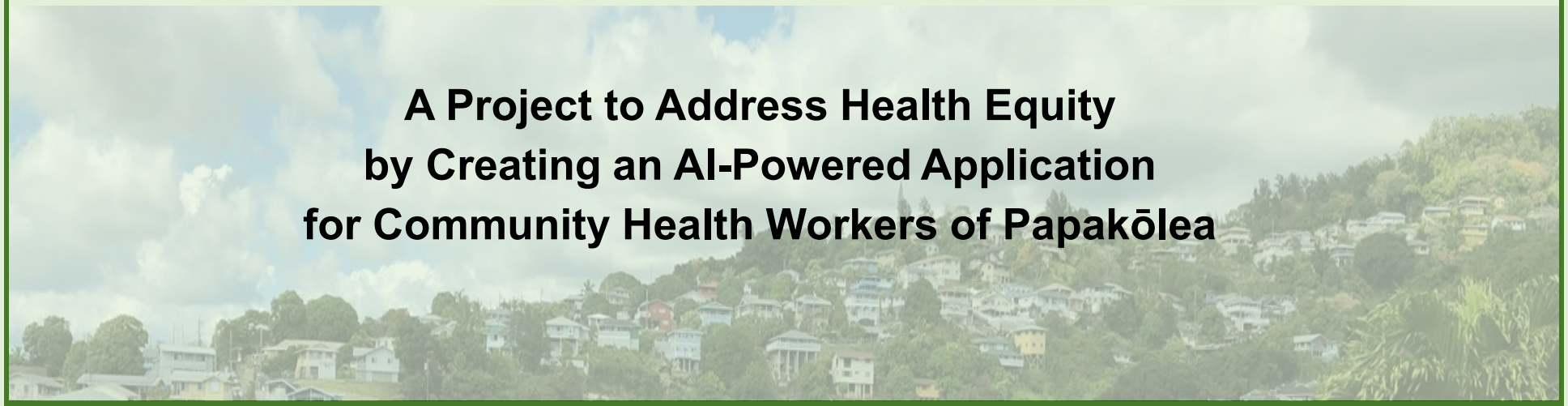
KA MALU A MOANANUI



A Project to Address Health Equity by Creating an AI-Powered Application for Community Health Workers of Papakōlea

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Kula no na Po'e Hawai'I
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Land Acknowledgement

Pacific Gathering 2024 – Kula No Na Poʻe Hawaiʻi & NAOPO

Land acknowledgement

We acknowledge that we gather on the traditional lands of the Dena’ina Athabascan people. We honor their history and culture and are grateful to be here.

Agenda

Pacific Gathering 2024 – Kula No Na Po‘e Hawai‘i & NAOPO

Agenda

- Introduction
- Background
- Objectives & Goals
- Theoretical Framework
- Methods & Results
- Discussion and Lessons Learned

Introduction

Ka Malu a Moananui means “Protector of Life for the Pacific”

- *Ka Malu a Moananui* is a community-based participatory research approach to Artificial Intelligence and Machine Learning that focuses on community engagement and capacity building for Community Health Workers through education and the development of a machine learning model to address cardiometabolic health for Native Hawaiian, Chamorros, and Marshallese populations in the Pacific

- The project is dedicated to providing a culturally safe Introduction to AI/ML for Native Hawaiian and Pacific Islander Community Health Workers. Most importantly, it will provide an understanding of the process of developing the Machine Learning tool designed using CBPR and cultural safety principles of engagement, which brought our team together and produced success

Introduction

The Ka Malu a Moananui Consortium

- **Kula no na Po'e Hawai'i** (KULA): *Community-based 501-c 3 nonprofit serving the Hawaiian Homesteads of Papakolea, Kewalo, Kalawahin*e (Dr. Adrienne Dillard, Ph.D), Project Principal Investigator
- **The National Association Of Pasifika Organizations** (NAOPO): - *NH/PI led a coalition assembled by governing state-based NH/PI agencies to advance the well-being of Pasifika communities in the US, Hawaii, and US Territories.* (Dr. Nia Aitaoto, Ph.D.)
- **University of Hawai'i**, John A. Burns School of Medicine, Department of Native Hawaiian Health (Dr. Claire Townsend-Ing, Dr.PH)
- **Hawai'i Pacific University**, *Department of Computer Science and Engineering* (Dr. Yi Zhu, Ph.D)
- **ULU-HI Tech**: (Gregory and Halia Hestor) *Ulu HI-Tech is a Native Hawaiian Organization (NHO) owned DevSecOps company with Small Business Administration (SBA) 8(a) certification and small disadvantaged business (SDB) and disadvantaged business enterprise (DBE) designations*

