



# **DECENTRALIZED PANDEMIC RESERVE**

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**DEVPOST HACKATHON**



# Problem

As hospitals and essential businesses compete for necessary supplies, the identification of need is skewed by racial, political, and socio-economic biases. Policies are being driven by short-sighted and inaccurate data with little understanding of the virus's real-time effective reproductive number, leaving communities left scrambling for an effective plan of action.



# Black communities account for disproportionate number of Covid-19 deaths in the US, study finds

By Shelby Lin Erdman

## Michigan governor says shipments of medical supplies 'canceled' or 'delayed' and sent to federal government

By Kelly Mena, CNN

UP FRONT

## Class and COVID: How the less affluent face double risks

Richard V. Reeves and Jonathan Rothwell · Friday, March 27, 2020

## While Some Wait For COVID-19 Tests, The Wealthy Cut The Line

In the absence of adequate federal support, states are having to fend for themselves to get the medical equipment they need—and the Trump administration is making a hard situation even worse.

## Texas hospitals brace for coronavirus surge with uncertain stocks of protective gear

"I will give you X number, you are to make these last for however long," a Panhandle hospital executive told one of his clinics when it sought more respirators. "We've got to ration these resources."

HELPING HANDS · UPDATED MAR. 30, 2020

## HOW CAN I DONATE SUPPLIES TO NEW YORK HOSPITALS IN NEED?



# Solution - Immediate

The Decentralized Pandemic Reserve (DPR) aims to create an autonomous supply chain consortium that matches individual and manufacturer resources with the areas most in need. Our end-to-end solution solves issues with **data storage, data retrieval, data validity, supply chain, and governance.**

- By using a predictive model to identify the coronavirus's real-time, effective reproduction number.
- Training that model with A DAO supported by decentralized voters.
- Assessing proposals of hospitals or entities in need of resources against data models of activity ([healthcare.gov/covid](https://healthcare.gov/covid) or [healthdata.org/covid](https://healthdata.org/covid)) to deliver supply.



A pink mandala background with a central sunburst-like pattern of overlapping petals. Two solid pink circles are positioned horizontally on either side of the center.

