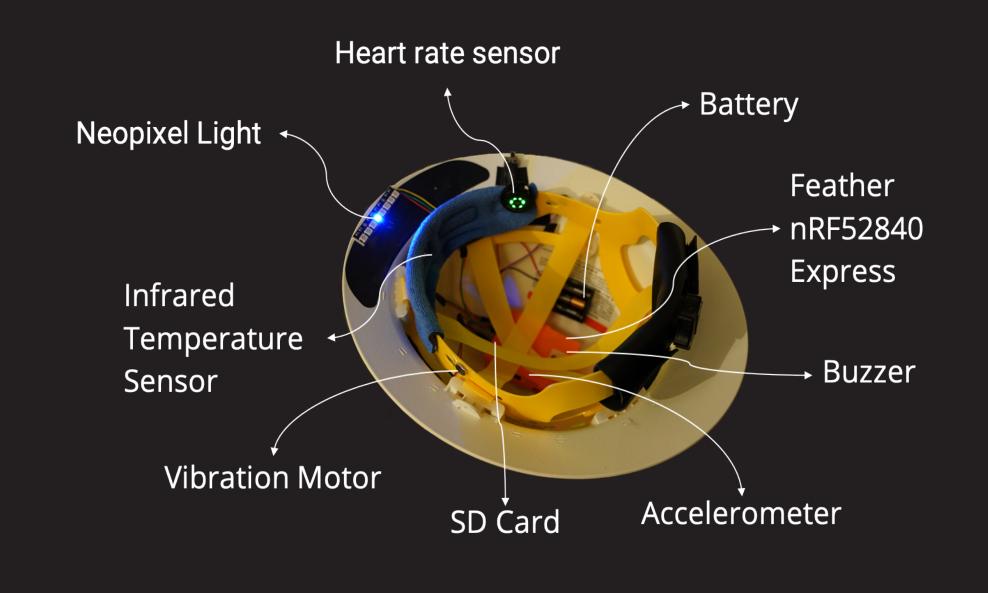
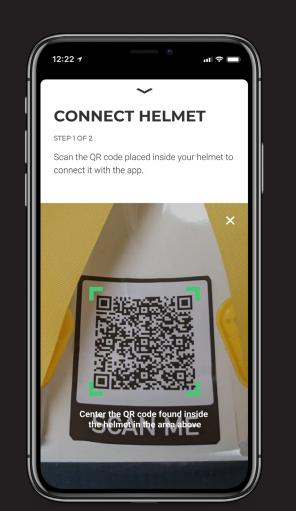


## Problem

Heat-related illness is a severe problem that wildland firefighters face during their deployment. Since 2000, 313 wildland firefighters have lost their lives on the field, and 54% of them were caused by overexertion under hot and challenging conditions. The current method used to distinguish different heat-related illnesses, such as heat cramps, heat exhaustion and heatstroke is by human observation. However, human observation can be too slow and inaccurate in assessing different heat related conditions. Our team project focused on how emerging technologies might monitor wildland firefighters' physical condition, so that potentially hazardous situations can be anticipated.