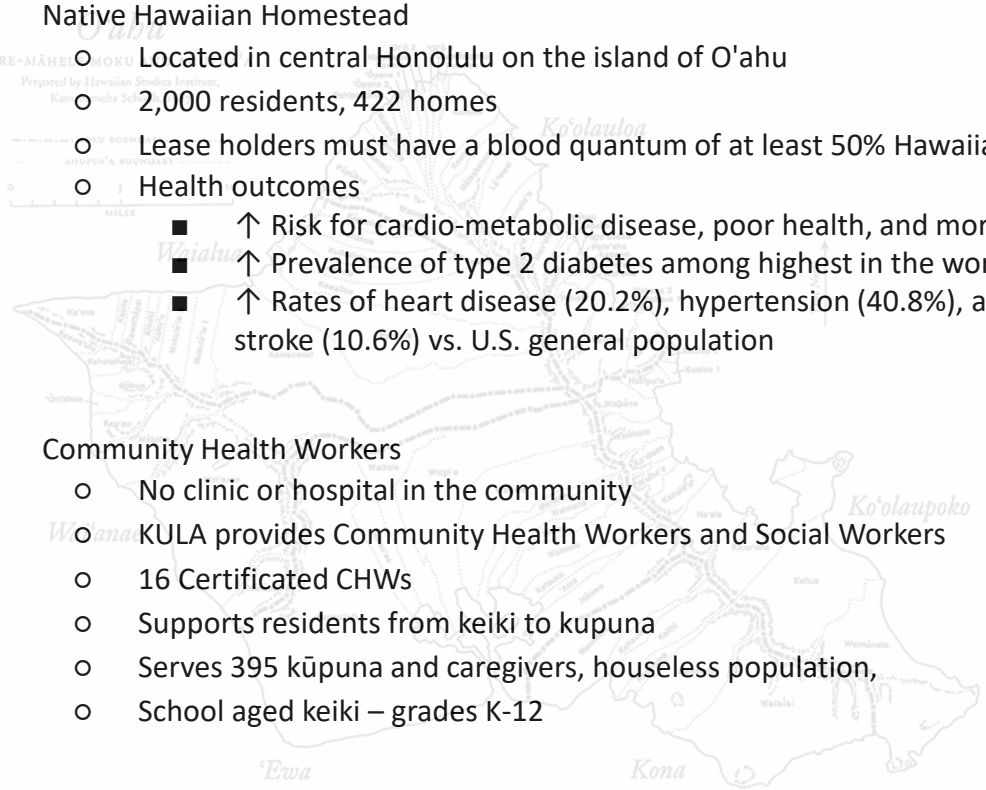
Background

Kula No Na Po’e Hawai'i (KULA)

- Community-based nonprofit serving Native Hawaiian Homestead communities of Papakōlea, Kewalo, and Kalāwahine (Papakōlea) for the last 30 years
- Consistently delivers health and education programs in Papakōlea that utilize CBPR and Cultural Safety to address and define individual, family, and community health needs and to understand the complex interaction of culture, acceptability, and access related to health disparities

Papakōlea at a Glance

- Native Hawaiian Homestead
  - Located in central Honolulu on the island of O'ahu
  - 2,000 residents, 422 homes
  - Lease holders must have a blood quantum of at least 50% Hawaiian
  - Health outcomes
    - ↑ Risk for cardio-metabolic disease, poor health, and mortality.
    - ↑ Prevalence of type 2 diabetes among highest in the world
    - ↑ Rates of heart disease (20.2%), hypertension (40.8%), and stroke (10.6%) vs. U.S. general population
- Community Health Workers
  - No clinic or hospital in the community
  - KULA provides Community Health Workers and Social Workers
  - 16 Certificated CHWs
  - Supports residents from keiki to kupuna
  - Serves 395 kūpuna and caregivers, houseless population,
  - School aged keiki – grades K-12