# **USE OF DATA**

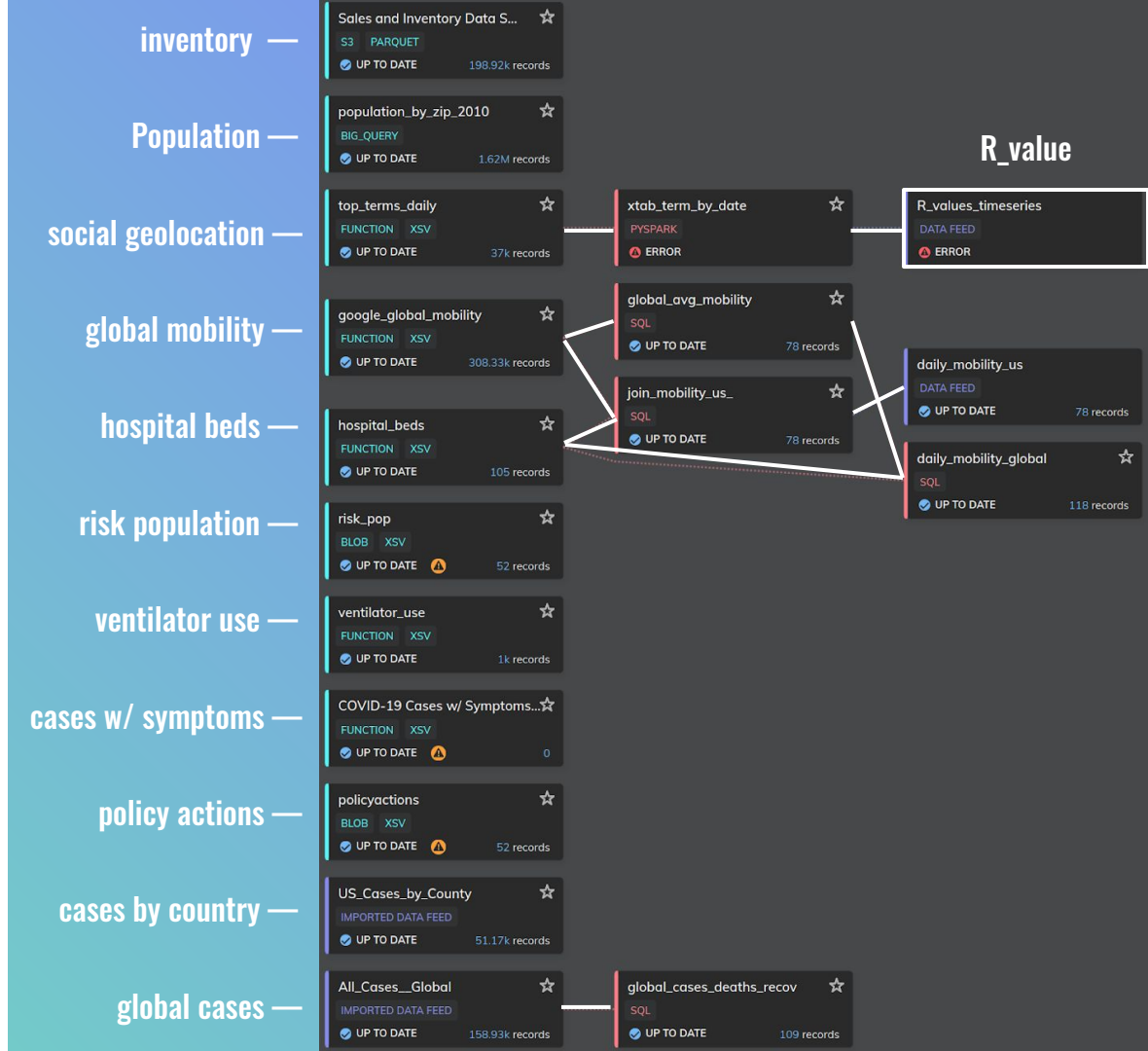
# Data

We need more than the daily amount of reported cases, **we need** the coronavirus's real-time, effective reproduction number, or its actual ability to spread at a particular time.

- [NY Times](#)

So that we can:

- Compare the NEED vs the CURVE
- Inform the consortium
- Identify Need (IDN) by %
- Vote before supply requests are made

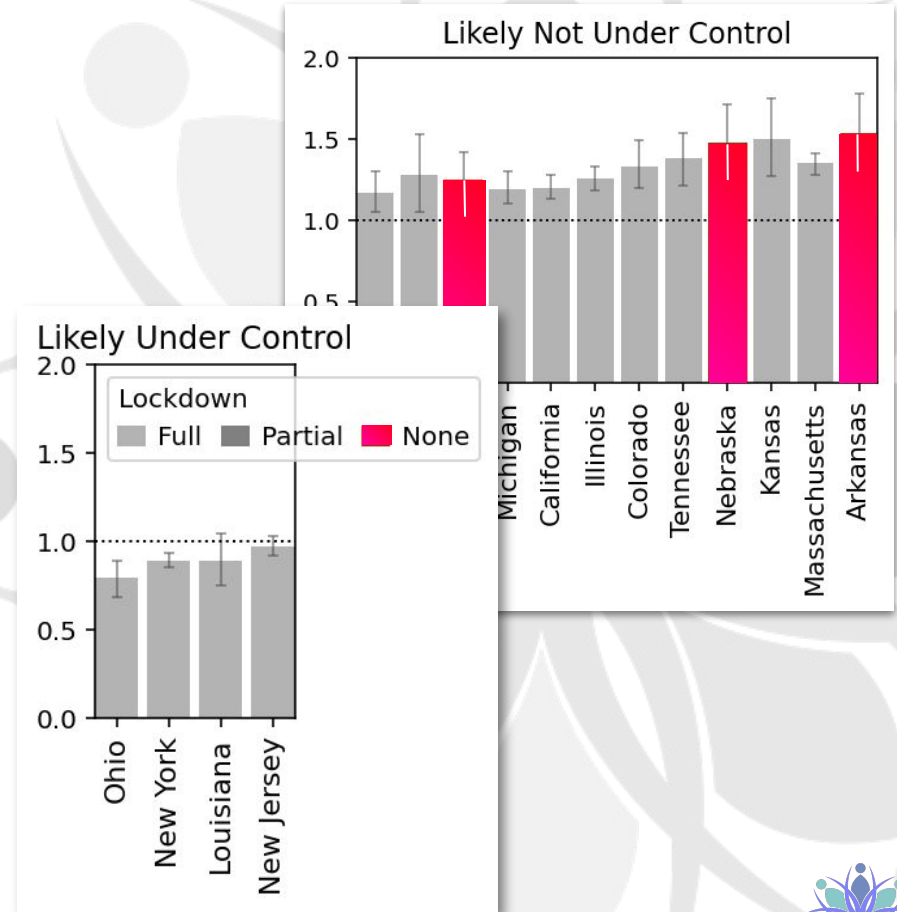


# R-Value

In any epidemic,  $R(t)$  is the measure known as the effective reproduction number. It's the number of people who become infected per infectious person at time  $t$ . The most well-known version of this number is the basic reproduction number:  $R_0$  when  $t=0$ . However,  $R_0$  is a single measure **that does not** adapt with changes in behavior and restrictions.

