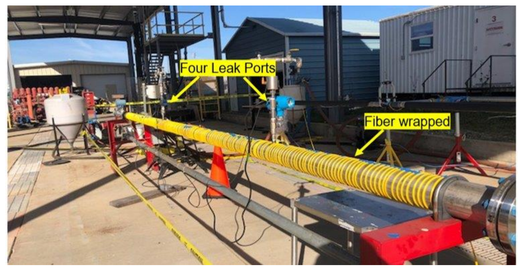
Pipeline Leak Detection Via Machine Learning on DAS Data

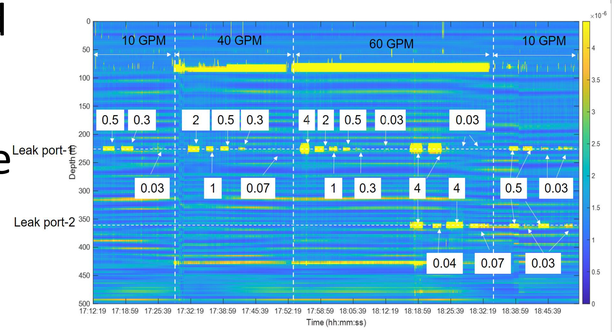
Hayden Gemeinhardt and Dr. Jyotsna Sharma (PI)

CISIA
THE CENTER FOR INNOVATIONS IN STRUCTURAL INTEGRITY ASSURANCE

Objectives and Challenge

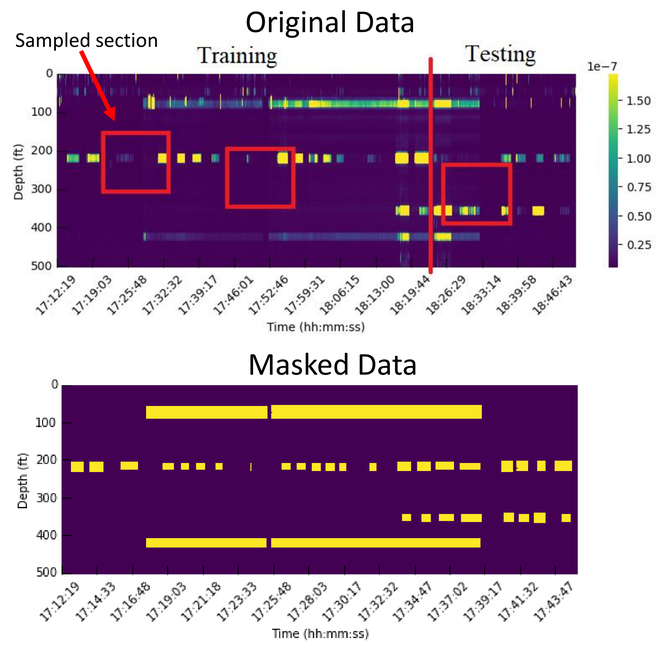
- Conventional gauges only measure at discrete locations and small leaks go undetected.
- Simulate pipeline leak and collect data using Distributed Acoustic Sensors (DAS).
- Automatically detect pipeline leaks with machine learning.





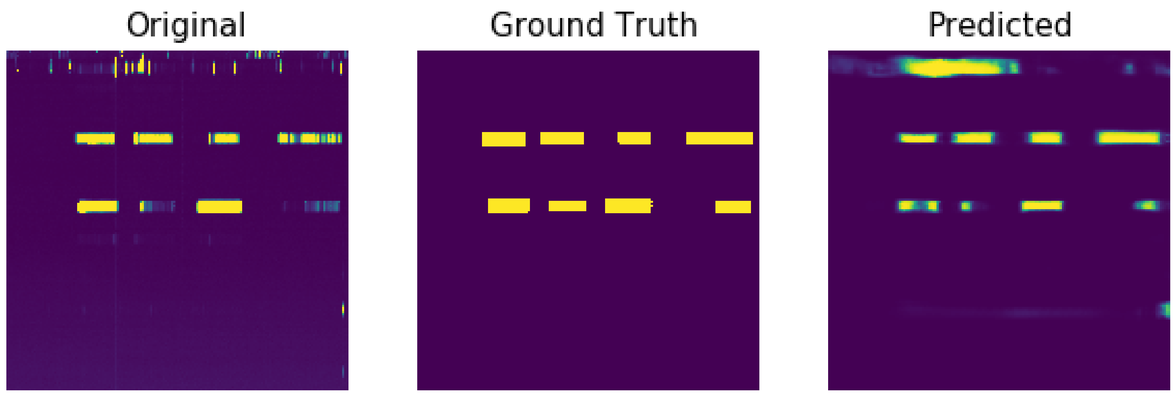
Data/Model

- Supervised image segmentation.
- Built on U-Net architecture.
- Randomly sampled sections of data to be used for training and blind testing.



Results

- 89% categorical accuracy.
- Successfully classified large leaks.
- Able to differentiate between noise and leak signal.
- Had trouble detecting some small leaks.



Conclusion

Key Takeaways:

- Successful proof-of-concept demonstration.
- Staging ground for further development.
- Low performance likely due to limited amount of data.

Next Steps:

- Increase amount of processed DAS data.
- Implement on other types of sensor data.