PROPOSAL OF IMPROVED VACCINE DISTRIBUTION PARADIGM

Data Drivers

DATA DRIVERS CONTRIBUTION SHEET

Topics	Akar 25%	Anurag 25%	Chinmay 25%	Siddharth 25%
Introduction	✓			
Significance			✓	
Solution				✓
Methodology				✓
FATE & Ethics		✓		

EXECUTIVE SUMMARY

Main topics we will be touching on in our presentation

Health Care

Supply Chain

Current Vaccine Model

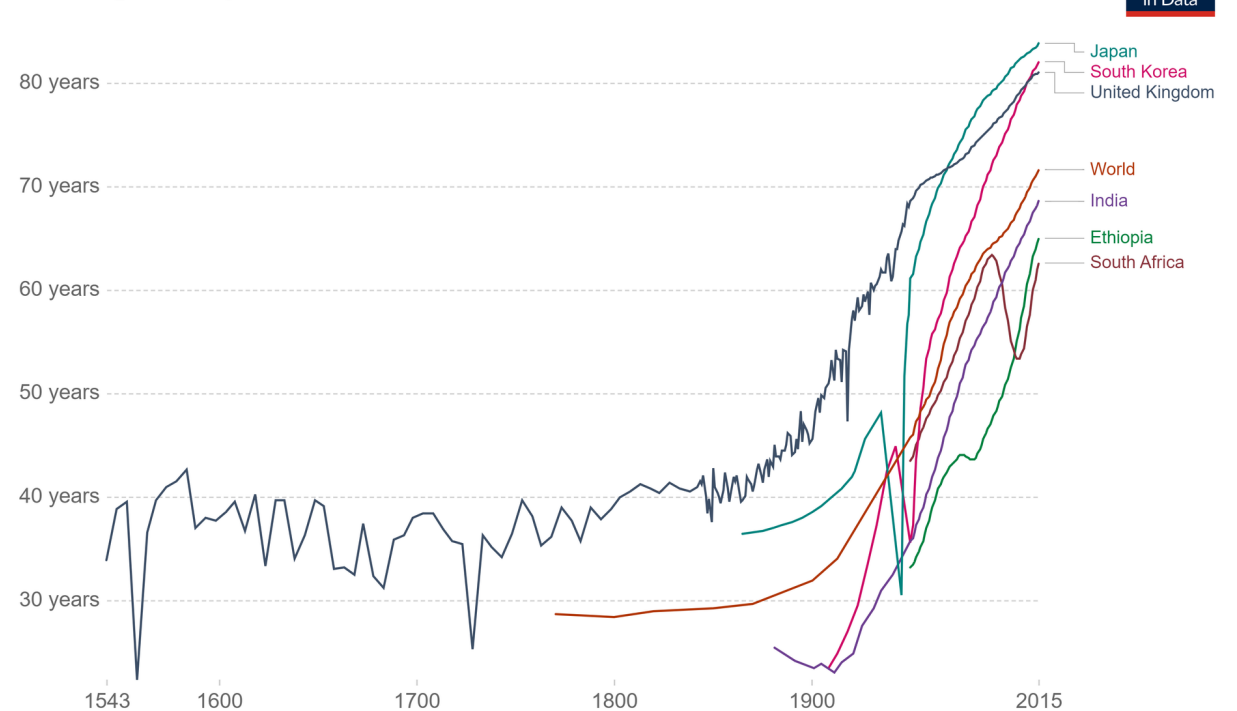Solution

AI models

FATE

INTRODUCTION

HEALTHCARE AND HUMAN RACE

- With advent of
  the industrial revolution
  technological advancements were
  done in healthcare sector.

- This increased the average human
  life expectancy.

