

Project Title: Pyre: Wildfire Radio Alert System for Community Resilience

Summary:

The **Pyre Wildfire Radio Alert System** provides a life-saving communication tool for vulnerable communities during wildfire crises. This non-digital satellite alert system ensures high-risk populations can receive timely evacuation notifications without the need for internet or cellular access.

Challenge Description:

California's wildfire season has become a year-round crisis, fueled by extreme weather patterns including drought, high temperatures, and strong winds. These wildfires not only destroy vast landscapes but also threaten homes, infrastructure, and lives. In recent years, the intensity and frequency of these fires have increased, making it difficult for local emergency services to alert communities in a timely manner. This creates life-threatening situations, especially for vulnerable populations with limited access to technology and real-time information.

The Pyre Alert System focuses on high-risk groups, including elderly residents, low-income households, individuals with limited digital literacy, and people in rural or remote areas. These groups are often disproportionately affected by wildfires due to barriers in accessing timely evacuation alerts. Many in these communities lack access to digital devices or reliable internet and cellular networks, making it nearly impossible for them to stay updated on evacuation orders. The lack of information not only increases the risk to their safety but can also delay critical evacuation efforts, ultimately endangering both residents and first responders.

The Pyre Alert System is an interdisciplinary solution that merges environmental science, emergency management, engineering, and public health principles. The system leverages existing fire data and real-time wildfire monitoring through California's fire agency API. By incorporating geospatial data, air quality information, and fire progression analytics, the system can identify when a wildfire poses immediate danger to residential areas. We have designed the alert transmitter to seamlessly integrate with existing fire alarms, using a familiar interface to reduce learning barriers. Additionally, social scientists and public health experts will need to shape the outreach and education strategy, ensuring that vulnerable populations are informed on how to use

and respond to the alert system. This comprehensive approach ensures that the technology is both accessible and effective, reducing the likelihood of preventable losses and promoting safer evacuations for high-risk populations.

Justice-Centered Vision Statement:

The Pyre Alert System is dedicated to safeguarding high-risk communities through equitable access to life-saving information during wildfire emergencies. By delivering timely evacuation alerts to populations often overlooked by digital warning systems—such as elderly, low-income, and rural residents—our solution prioritizes those most vulnerable to climate threats. Designed to work without internet or cellular access, the system enhances community resilience by reducing evacuation delays and promoting safety for all. This justice-centered approach bridges systemic disparities, empowering communities with the resources they need to respond effectively to climate crises and fostering a safer, more inclusive environment for everyone.

Community Engagement Plan:

To ensure the success of the Wildfire Radio Alert System, our community engagement plan focuses on identifying, understanding, and empowering high-risk populations in wildfire-prone areas.

- **Identifying and Engaging the Target Audience**
 - Our initial outreach would involve collaboration with local agencies, community organizations, and emergency services to pinpoint high-risk populations: elderly residents, low-income households, individuals in rural areas, and those with limited digital access. We would partner with trusted local organizations, like fire departments, senior centers, rural associations, and health and social services, to host informational sessions and workshops, ensuring community members are both informed and equipped to engage with the alert system.
- **Participatory Methods**
 - We plan to employ a participatory approach to build trust and tailor the solution to local needs. Community members will be invited to trial the system, with their feedback guiding modifications to ensure usability and cultural relevance. These sessions allow residents to

voice preferences and concerns, which will inform both the user experience and any training materials.

- **Equity Considerations**

- Recognizing the systemic barriers these communities face, we will prioritize an accessible, straightforward design for the alert system. Outreach materials will be translated into multiple languages, and in-person sessions will be provided for those with limited digital literacy. Additionally, we will offer educational resources to help residents understand wildfire risks and prepare for potential evacuations, ensuring equitable access to knowledge and tools.

- **Cultural Relevance**

- We will respect local customs and preferences, ensuring the project is presented with cultural sensitivity. Collaborating with community leaders will help tailor messaging and delivery in ways that resonate, ensuring our approach aligns with the community's values and priorities.

- **Contingency for Community Pushback**

- If the community is hesitant or resistant to the project, we would conduct additional listening sessions to better understand their concerns and modify our approach accordingly. We would also collaborate with local advocates or representatives to communicate the project's benefits and respond to feedback, creating an inclusive and responsive engagement process.

Implementation Plan:

1. Initial Outreach

- **Key Steps:** Launch project awareness through partnerships with local government agencies, fire departments, and emergency response organizations. Conduct outreach to identify target communities in high-risk areas and pinpoint households with vulnerable populations.

- **Stakeholder Involvement:** Collaborate with local fire departments, community-based organizations, healthcare providers, and social services to identify and engage high-risk populations.
- **Community Engagement Strategy:** Host informational sessions with community leaders and residents to introduce the project, explain its benefits, and gather feedback. Focus on transparency to build trust.

2. System Design and Development

- **Key Steps:** Develop the wildfire radio alert system's hardware and software, including the radio transmitter, dashboard interface, and API integrations. Conduct focus groups and usability testing to ensure user-friendliness, especially for residents with limited digital literacy.
- **Stakeholder Involvement:** Involve engineers, software developers, public health experts, and community representatives to address accessibility, functionality, and user experience.
- **Community Engagement Strategy:** Implement iterative testing with residents in collaboration with local organizations. Gather feedback to make adjustments, ensuring the system meets community needs and usability standards.