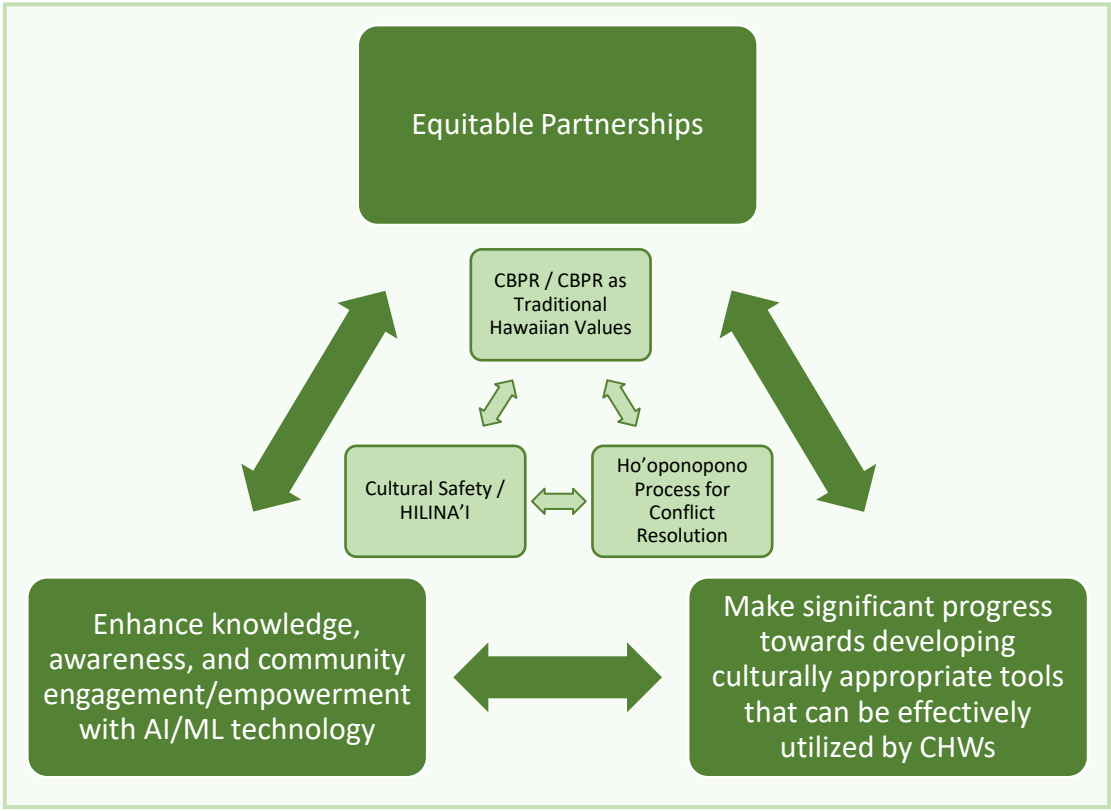


Objectives & Goals

Ka Malu a Moananui

Goals

1. Use existing data from the Hawaiian Homestead Health Survey Papakōlea (HHSP) administered by KULA to be merged with other existing datasets to be used by CHWs to assist them in their work with the community
2. Train community members and CHWs on AI/ML technology
3. Develop a culturally responsive approach to AI/ML with community and CHW input