- 46 years in --> early 1900's to

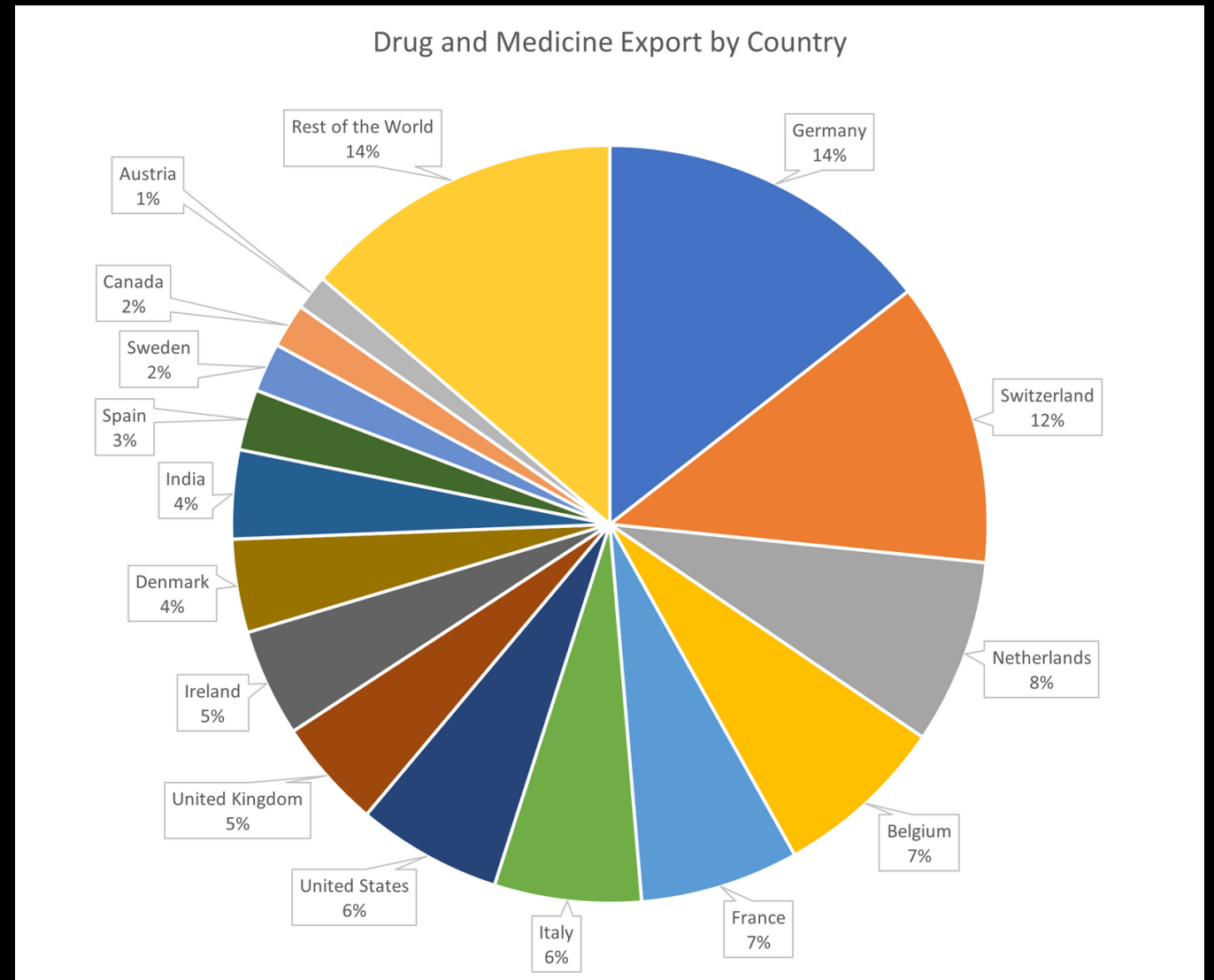- 76 years in --> 2000's

Life expectancy, 1543 to 2015

Our World
in Data

80 years

70 years

60 years

50 years

40 years

30 years

Japan
South Korea
United Kingdom

World
India

Ethiopia
South Africa

1543   1600   1700   1800   1900   2015

Source: Riley (2005), Clio Infra (2015), and UN Population Division (2019)
OurWorldInData.org/life-expectancy • CC BY
Note: Shown is period life expectancy at birth, the average number of years a newborn would live if the pattern of mortality in the given year were to stay the same throughout its life.

SUPPLY CHAIN

- Medicine research and production is just one step to completely take benefit of health care system we need a supply chain.

- The chart on the right shows that around 86% of total global production is overlooked by just 15 countries.

- This solidifies how important transportation of drugs is for our survival.

