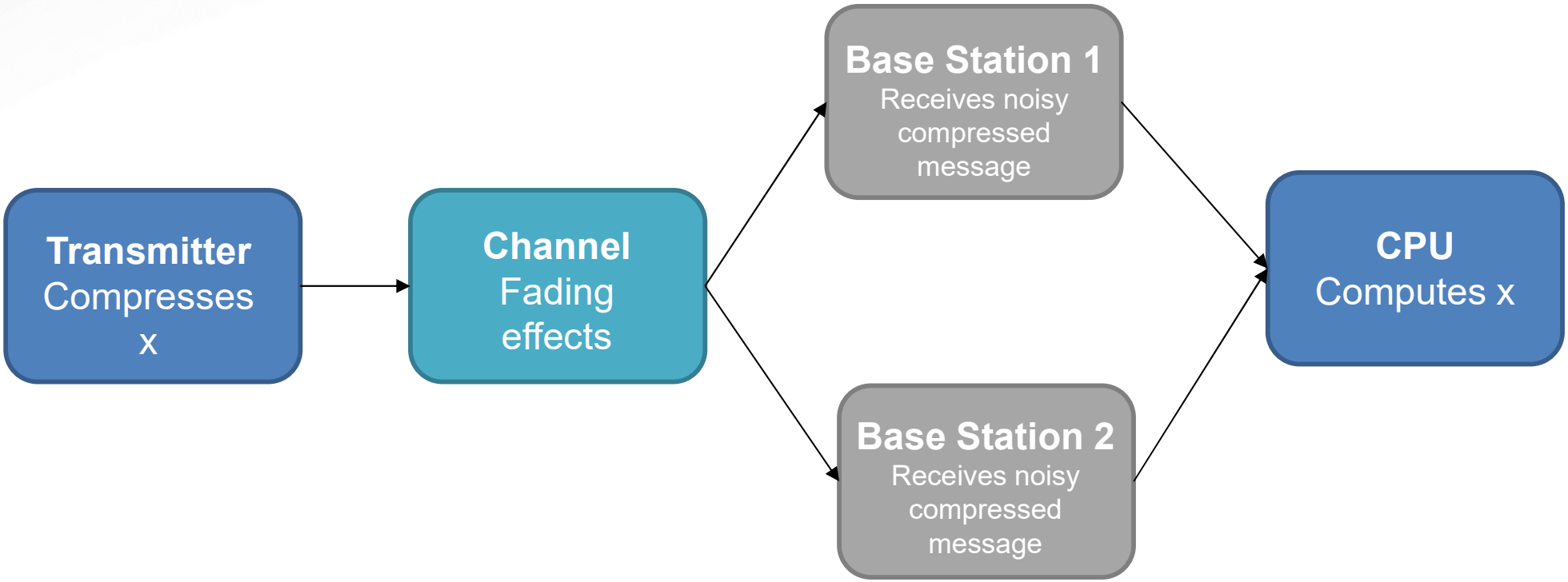
# Project Summary

- We are seeking to enhance compressed sensing algorithms with deep learning
- Focusing on user detection
- LISTA converts IST to a neural network



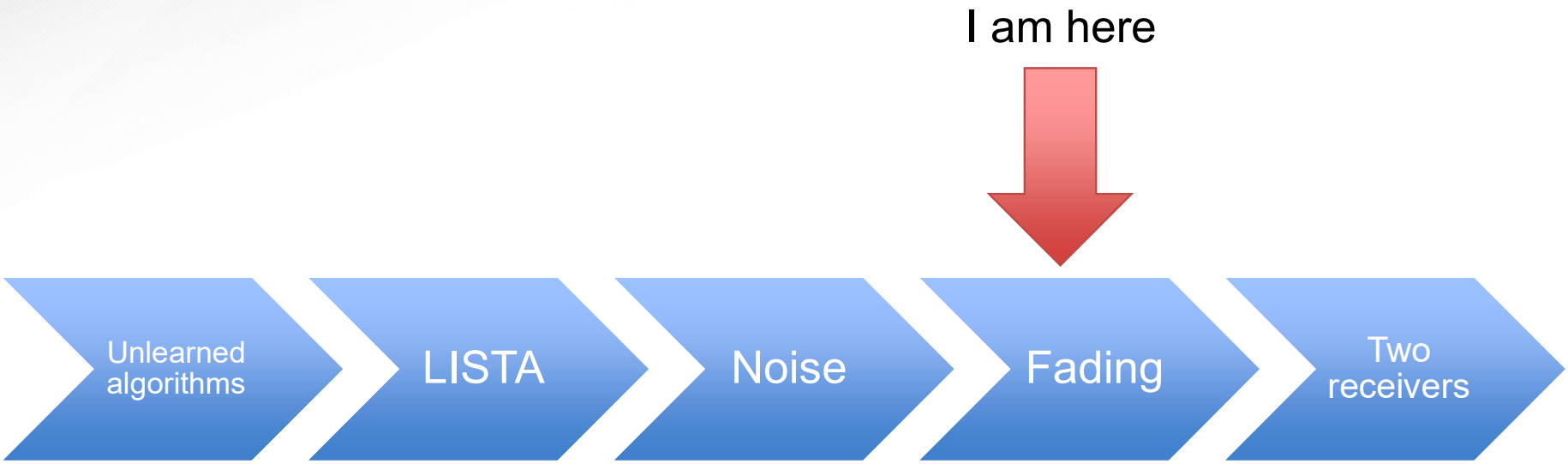
# Project Overview



# Major Project Changes for 404

There were no major complications faced in 403, so I am still on track with the original project.