Objectives & Goals

Creating an AI-Powered Application for Community Health Workers in Papakōlea

Utilize Community Based Participatory Research (CBPR) to orient project	• The community of Papakōlea is an equal partner in this research process. Input from senior KULA staff, social workers, CHWs, and community members are included in every phase of this project
Review and analyze Homestead Health Survey (HHSP) Data	• Understanding responses from the HHSP survey shows us the health and wellness needs of our community. Access to AI-Powered HHSP data will help CHWs when working in the community
Build and test a Machine Learning (ML) Model	• Work with a Data Scientist to teach a computer how to make health and wellness recommendations using knowledge and experience from CHWs and senior KULA Staff, and survey data from Papakōlea
Develop iOS "App" Graphical User Interface for iPhone and iPad to implement ML model and remotely access HHSP data	• Turn the computer into a mobile "App" for CHWs to use to serve community.
Develop a culturally-adapted curriculum on AI/ML for CHWs	• Create an educational program on AI/ML in community, by community, for community
Train CHWs on basics of AI/ML, how to use the "App", and how to explain the utility of the "App" to members of the community	• Teach CHWs about AI/ML using our new educational program! Share our program with Papakōlea!

Theoretical Framework

Cultural Safety

- Cultural Safety is a strengths-based construct emphasizing trust and practices that engage the community in their shared sense of place, history, ways of knowing, and capacity-building (Ka'opua et al., 2017)
- Cultural safety in community-specific contexts acknowledges the community as the negotiator of how safety is actualized

- **HILINA'I Model** of community-based safety for indigenous and communities of color
  - Builds trust and ensures cultural safety when engaging in research
- In Hawaiian the word "hilina`i" means "trust" and implies a depth of confidence and belief in another that allows for interdependent relationships
- *KULA utilizes this framework to ensure that the community of Papakōlea can be engaged on their terms, to advance self-sufficiency and the self-determination of native Hawaiians, and to act in the preservation of the values, traditions, and native Hawaiian culture.*

Building Trust and Cultural Safety in Research Praxis	
H	Honor a community's history of strength and resilience, vision for health-wellness, lifeways, and research needs and priorities
I	Introspect on personal, professional, and organizational biases that may influence negative attributions of poor health outcomes in a community and among its members
L	Learn community ways of knowing and transmitting what is known. Be open to learning from kia'i, kūpuna, traditional practitioners, and other community members
I	Involve self in community activities, get to know community as more than a study site and to know residents as more than (potential) study participants. This may set the foundation for holistic and enduring relations with community and its members
N	Nurture meaningful community participation in the research endeavor across the trajectory of a project–from needs assessment to intervention development, evaluation, and dissemination of findings
A	Act to enhance research capacity of persons-in-community and of community as dynamic organization. Partner/mentor on specific research activities when possible, and know when to "release" research leadership to community members
'I	Insurrect relationships of unequal power and control through culturally-grounded relationships and dialogic processes

(Ka'opua, Tamang, Dillard, Kekauoha, 2017)

Methods & Results

KULA Stakeholder Meetings

- **Community**
- **Project Partners**
- **CHWs**
- **KULA Staff**
- **University students**
- **Contractors**

- Ongoing monthly meetings in community space and zoom
  - Continuously assess and define what information is most relevant to community members to influence meaningful change within the community with AI/ML education and CHW AI-powered App
  - CBPR/HILINA'I
- Disseminate information to community stakeholders
  - Research Newsletters
  - Health Fair

Methods & Results

National Association of Pasifika Organizations (NAOPO) Community Engagement Initiative

- **NAOPO's AI/ML community engagement initiative project explores 2 Pasifika communities' stance on AI/ML**
  - Commonwealth of the Northern Mariana Islands (CNMI)
  - The Republic of the Marshall Islands (RMI)

- **Talanoa (Group Discussion & Interviews) – Qualitative Approach**
  - Pasifika communities' knowledge of and experience with AI/ML
  - Attitude towards using AI/ML to support public health work
  - Possible benefits and drawbacks in using AI/ML in the Pasifika

Protocol

- Host talanoa (interview discussion) with 6 community leaders
  - Analyze results to inform the second step's protocol
- Talanoa (group discussion) with community members
- Thematic analysis data was through another Pasifika process by the steering committee
  - Sifted through data then engaged in a consensus-based decision-making discussion to agree on the codes and themes
  - Prioritized stories, allegories as examples or case studies to illustrate topics and ideas.
  - Findings include perspectives on benefits, concerns, and recommendations

Methods & Results

National Association of Pasifika Organizations (NAOPO) Community Engagement Initiative

Findings - What NAOPO learned about AI/ML in the Pacific

Benefits: AI/ML's capacity to;

- Strengthen health research by incorporating indigenous knowledge, practices, and experience.
- Address complex issues like Social Determinants of Health by refining tools to assess, refer to resources, and evaluate their effectiveness.
- Tailor health education and support (ex., Incorporating Pasifika foodways and foods).