Drug and Medicine Export by Country

Country	%
Germany	14%
Rest of the World	14%
Switzerland	12%
Netherlands	8%
Belgium	7%
France	7%
Italy	6%
United States	6%
United Kingdom	5%
Ireland	5%
Denmark	4%
India	4%
Spain	3%
Sweden	2%
Canada	2%
Austria	1%

COVID, ITS VACCINES & OUR SOLUTION

- COVID -19 is not something which needs introduction at this time the whole world knows about it.
- Bigger question is the vaccines which are being manufactured by pharma companies.
- Their timely distribution and its issues.

- We propose a decentralized Machine Learning model for restructuring the distribution of life saving vaccines throughout the globe
- We will be looking at how our model will counter the ethical concerns as well as any other concern arising because of the proposed Machine Learning (ML) model.
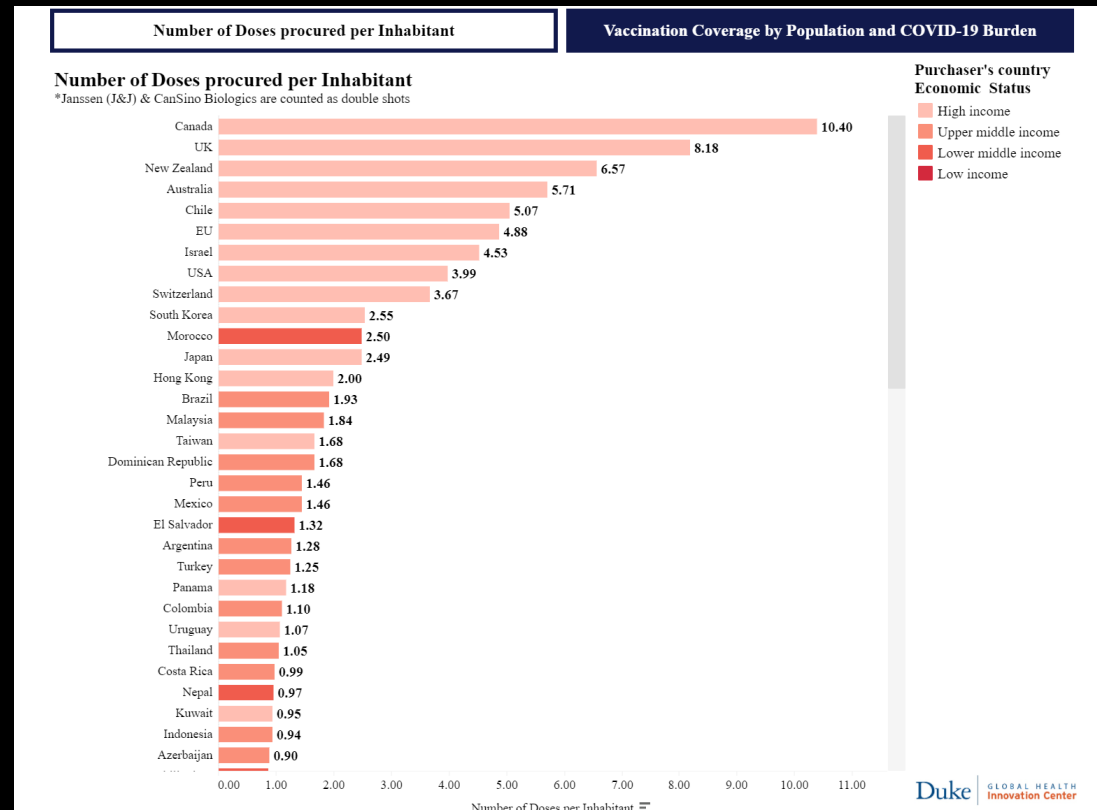
SIGNIFICANCE

PROBLEMS IN VACCINE SUPPLY CHAIN

Bilateral Deals - It is an agreement between two parties which acts as a treaty where both parties promise some thing to each other in return. They are very important in order to promote trade & commerce, eliminate trade barriers such as tariff and to expand market.

1. Unfair Distribution

Many deprived countries were short of vaccines but at same time well established nations were holding more vaccine stocks than their requirement .

2. Extensive time span of COVID

Bilateral Deals were also in progress before covid but the tenure of pandemic was not so long as compared to COVID and that is why the system got exposed.

COVAX & ITS DRAWBACKS

COVAX :- It is a union body formed by who which act as supporting factor to deal with COVID .

The main aim of COVAX is to supply 2 Billion vaccine doses by the end of 2021.

