EESTEC Hackathon- Radar Based Vital Sensing

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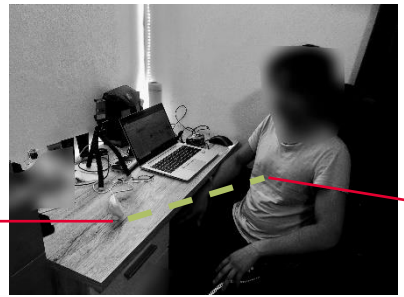
Problem Statement

- Build a vital sensing solution using Infineon's BGT60TR13C radar chip
  - Target Scenario – Single Person sitting in front of the radar facing towards the chest (<1m).
  - Challenges to be addressed:
    - Detect if the person is moving or quasistatic.
    - Predict Resting Stage Vs After-activity or Anxious Stage
    - Avoid/smoothen noisy predictions.



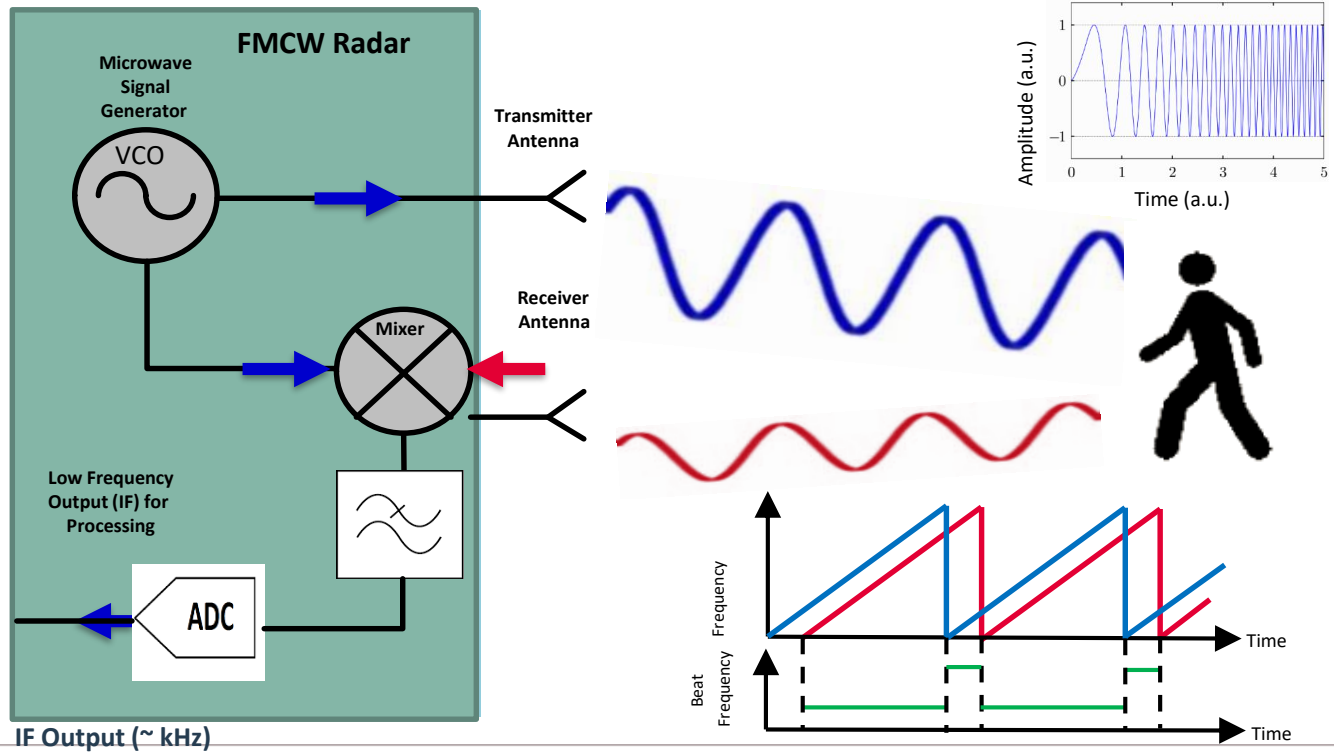
Example of Target Scenario

Evaluation Criteria

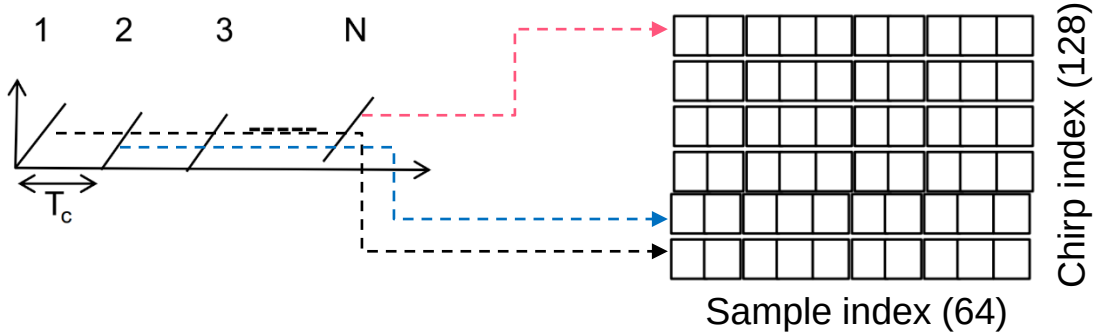
Criteria	Points
Algorithm Innovation (Data Collection, Overall Flow , etc.)	20
Moving / Quasistatic Person Classification	20
Resting/Anxious Accuracy	20
Pitch Deck	20
Solution Feasibility (Embedded Solution Perspective)	20