As a pandemic evolves, increasing restrictions (or potential releasing of restrictions) change  $R(t)$ . Knowing the current  $R_t$  is essential. When  $R > 1$ , the pandemic will spread through the entire population. If  $R(t) < 1$ , the pandemic will grow to some fixed number less than the population. The lower  $R_t$ , the more manageable the situation. The value of  $R_t$  helps us

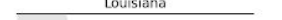
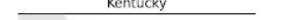
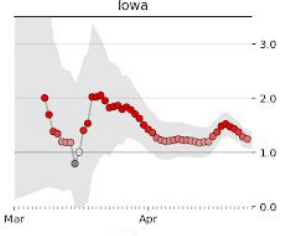
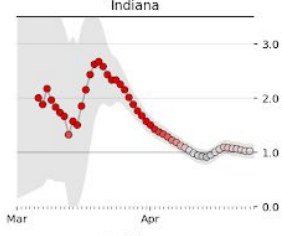
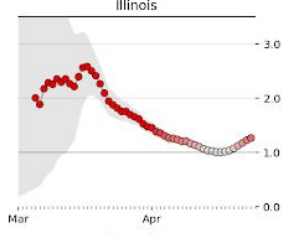
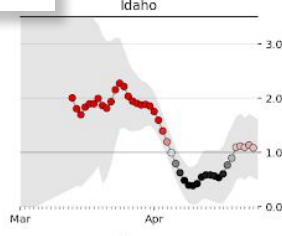
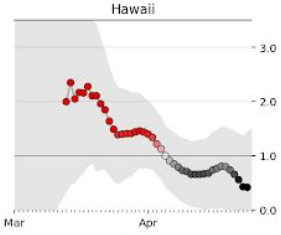
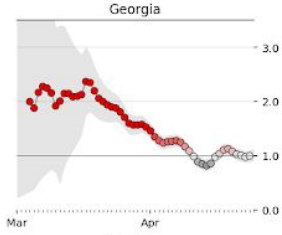
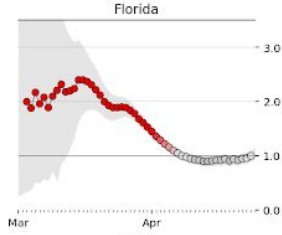
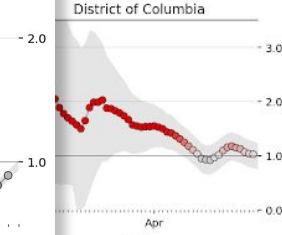
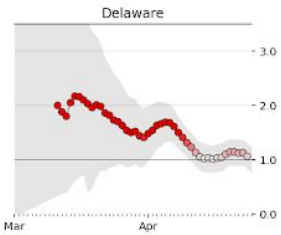
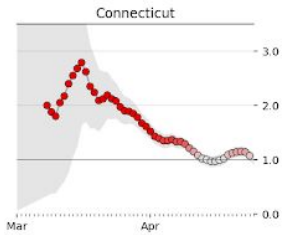
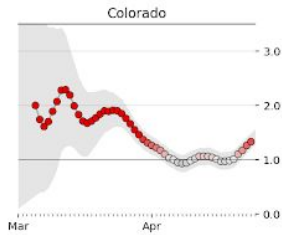
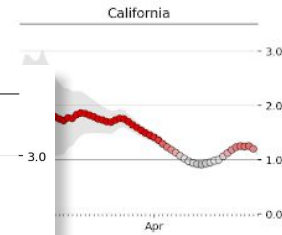
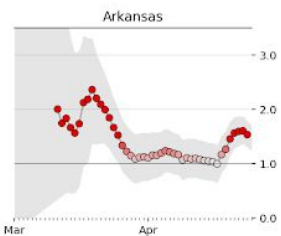
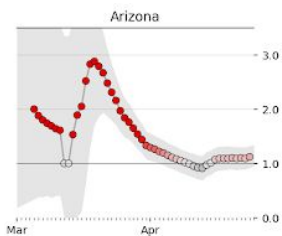
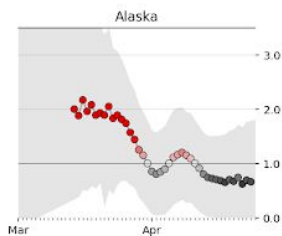
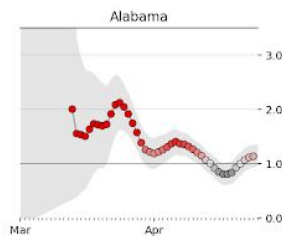
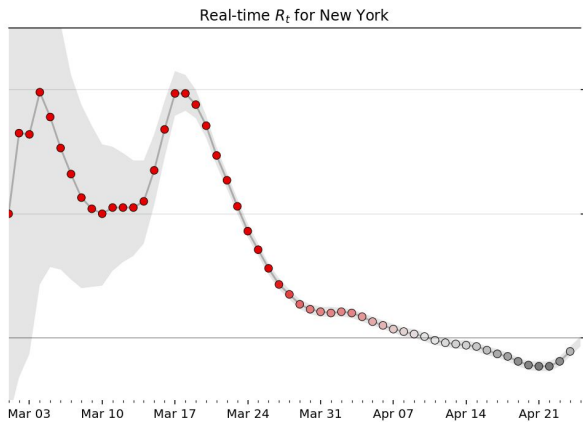
1. Understand how effective our measures have been controlling an outbreak.
2. Gives us vital information about whether we should increase or reduce restrictions based on our competing goals of economic prosperity and human safety. [\[Well-respected epidemiologists argue\]](#) **tracking  $R(t)$  is the only way to manage through this crisis.**