Drawbacks of COVAX:-

1. Behindhand :

COVAX was brought late for around 30 days into picture and by the time most nations have already signed the bilateral deals. Thus, it resulted in a huge drawback as vaccine doses were sanctioned on the name of developed countries.

2.Catastrophic Moral Failure

COVAX didn't follow proper vaccine policies as there was inequality which failed the morality as healthy people in developed countries were vaccinated and rest were struggling for vaccination.

SOLUTION

PROPOSED SOLUTION

The ML model we propose as a solution is a decentralized open machine learning model, which takes into account the following parameters apart from the investment from respective countries.

Population

ICU Admission Rate

Human Development Index

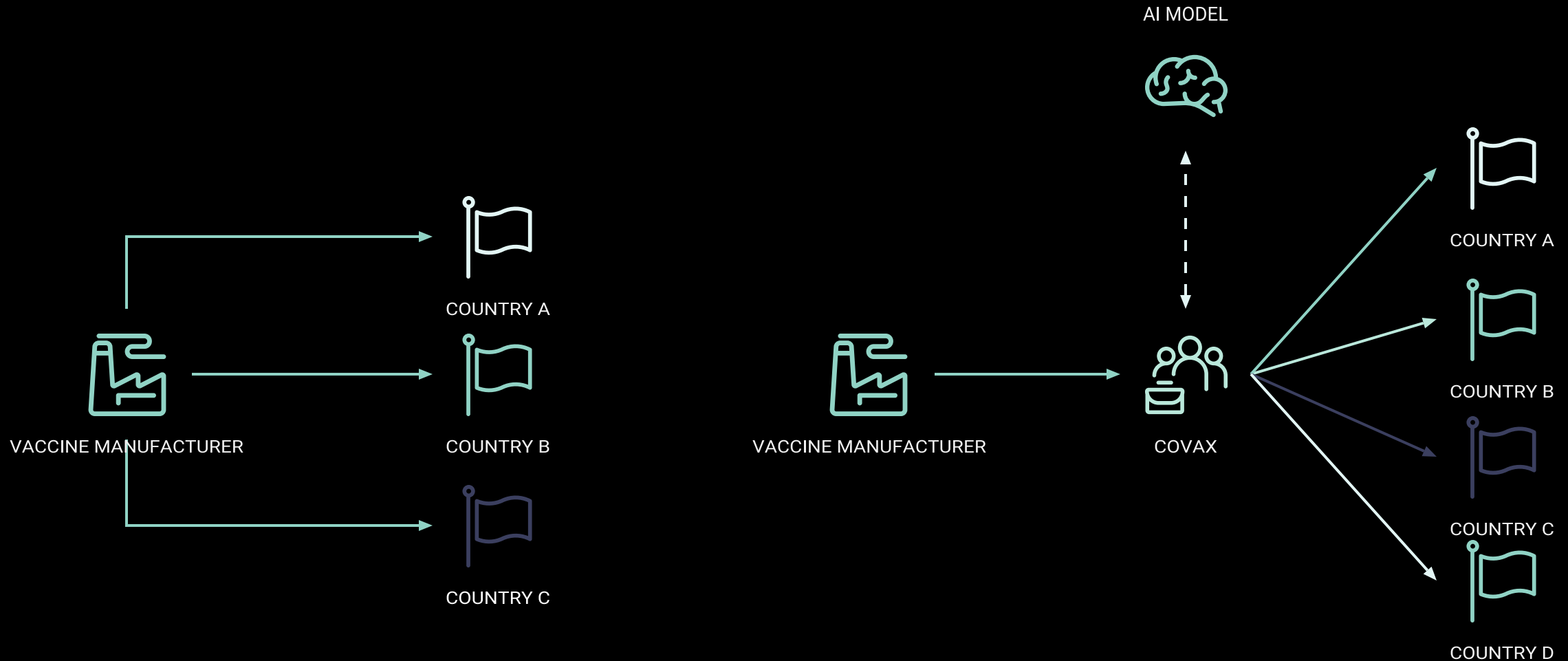Vaccination Rate

Infection Rate

Investment

Death Rate

Recovery Rate

Medical Infrastructure

PROPOSED SOLUTION

This kind of ML model would help redirect some of the vaccines to the countries hit worst by the pandemic, while still maintaining a steady stream of vaccine supply to the countries with bilateral deals with the vaccine providers.