Frequency-Modulated Continuous Wave (FMCW) Radar

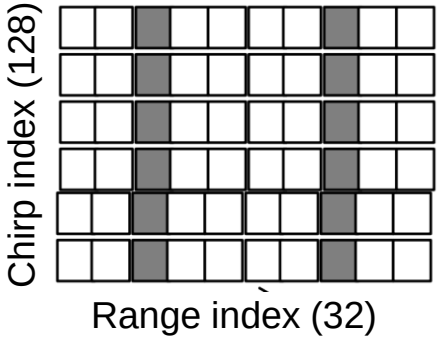
IF (intermediate frequency) output = **Beat** frequency



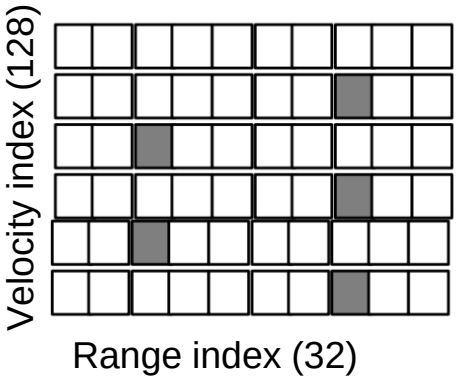
Sample Pre-Processing



1. ADC data corresponding to chirps are stored as the rows of a matrix



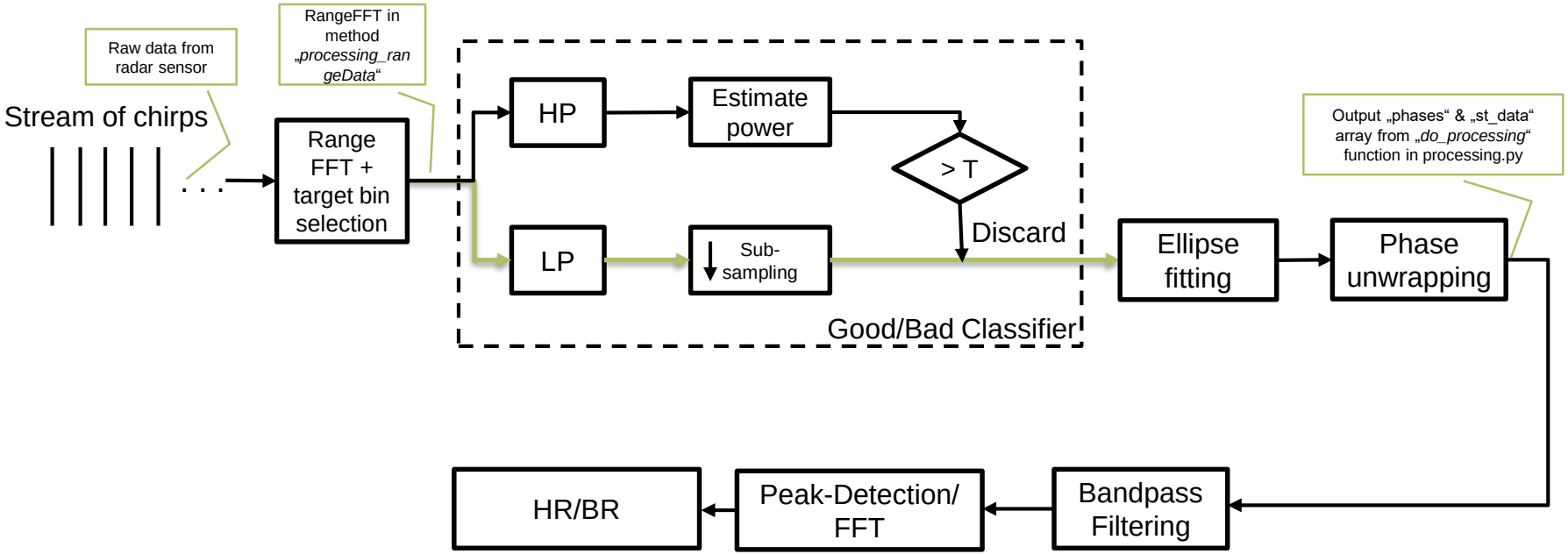
2. A range-FFT on each row resolved objects in range (real data is symmetric)



3. A doppler-FFT along the column resolves each column in velocity

Reference: https://training.ti.com/sites/default/files/docs/mmwaveSensing-FMCW-offlineviewing_0.pdf

Example Vital Sensing Algorithm



Useful Information & Reference Paper

- Normal Adult BR Range – 12-30 bpm
- Normal Adult HR Range – 48-120
  - Example butterworth Bandpass filter parameters for HR
    - Fs=1, lowcut = 0.8/500 , highcut = 2/500, order=6

- Improved Contactless Heartbeat Estimation in FMCW Radar via Kalman Filter Tracking

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