3. Education and Training

- **Key Steps:** Develop culturally relevant training materials and resources in multiple languages. Organize workshops and training sessions to familiarize residents with the system, demonstrate device functionality, and provide evacuation preparedness tips.
- **Stakeholder Involvement:** Local non-profits, healthcare providers, and community organizations to assist in delivering training materials and organizing hands-on sessions.
- **Community Engagement Strategy:** Ensure training sessions are accessible and involve trusted community figures to facilitate understanding and adoption. Provide a helpline for ongoing support.

4. Pilot Program and Feedback Collection

- **Key Steps:** Conduct a 6-month pilot in selected high-risk areas. Monitor usage, collect data on alert response rates, and assess the effectiveness of the engagement strategies. Gather community feedback through surveys and in-person interviews to identify areas for improvement.

- **Stakeholder Involvement:** Emergency response teams and community liaisons will help track the system's effectiveness, while local nonprofits and resident representatives assist in feedback collection.
- **Community Engagement Strategy:** Conduct exit interviews with participants, host feedback sessions, and encourage open communication channels. Implement improvements based on the feedback received to increase usability and cultural alignment.

5. Full-Scale Deployment

- **Key Steps:** Roll out the system across all identified high-risk areas, addressing any issues highlighted during the pilot. Ensure each household has a working device and adequate training. Establish maintenance and support protocols.
- **Stakeholder Involvement:** Ongoing support from fire departments, local agencies, and community-based organizations to ensure continued functionality and accessibility.
- **Community Engagement Strategy:** Keep open communication channels through periodic community check-ins and updates. Provide follow-up training and refresher courses.

6. Sustainability and Maintenance

- **Key Steps:** Secure funding through government grants and partnerships to ensure long-term sustainability. Establish a routine maintenance schedule, with dedicated support staff for updates, repairs, and troubleshooting.
- **Stakeholder Involvement:** Collaboration with government agencies, community organizations, and local businesses to fund and sustain the project.
- **Community Engagement Strategy:** Develop a community feedback loop, allowing residents to report any issues or suggest improvements. Encourage local involvement in device upkeep and information sharing.

Equity, Cultural Relevance, and Sustainability

- **Equity:** By partnering with trusted local organizations, translating materials, and providing hands-on assistance, we ensure accessibility for all populations. We prioritize reaching residents with limited digital literacy or internet access.
- **Cultural Relevance:** Incorporating feedback from focus groups and culturally aware training sessions helps align the project with local customs and values.
- **Sustainability:** Funding from grants and government partnerships supports long-term maintenance. Encouraging local ownership of the alert

system—through engagement with community organizations and ongoing training—reinforces project sustainability and adaptability.

Interdisciplinary Collaboration Plan:

The Pyre Alert System requires a comprehensive approach, combining expertise from various fields to ensure functionality, accessibility, and impact. Our collaboration strategy focuses on integrating insights from engineering, public health, emergency management, social work, and community advocacy to create a well-rounded solution that truly serves at-risk populations.

1. Engineering and Technology

- **Role:** Electrical and software engineers will design and develop the radio transmitter device and alert dashboard. This team will focus on the technical functionality of the device, ensuring reliability, ease of integration with existing fire alarms, and seamless API connections for real-time updates.
- **Contribution:** By leveraging expertise in hardware development, signal processing, and software integration, the engineers will create a resilient and effective alert system that operates independently of digital or cellular networks, catering to the needs of low-tech households.

2. Public Health and Social Work

- **Role:** Public health professionals and social workers will assess community needs, identify high-risk populations, and provide insights into how best to reach these groups. They will also aid in creating culturally relevant educational materials and evacuation preparedness resources.
- **Contribution:** Drawing from their knowledge of community health disparities, these professionals will help ensure that the system's messaging, design, and educational materials are equitable, easy to understand, and sensitive to the needs of marginalized groups.

3. Emergency Management and Environmental Science

- **Role:** Emergency management experts and environmental scientists will provide input on wildfire behavior, risk assessment, and evacuation protocols. They will work closely with the technology team to set up real-time fire monitoring features, define alert criteria, and guide the timing for evacuation notifications.
- **Contribution:** Their expertise will ensure that alert thresholds are accurate and timely, allowing residents to evacuate safely. Environmental scientists will offer insights into fire spread patterns and high-risk zones, contributing to a data-informed system tailored to local geography.

4. Community Advocacy and Cultural Specialists

- **Role:** Community advocates and cultural specialists will ensure that the project is sensitive to local customs, language needs, and resident concerns. They will support community engagement efforts, act as liaisons between residents and the project team, and lead focus groups and testing sessions.
- **Contribution:** By fostering trust and open communication with local populations, community advocates will ensure the system is culturally relevant and that residents feel empowered to use it effectively.

5. Data Analysis and User Experience Design

- **Role:** Data analysts will monitor the system's effectiveness, tracking response rates and assessing areas for improvement. UX designers will collaborate with all stakeholders to make the dashboard interface and device user-friendly, ensuring ease of use for diverse users.
- **Contribution:** Data analysis will support iterative improvements to the system, while UX design will ensure an intuitive user experience. This combination ensures the alert system's continuous improvement and accessibility for all residents.

Holistic and Impactful Solution

By combining these areas of expertise, our team will create a holistic solution that not only addresses the technological and environmental aspects of wildfire response but also incorporates a deep understanding of community needs, equity, and cultural sensitivity. This interdisciplinary approach will ensure that the Wildfire Radio Alert System is not only functional but also accessible, sustainable, and capable of truly supporting vulnerable communities.