Concerns: Majority of the discussion was around trust;

- The possibility of using AI/ML to further advance colonial practices of exploiting the human, natural, and economic resources of the Pacific, extracting physical, spiritual, and intellectual properties, and controlling the utilization of resources.
- The collection of indigenous knowledge, customary practices, and cultural expressions in a massive way and deposited in a system that may put Indigenous traditional knowledge, practices, and expressions at risk of global-scale appropriation.

General Recommendations:

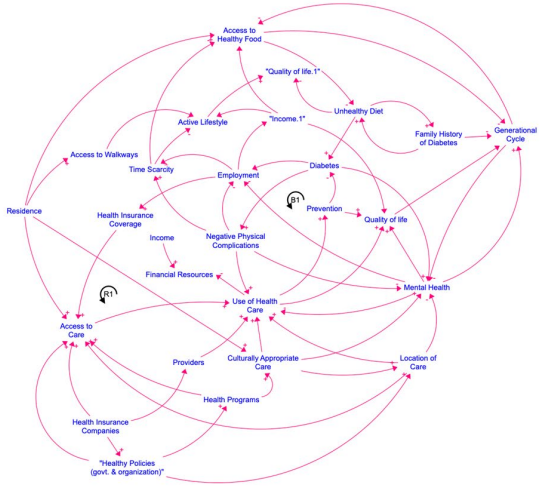
- Develop data sovereignty & local, national, regional, global ethical guidelines for design / deployment of AI/ML.
- Use indigenous storytelling and descriptive skills to describe the layers of complex & intricate knowledge that occur in AI/ML. These communication & cultural practices are key to developing a framework to describe / design aspects of AI/ML projects.
- Use Pasifika relational and reciprocal practices to cultivate a long-term relationship between the Pasifika community and developers
- Use Pasifika values of respect, reciprocity, collectivism, responsibility, and relationality in all aspects of the Project/Program

Methods & Results

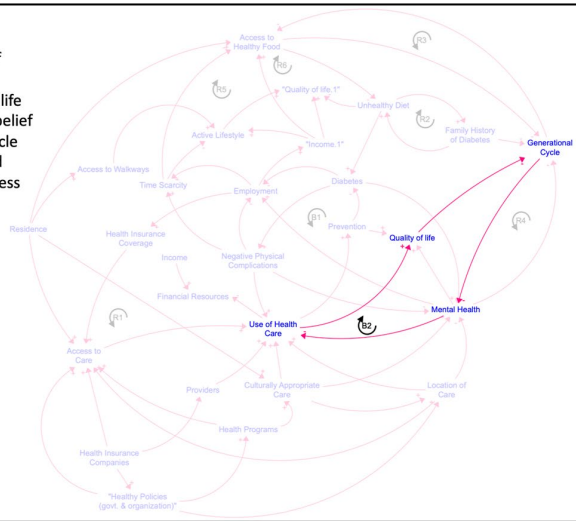
Group Model Building

- Two group model building sessions held in the community of Papakōlea with 8-10 CHWs & KULA staff to develop a causal loop diagram to represent diabetes in the community of Papakōlea
    - Process illustrated the social determinants of health (SDOH) for participants and built confidence in domain knowledge
    - Balancing and reinforcing loops brought attention to SDOH that could be useful to examine in data sets when selecting features for a machine learning model

Version 2



Poor mental health increases the use of health care, which improves quality of life and decreases the belief in a generational cycle leading to improved mental health and less health care use.