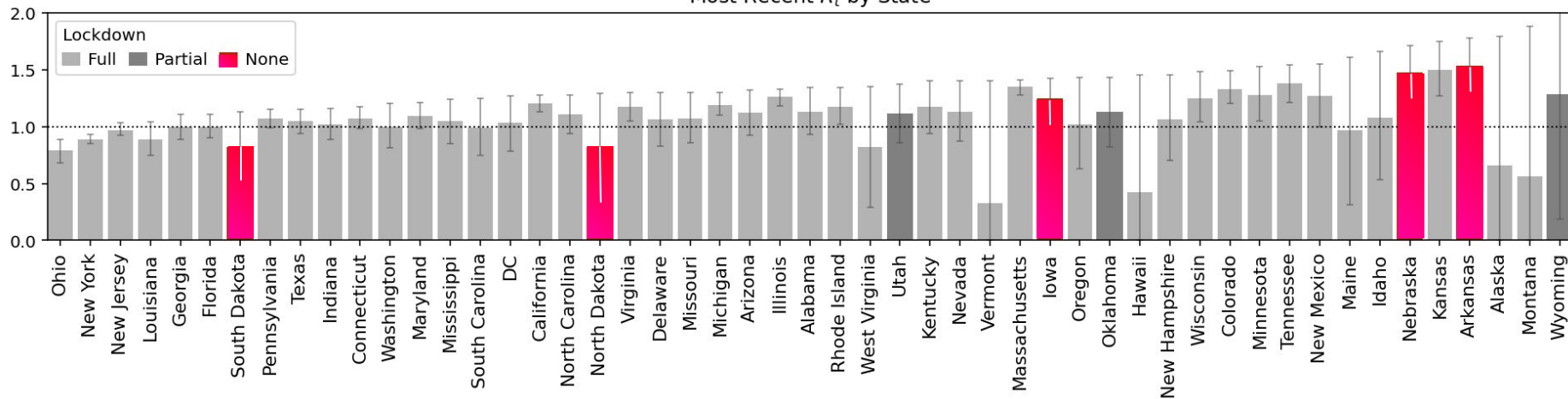
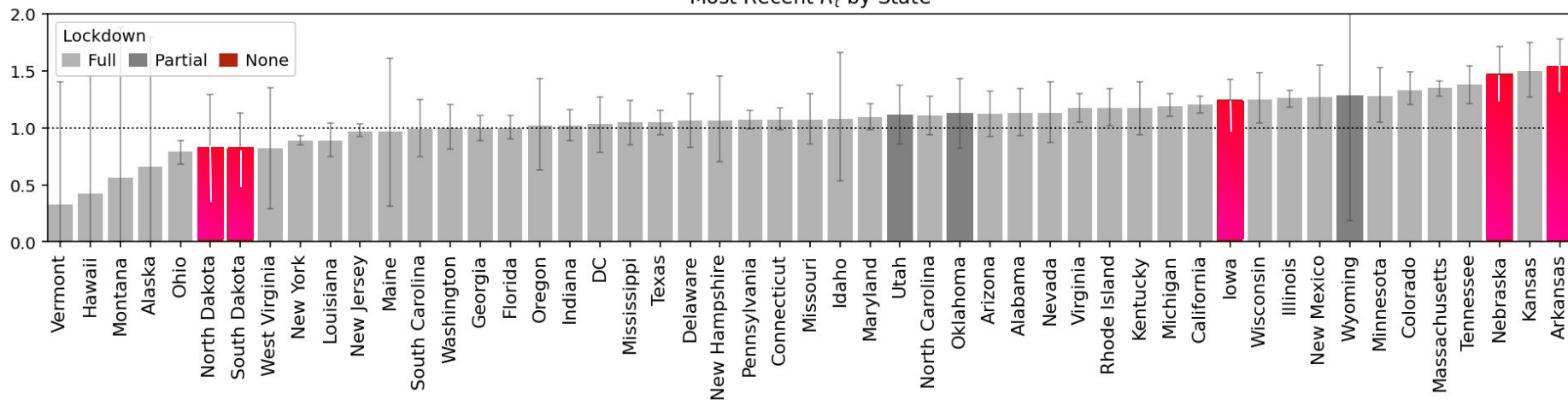


# R-Value

By State





Most Recent  $R_t$  by StateMost Recent  $R_t$  by State

A pink mandala with a central sunburst and eight petals, each containing a stylized eye. Two small pink circles are on the left and right sides.