# Project Timeline



# Unlearned Algorithms

**Holly**

| Accomplishments since 403<br>1 hr of effort | Ongoing progress/problems and plans until the next presentation |
|---|---|
| Changed the way we programmed IST to line up with LISTA | • Implement real Rayleigh fading<br>• Evaluate performance |

$$\mathbf{z}^t = \mathbf{y} - \mathbf{A}\mathbf{x}^t,$$
$$\mathbf{x}^{t+1} = \eta(\mathbf{x}^t + s\mathbf{A}^T\mathbf{z}^t; s\lambda)$$

$$\mathbf{x}^{l+1} = \eta((\mathbf{I} - \frac{1}{L}\mathbf{A}^T\mathbf{A})\mathbf{x}^l + \frac{1}{L}\mathbf{A}^T\mathbf{y})$$

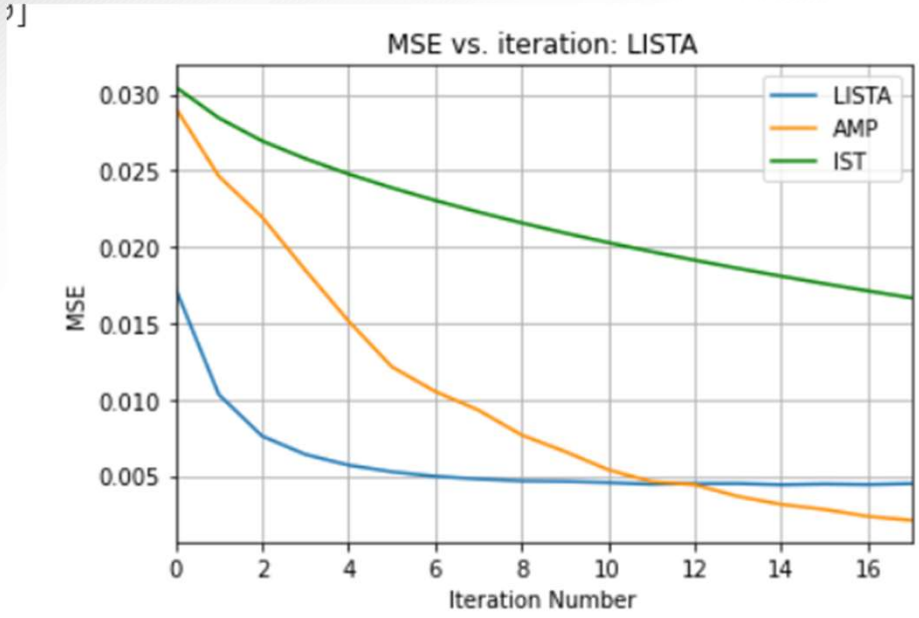
# LISTA

**Holly**

| Accomplishments since 403<br>10 hrs of effort | Ongoing progress/problems and plans until the next presentation |
|---|---|
| • Generated MSE vs. SNR plots (Now with correct SNR values)<br>• Fixed weights of layers and trained to improve performance | • Implement real Rayleigh fading<br>• Train the network<br>• Evaluate performance<br>• Start adaptation to handle complex numbers |