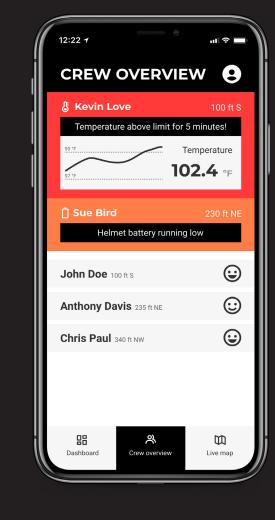


Smart Helmet Physical Prototyype





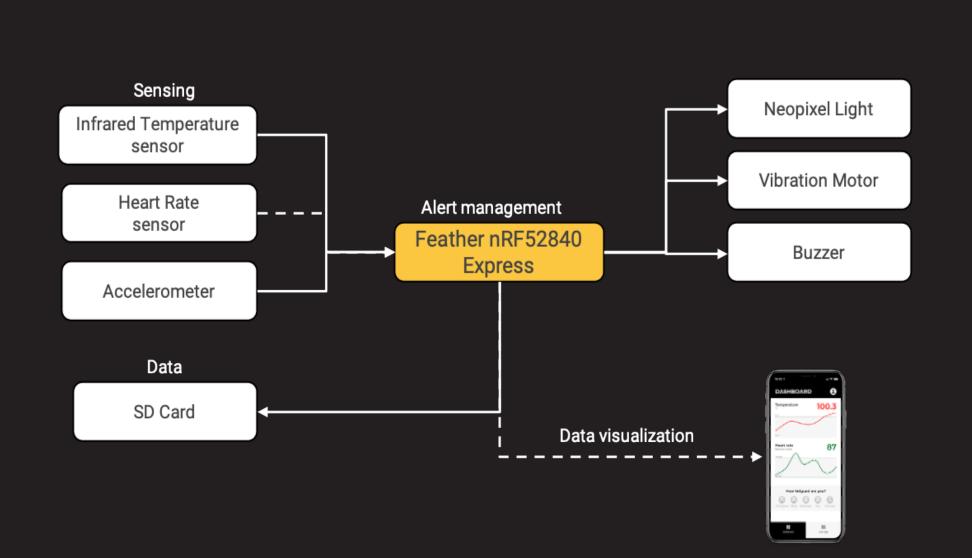




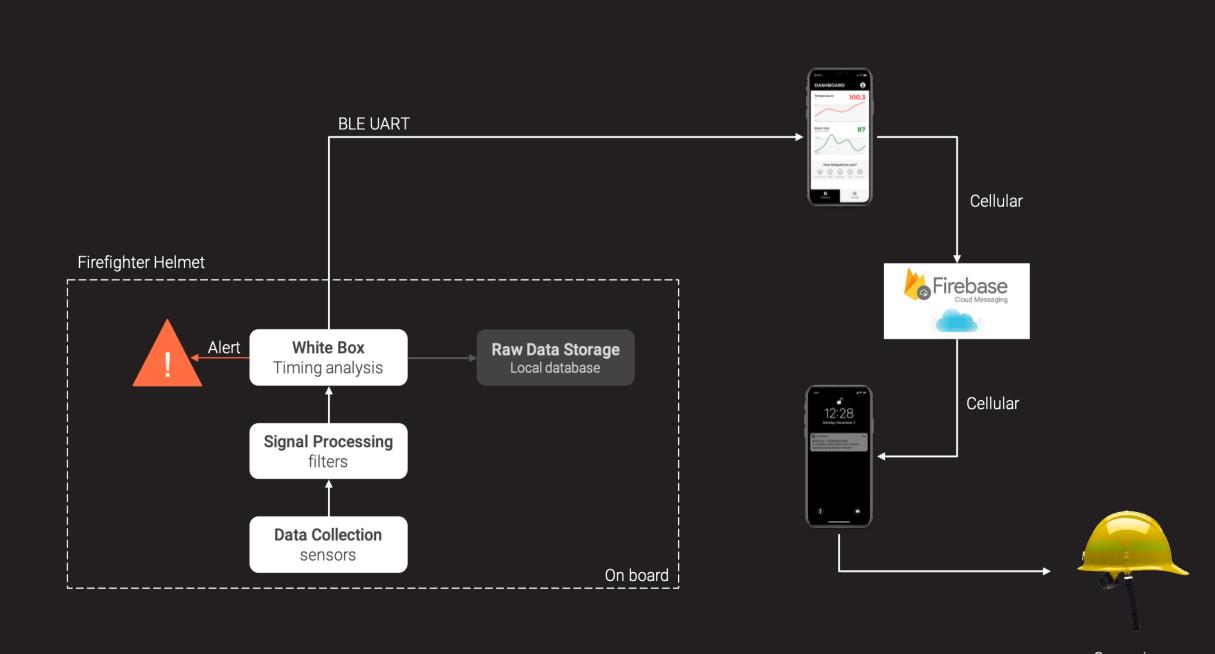
FireWorks App - Firefighter Side

FireWorks App - Supervisor Side

Our propsed solution involves using heart rate, temperature, and movement data to alert firefighters and their supervisors about potentially hazardous heatrelated illnesses. We have developed a smart helmet with integrated sensors to monitor the health data, a corresponding FireWorks App to show data visualization to the wildland firefighters and supervisors, and an alert system on the helmet to nudge the firefighters and supervisors when it detects abnormal data. All sensor data are also sent to the App using Bluetooth and it would be synced to the cloud database so that supervisors can be alerted and monitor their crew's health conditions.



Hardware Architecture



Software Architecture

# **Process**

#### **Research & Brainstorming**

- Conducted a competitive analysis.
- Read 10+ papers and reports about firefighting or heat-related illnesses.

#### **Interview & Field Study**

- Interviewed 15+ wildland firefighters and crew supervisors.
- Interviewed 5+ medical experts.
- Went to a wildland fire to conduct a field study

### Design

- Created Framework App in Figma.
- Used Fusion 360 to design the enclosure.
- Designed the schematic diagram in VeeCad.

#### **Prototyping & User Testing**

- Built three iterations of prototypes.
- Conducted two rounds of user evaluation testing.
- Analyzed the testing after each evaluation.

#### **Functional Evaluation**

- Tested the functionalities of the FireWorks App, database, and alert system.
- Simulated the circumstances to trigger the algorithm statements and test the alert system.