(Ing, 2023)

Methods & Results

Machine Learning Model Development

Data Scientist

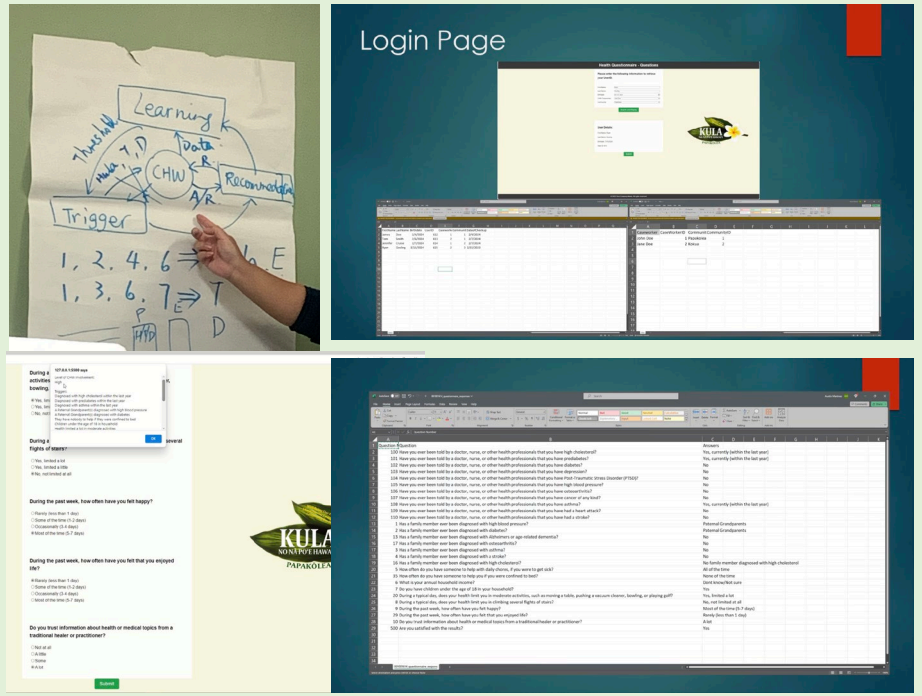
- Dr. Zhu, established a machine learning (ML) model that could be triggered by x-features to select/predict y-outcomes and produce adaptive text by utilizing KULA HHSP data

- Reduce number of survey questions on HHSP (<100); display reduced survey

Domain Experts

- KULA Staff and CHWs met in a series of three meetings to select the features and outcomes for the ML model

- Participating in the development of the ML model as domain experts that select model features from the data, gives KULA the ability to control algorithmic bias and include context in the form of SDOH and according causal loop relationships



Images of the ML Model / webpage built by Dr. Zhu and students, Aaron Bauman (AI/ML algorithm developer) and Austin Martinez (Webpage developer)