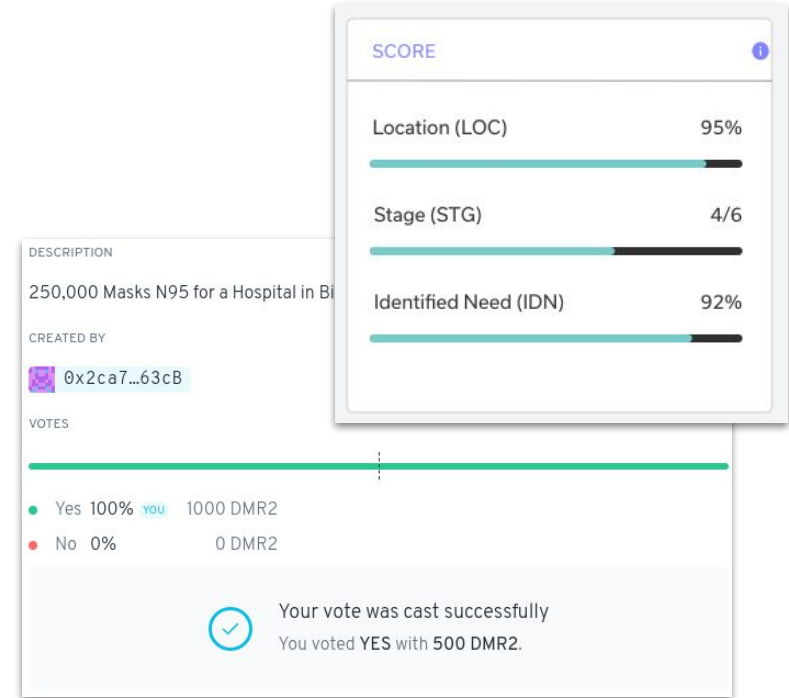
**DECENTRALIZATION**



# DAO - Decentralized Autonomous Organization

By leveraging a Decentralized Autonomous Organization we are putting the power of choice back into the hands of the people. A modified **voting** mechanism with informed data points informs the community about relevant information such as **supply recipient, location, (R) infection rate**, and **reputation**.

*Giving people a choice and a voice*





# Reputation

Incenting good behavior, reputation, and settled proposals via community consensus helps to reduce the signal to noise ratio.

Each wallet starts with a certain amount of tokens with one vote per proposal. As a user votes for proposals that pass, reputation is built.

*Greater reputation = greater voting power*





# Governance and Tokennomics


To maintain a healthy ecosystem, the DAO retains decision rights through voting and consensus. A small subset of use case entails:

- Voting on supply distribution
- Issuing tokens
- Freezing tokens
- Burning tokens

DESCRIPTION

250,000 Masks N95 for a Hospital in Birmingham, AL, USA

CREATED BY


 0x2ca7...63cB

VOTES

Progress bar: 100% (green)

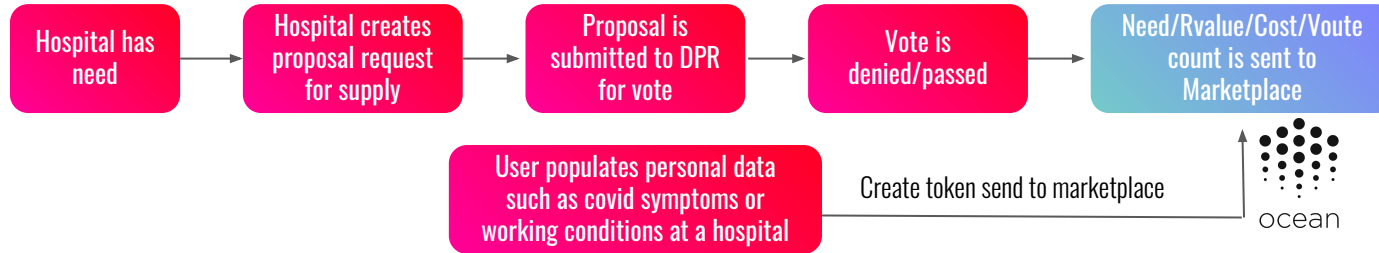
Yes 100% you 1000 DMR2

No 0% 0 DMR2

 Your vote was cast successfully  
You voted YES with 500 DMR2.



