

Development of a Closed Loop FMCW Radar Device to Extract Biometric Data for Security and Irregularity Detection

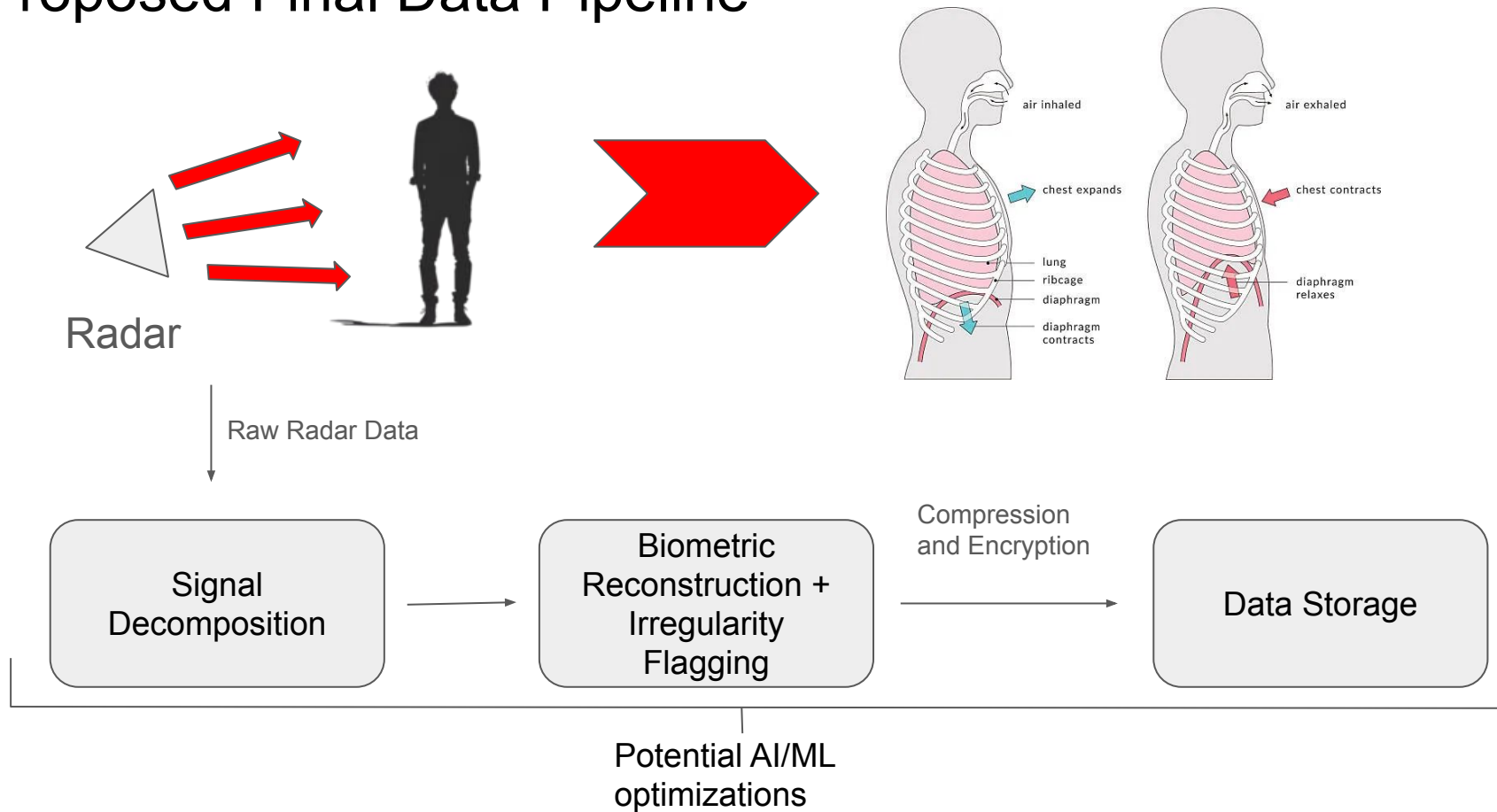
Dr. Qiuye He / Areesh Sobhani

7/7/25

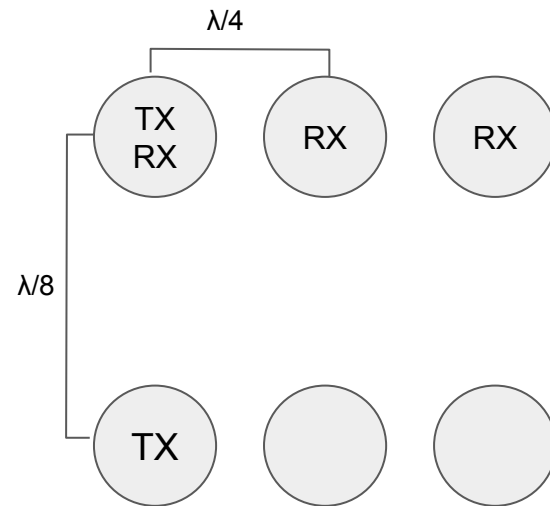
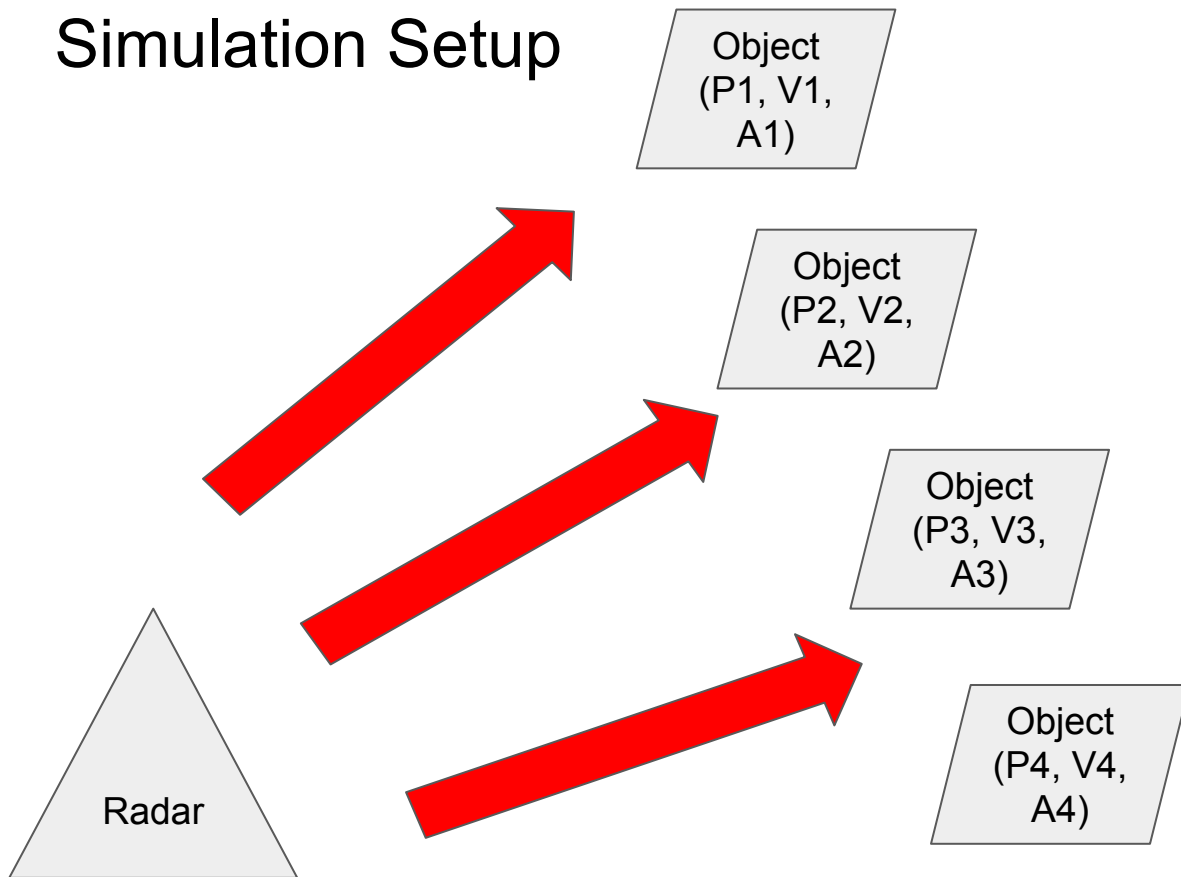
Problem Statement

This project aims to develop an accurate and optimal algorithm to extract and store biometric data from a Frequency Modulated Continuous Wave radar within an easily-used device for data privacy and early irregularity detection.