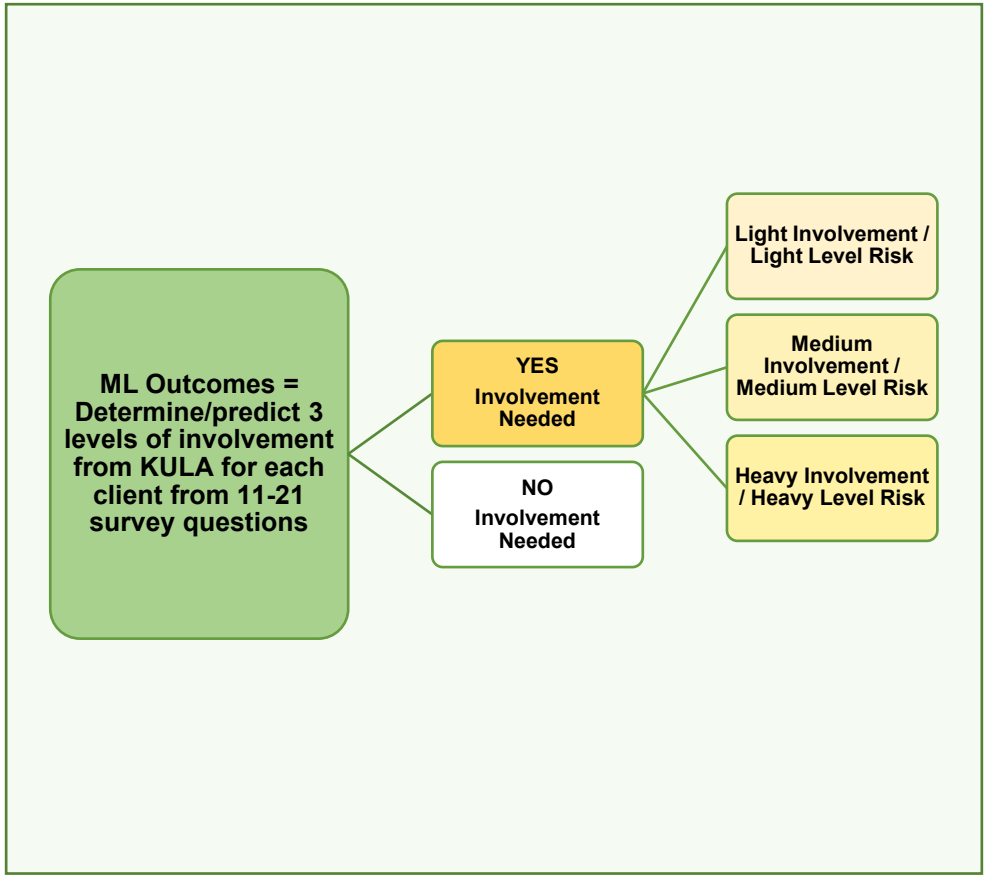
Methods & Results

Machine Learning Model Development

AI-Powered Application for Community Health Workers of Papakōlea

<u>Phase 1: Outcomes for KULA</u>

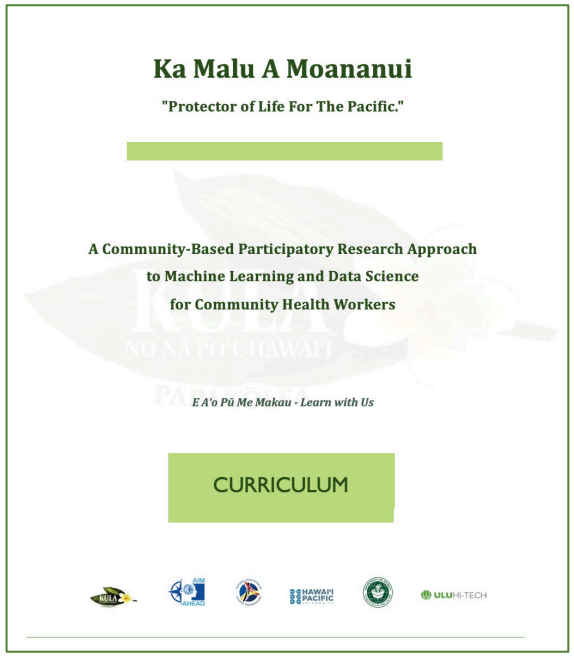
- A private webpage hosts ML model (iPad app in progress)
  - ML model provides CHWs with 11-21 questions (reduced from 100) to ask during home visits in order to determine/predict a *'level of involvement'* needed from KULA for each client
    - Efficient visits → more time/visits, specialized follow-up, resource allocation
    - Data collected during the visits will give KULA the ability to assess the community's needs in real-time



Methods & Results

Curriculum Development and Delivery

- **Curriculum for Community Health Workers (CHWs)**
  - **KULA & NAOPO Community Engagement Initiative**: informed curriculum development
  - Papakōlea → Interviews/Stakeholder Meetings → what information is most relevant to CHWs to influence meaningful change within the community with an introduction to AI/ML



Goals of the Curriculum are:

- Increase CHW and community knowledge of data science, artificial intelligence, machine learning, CBPR, and cultural safety principles.
- Inform CHWs about the project *Ka Malu a Moananui*.
- Support CHWs as they provide training and facilitate community conversations to describe and navigate the complexities of AI/ML and data science.
- Foster Native Hawaiian and Pasifika communities' participation in developing CBPR and ML tools.