# Data and Ocean / DPR Marketplace



- A marketplace adds value as it helps in sharing data in a decentralized and transparent way while protecting privacy at the same time.
- This allows users to submit data to OCEAN chain
  - Immutable
  - Decentralized
  - Retrievable
  - Can flow into decision making process for DPR

The screenshot shows the 'Publish' interface of the DPR Marketplace. The header includes the 'DPR Marketplace' logo, navigation links for 'Publish', 'Your Uploads', and 'About', and a status indicator 'Offline'. The main heading is 'Publish', followed by the instruction 'Publish your covid19 related data to the Ocean Protocol Pacific network.' Below this is a progress bar with three steps: '1 Basic Info', '2 Description', and '3 Register'. The 'Basic Info' section is active, showing a form to 'Start by adding a title for your personal data.' The form has a 'Title\*' field with the example text 'e.g. Alice's friends in past month' and a 'Files\*' section for adding data from URLs or IPFS. A 'NEXT' button is at the bottom right.



# Data Immutability



- Data is on chain
  - Votes
  - What passed / what didn't
  - Amount of request
- Immutable - cannot change after the fact
- Reduces non-repudiation
  - "I never voted that way"
- Audit and attestation
  - All actions on chain and viewable

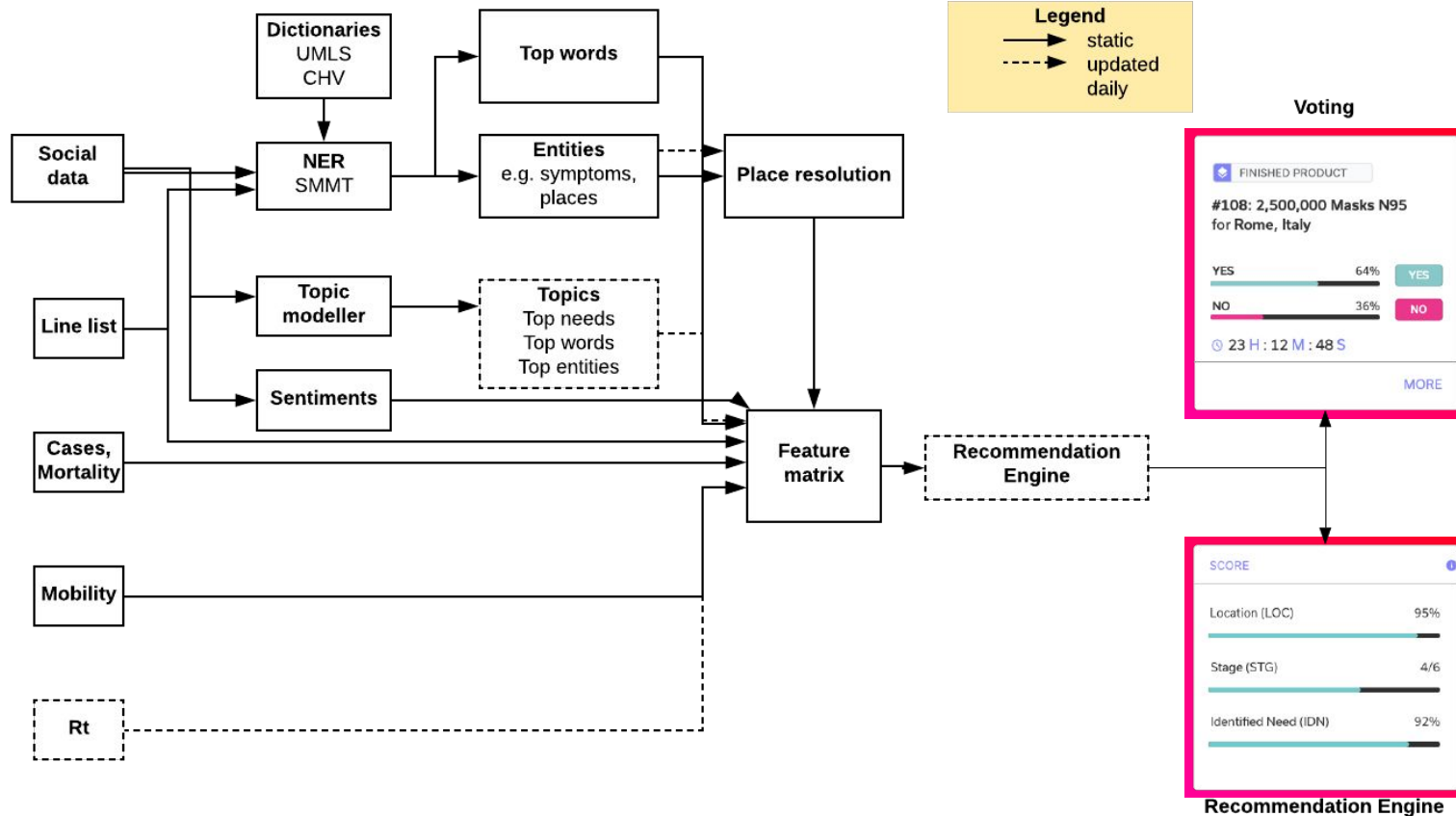
The background is a solid pink color. In the center, there is a large, stylized flower or mandala pattern. This pattern consists of multiple layers of pointed, petal-like shapes radiating from a central point. On the left and right sides of the image, there are two solid pink circles, one on each side, positioned horizontally relative to the center.