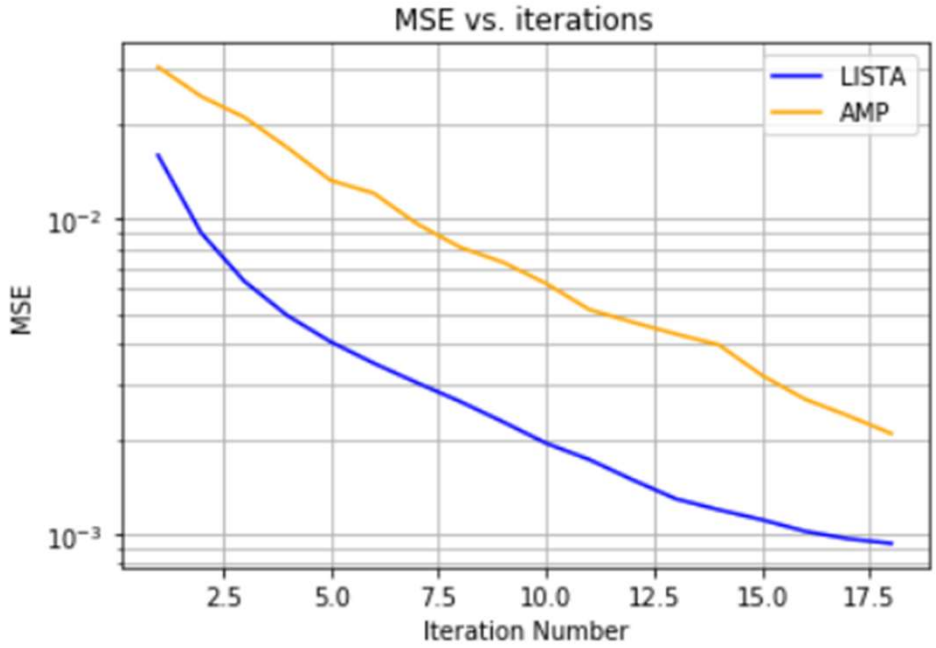
# LISTA

**Holly**



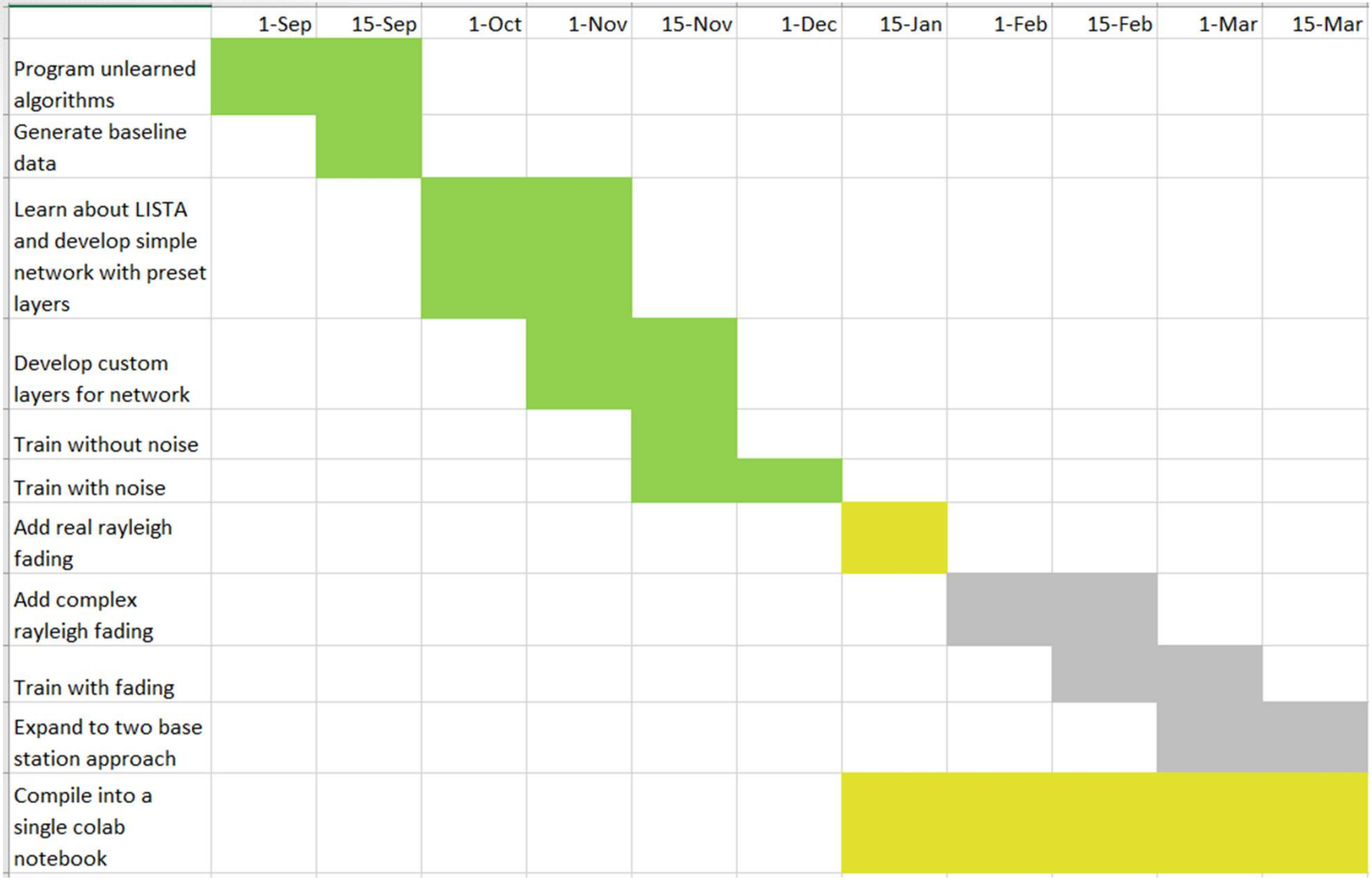

Before adjustments, LISTA flattened around 5 layers and AMP surpassed it at 11 iterations

After adjustments, we were able to push LISTA to 18 layers and continue to see performance enhancement




Note: above graph is log scale

# Execution & Plan




Question
Time!