Methods & Results

Curriculum Development and Delivery

Learning Objectives: Ka Malu a Moananui Curriculum

Unit 1: Orientation to Community

- Module 1: Introduction to Community
- Module 2: Native Hawaiians and Pacific Islanders (NHPI)
- Module 3: Introduction to Papakōlea – A Native Hawaiian Homestead Community
  - *Learning example*
- Module 4: Community Health Workers (CHW)
- Module 5: Community Based Organizations - Kula No Na Po'e Hawai'i (KULA)
  - *Learning example*

Unit 2: Kula No Na Po'e Hawai'i's Approach to Research in Community

- Module 1: Community-Based Participatory Research (CBPR)
- Module 2: Traditional Hawaiian Values for CBPR
- Module 3: Cultural Safety – HILINA'I Model
- Module 4: Ho'oponopono Process for Conflict Resolution

Unit 3: Collecting Data

- Module 1: Why and How We Collect Data
- Module 2: Social Determinants of Health (SDOH)
- Module 3: Group Model Building
- Module 4: Ethics
- Module 5: Community Voices in Big Data
- Module 6: Summary – Why your voice is vital in data collection

Unit 4: Ka Malu A Moananui

- Module 1: Why this project – Community Benefit
- Module 2: Qualitative Findings from National Association of Pasifika Organizations (NAOPO) Local Partnerships Data Collection
- Module 3: Project Overview

Unit 5: Data Science, Artificial Intelligence and Machine Learning

- Module 1: What is data science?
- Module 2: Artificial Intelligence
- Module 3: Machine Learning
- Module 4: Steps to Build a Machine Learning Model

Unit 6: The Data Science Method for Ka Malu A Moananui

- Module 1: Data Science Application Process
- Module 2: KULA's method for feature selection with Domain Experts

AIM-AHEAD Poster Presentations

Results Overview

- Increased community capacity
- Community-informed data and research
- Culturally appropriate & culturally safe communication and ML development strategies that will improve the lives of Pacific Peoples through CHWs using the unique AI-powered Application
- Ka Malu a Moananui Curriculum for CHWs
- ML Model to reduce HHSP survey questions and determine/predict three *'levels of involvement'*
- Three articles submitted for publication

AI/ML Pilot Approach

- **Great Value in Discussion and Lessons Learned**
  - **Community Engagement**
  - **Capacity Building**
  - **Reciprocal Relationship and Concurrent Learning**

Discussion and Lessons Learned

Community Engagement

- Community needs from the community's perspective must take priority over institutional research priorities
- When you know the community you can build something for them, but you must learn their needs from the beginning so that co-designing can happen through transparent collaboration
    - CBPR in Papakōlea emphasizes the belief of No kakou, na kakou; – meaning for us, by us
    - Build something with community, not for them
- There needs to be an understanding of how indigenous communities should be looked upon beyond using the data they collected in a relevant way for AI/ML research → have this type of conversation available

"The most outstanding achievement was getting data scientists (academia) and the community on the same page, with the community feeling heard. At our most recent meeting, one of the University ***partner's students indicated his contributions to the project were greater after meeting with the community and understanding the intended use of the AI algorithm****; until that time, he was coding. We were able to submit a publication, complete a community curriculum, have a group of* ***community health workers engage in group model building, design a practical AI-powered tool for their use, and plan out the subsequent phases of how it will benefit their work****. We are engaged with other CHWs to have the AI/ML conversation in the Pacific and attend training to understand better the science and its uses for health equity" AD*

Discussion and Lessons Learned

Reciprocal Relationship and Concurrent Learning

- Understanding that co-learning in scientific discovery with community and researchers is vital to successful engagement
- Community invested in learning AI/ML “language" and AI/ML (data science) invested in learning community "language”
- Engaged in a *process* to humanize the process of ML model building
- The CBPR principles are best implemented when shared values can be achieved
- Training
  - Give communities the information, platforms, and resources to do their work in a way that benefits their communities → This can only be accomplished by partnerships that honor the work already being done and the relationships at the core of that work
  - Projects should never be entered into with communities without training on financial processes/possible challenges to be expected
- Implementation
  - Cultural differences in communication and expectations must be considered appropriately during implementation

MAHALO

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MAHALO

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