# **TECHNICAL BUILD**





# Architecture





# Tech Stack

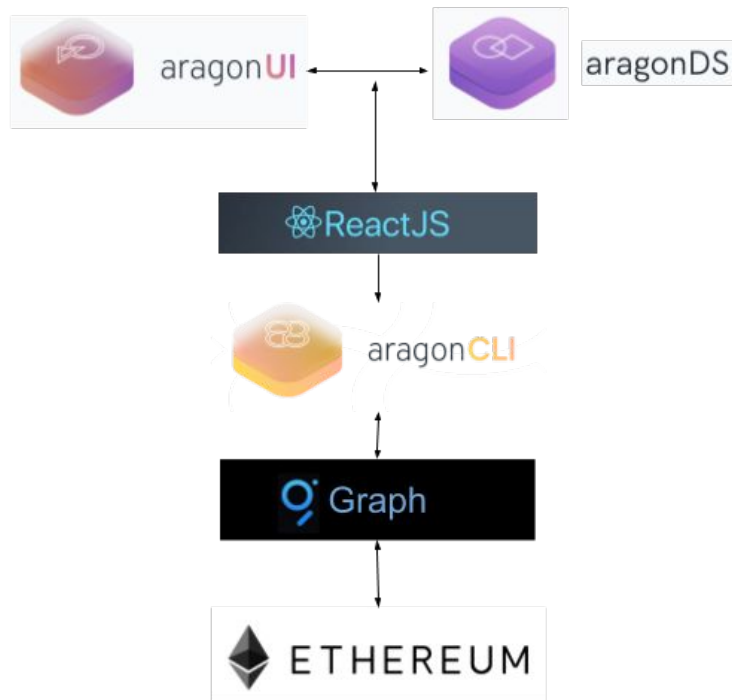
Sourcing from:  
[healthdata.org/covid](https://healthdata.org/covid)