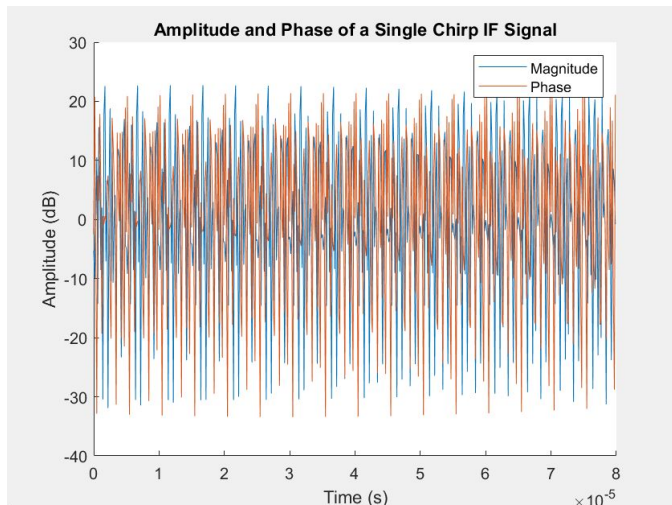
Proposed Final Data Pipeline



Simulation Setup



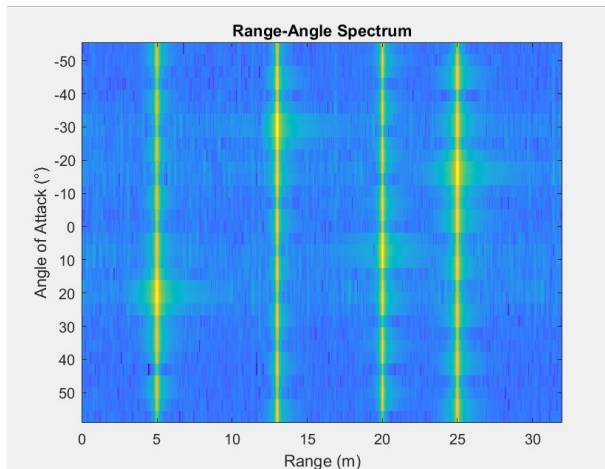
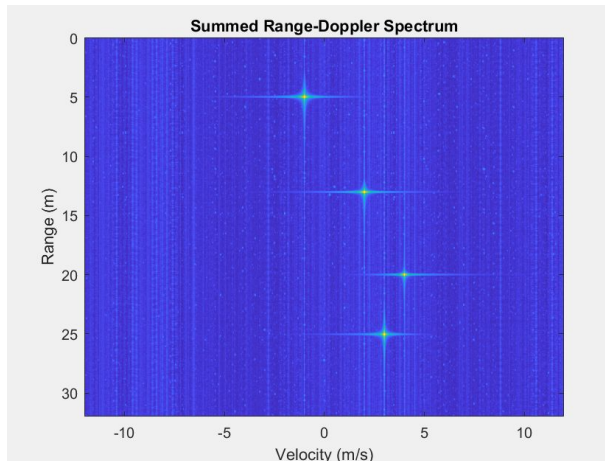
Final Simulation Output



```
target = [  
    13 2 -30;  
    5 -1 20  
    20 4 10  
    25 3 -15  
];
```

There are 4 objects detected

Object 1 has a range of 5.00 m, a velocity of -1.01 m/s, and an angle of attack of 21.49° .
Object 2 has a range of 13.07 m, a velocity of 1.99 m/s, and an angle of attack of -28.65° .
Object 3 has a range of 20.07 m, a velocity of 4.00 m/s, and an angle of attack of 7.16° .
Object 4 has a range of 25.02 m, a velocity of 3.00 m/s, and an angle of attack of -17.90° .

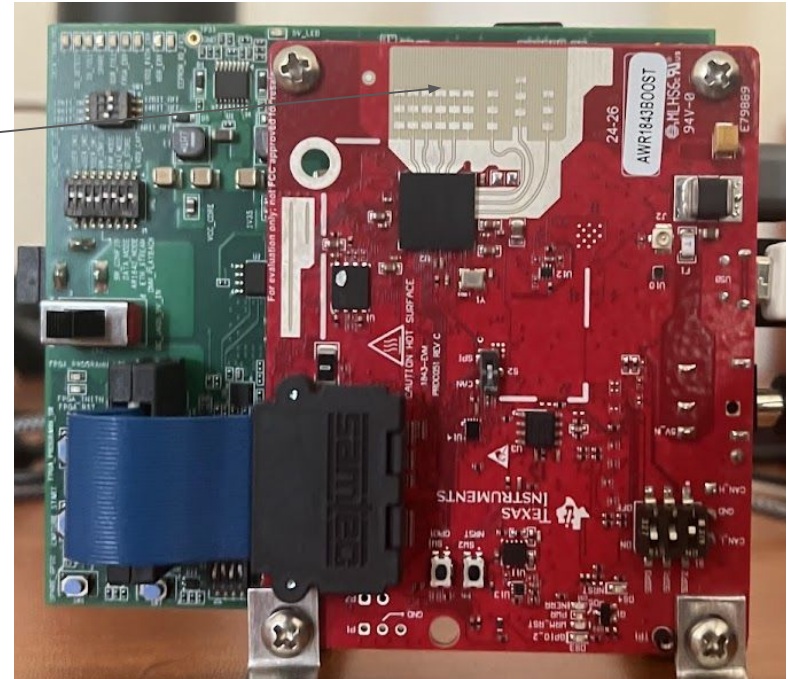


Initial Hardware Implementation

- Utilizing the Texas Instruments AWR1843BOOST mmWave Radar and Texas Instruments mmWave Studio

Antenna
array

Capture
card



Future Experimental Design

- Hardware implementation and tweaking
- Optimization of computation speed and accuracy
 - Test Fourier vs. Wavelet Transform
 - Potential use of Quantum Fast Fourier Transform (QFFT)?
- Testing on best encryption/transmission/storage methods
- Neural network implementation?