



## Wearable Sensors for Enhanced Assisted Rescue Response

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# SafeFire Project Goals



- **Develop wearable sensors** tailored for firefighting environments;
- **Enable Bluetooth data transmission** for real-time monitoring and **offline data storage** for post-mission analysis;
- **Analyze ECG data** to identify patterns of physical fatigue;
- **Build an automated alert system** for early detection of health crises;

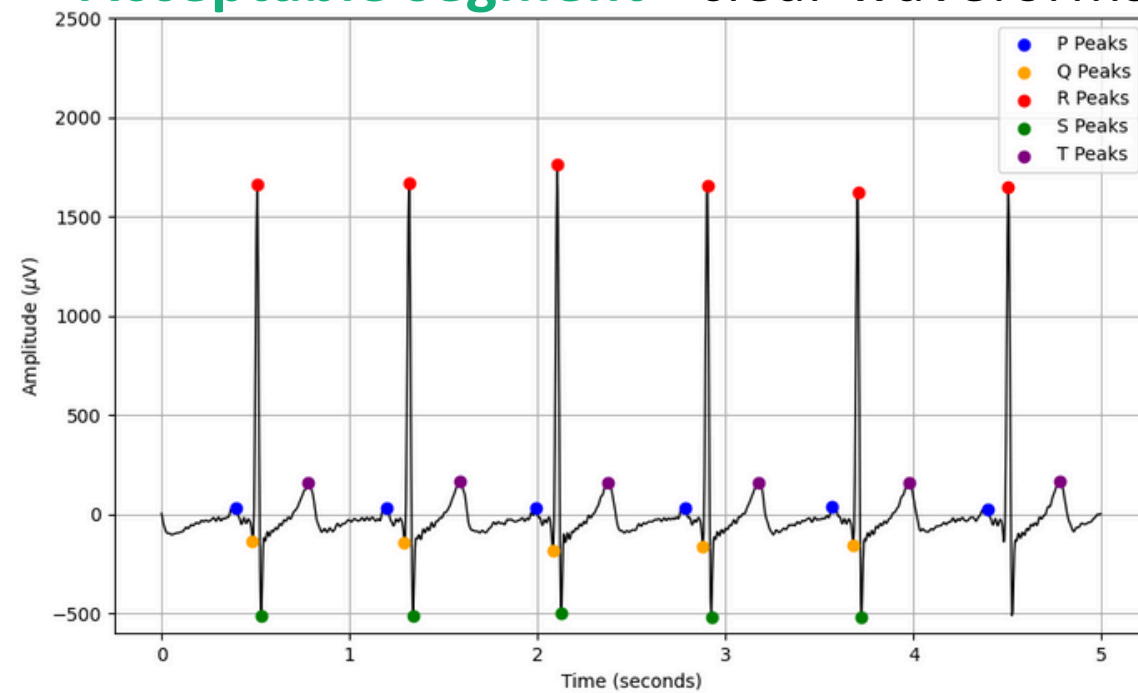


## Data collection

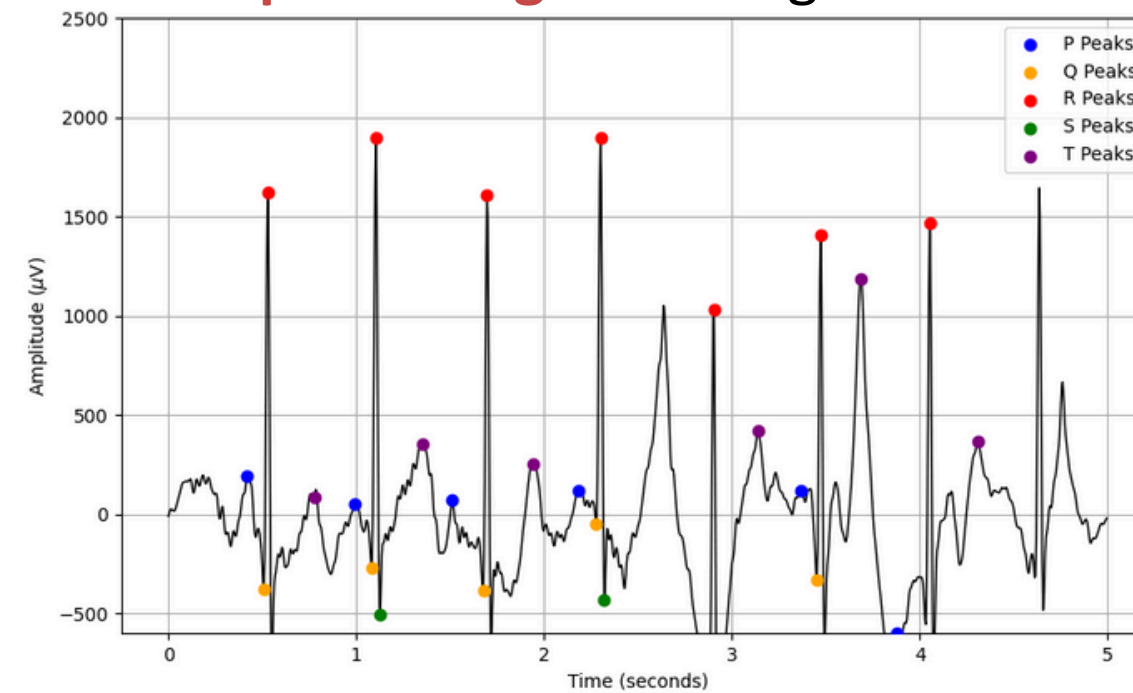
Data acquisition during regular duties + Daily activity forms

## ECG Signal Processing

**Acceptable segment** - clear waveforms



**Unacceptable segment** - significant noise



Calculate Acceptance Rate

# Preliminary Results



High activity intensity → Lower acceptance rates

Reported fatigue → Longer ST interval

Too limited data to confirm any trends

**Need to gather more data for robust conclusions**

## Expanded Testing

Increase sample size: 40 new volunteers ;

Include diverse environments: rural and urban firefighting.

## Data Collection Goals

Compare performance of the two electrode types;

Identify ECG patterns linked to fatigue.

## Future Plans

Apply machine learning for automated fatigue detection;

Develop real-time alerts for health risks during firefighting.

# Conclusion



## Summary

- Project combines **ECG monitoring, smart undergarments, and real-world testing;**
- Focus on **detecting physical fatigue.**

## Future Impact

- Incorporate **larger datasets and machine learning for real-time alerts;**

## Key Takeaway

- SafeFire aims to **revolutionize emergency response**, ensuring mission success and protecting lives.





**Thank you for your attention**

# Methodology

## Smart Undergarment



- **Tight fit** ensures electrode contact and signal quality;
- **Sleeveless design** minimizes noise from arm movement;
- **Real-time Bluetooth streaming** and offline **SD card storage**;
- **Heat-resistant materials** suited for firefighting;
- **Two versions with different electrodes** to optimize signal acquisition.