Python  
Jupyter Notebook



ocean

DATA

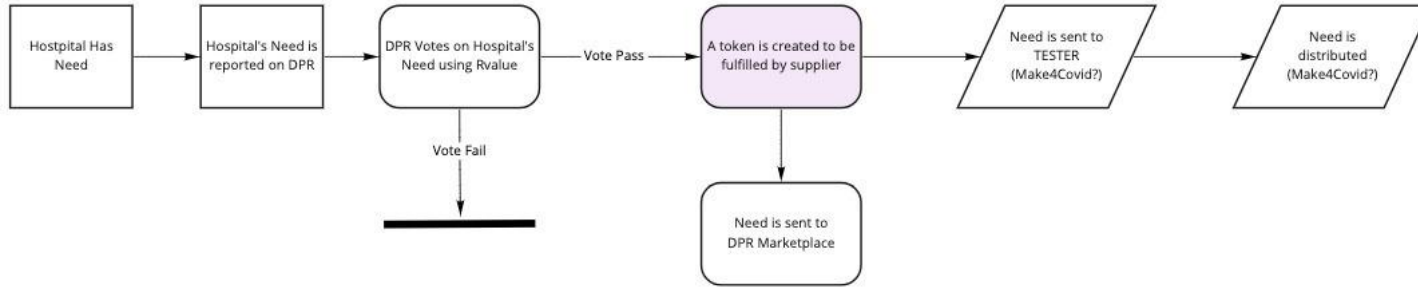


Application

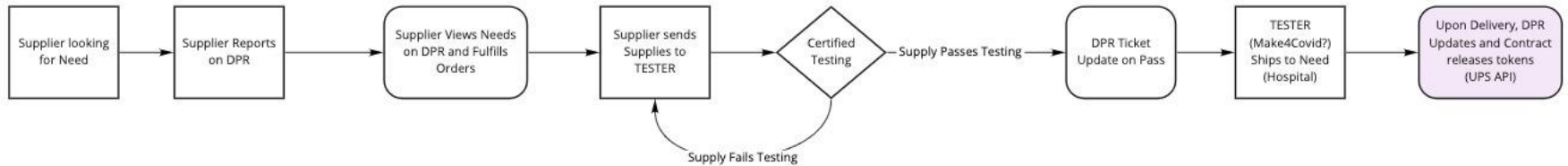


# Process Map

## Need Flow



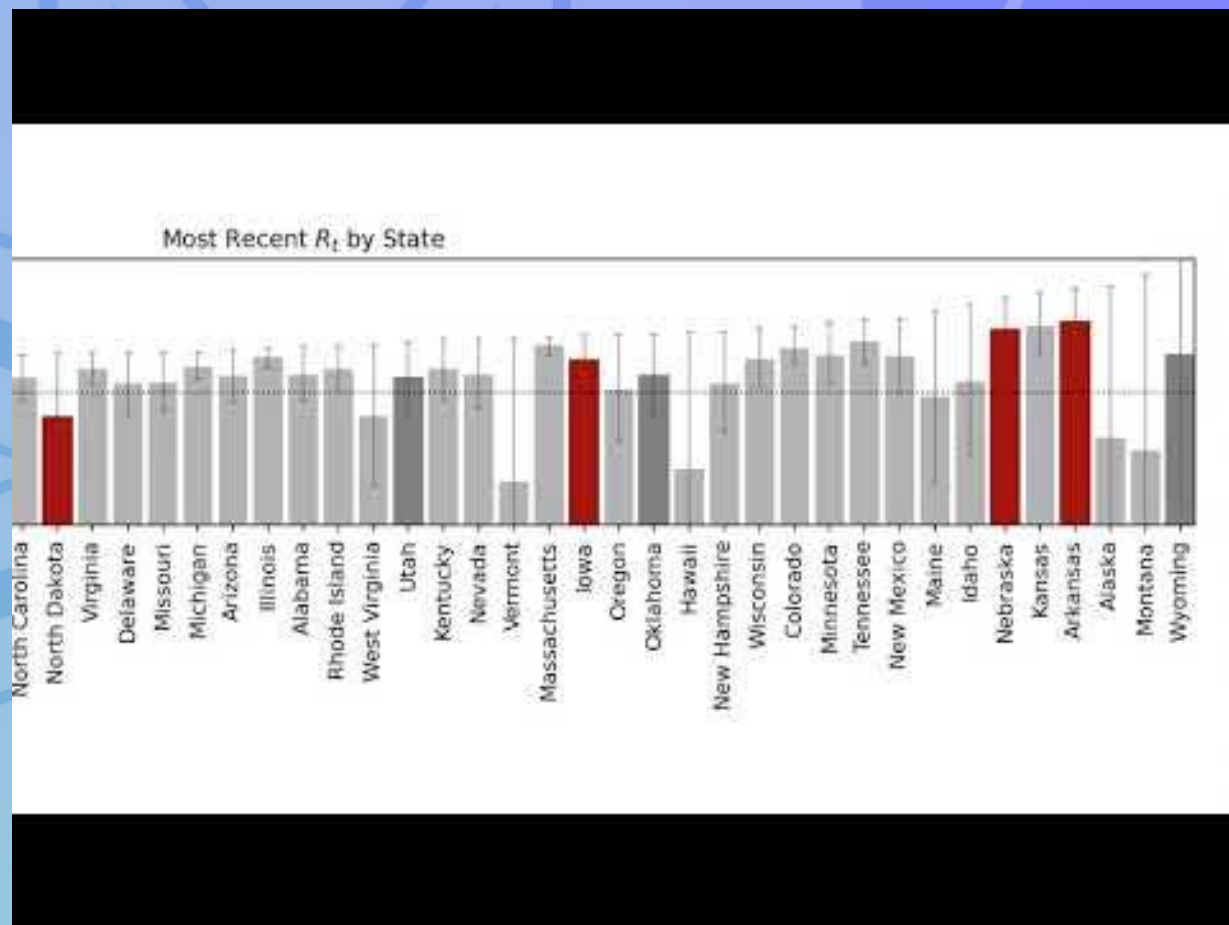
## Supply Flow



# Demo & Links

[Axure prototype](#)

[Invision prototype](#)





# **IMPACT & INSIGHTS**



# Long Term Impact & Benefits

- Ability to impact policy and decisions with the true state of the virus's spread and the voice of the people.
- Building an ecosystem of decentralized decision makers incentivised to do the right thing.
- Leverage data to create an **epidemic monitoring instrument**, forecasting the demand, voting on the need and relying on the consortium to deliver the supply.
- Potential to decentralize voting, force decision making and price transparency and build the data economy of the future.
- Can be used for a variety of supply chains, but more importantly it will eventually with enough training reduces the amount of human bias and mode from the decision chain.



Decisions backed  
by **DATA** and  
**CONSENSUS**



# Sources

- <https://www.nytimes.com/2020/04/06/opinion/coronavirus-end-social-distancing.html>
- <https://covid19.healthdata.org/united-states-of-america>
- <https://www.weforum.org/agenda/2020/03/from-perfume-to-hand-sanitiser-tvs-to-face-masks-how-companies-are-changing-track-to-fight-covid-19/>

## Alex

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<https://twitter.com/nanspr0>  
<https://linkedin.com/in/nanspro>  
<https://gitcoin.co/nanspro>

## Rishabh

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[www.github.com/exynos-999](https://www.github.com/exynos-999)  
[www.twitter.com/rishabh\\_0x99](https://www.twitter.com/rishabh_0x99)

## Ron

Twitter - [@forwardsecrecy](#)  
Medium - [@forwardsecrecy](#)



# Team

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Ronald  
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