PROPOSED SOLUTION

- The model will also be trained to factor in stockpiling of approved and unapproved vaccines by countries and suggest redistribution of stockpiled vaccines to countries with urgent need of the same.

- Considering the criticality of revamping vaccine supply, its paramount to have a ML model with a high degree of accuracy and precision to direct this crucial task.

- This high degree of accuracy and precision can only be achieved via complex ML techniques, such as neural-network and gradient boosting.
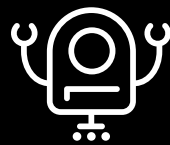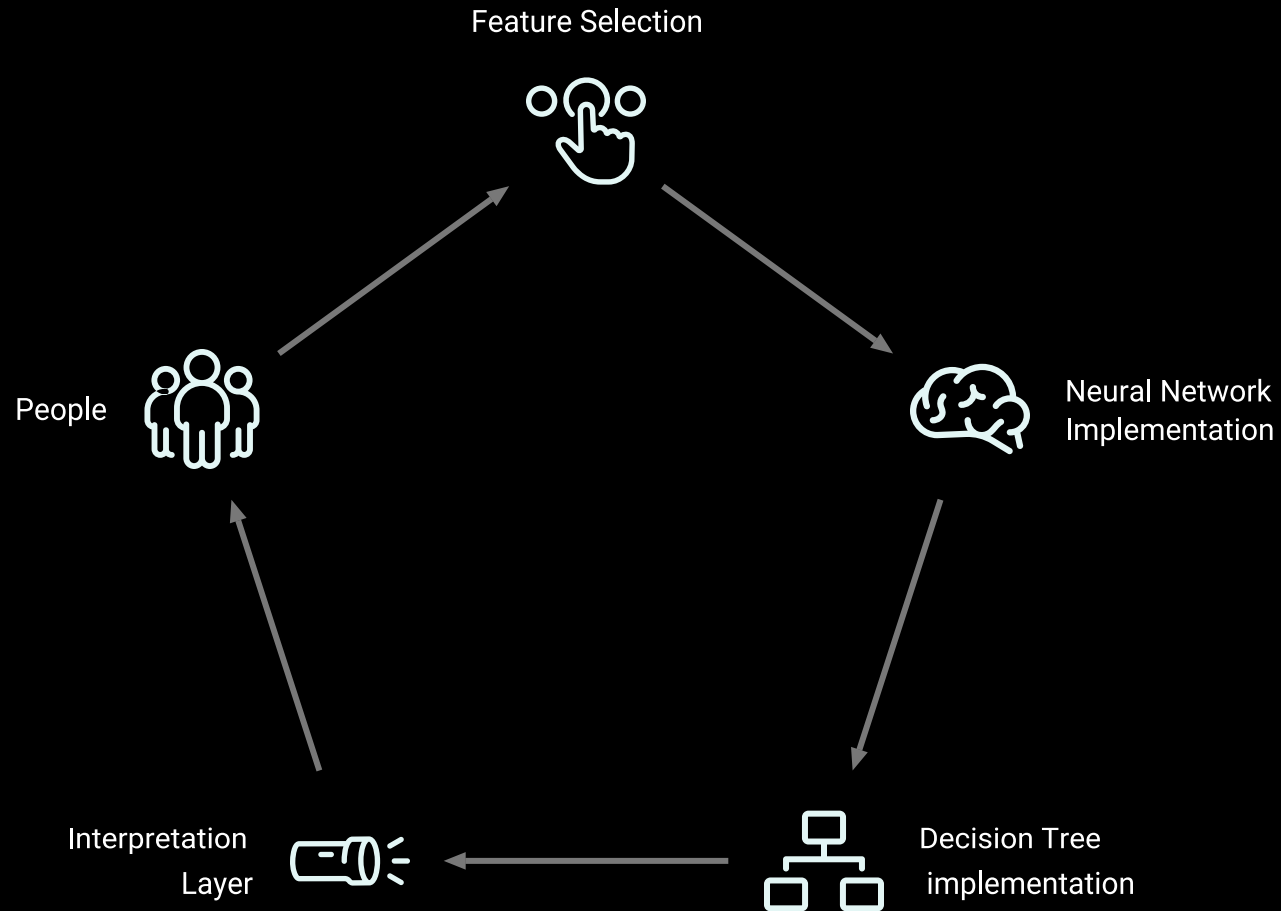
METHODOLOGY
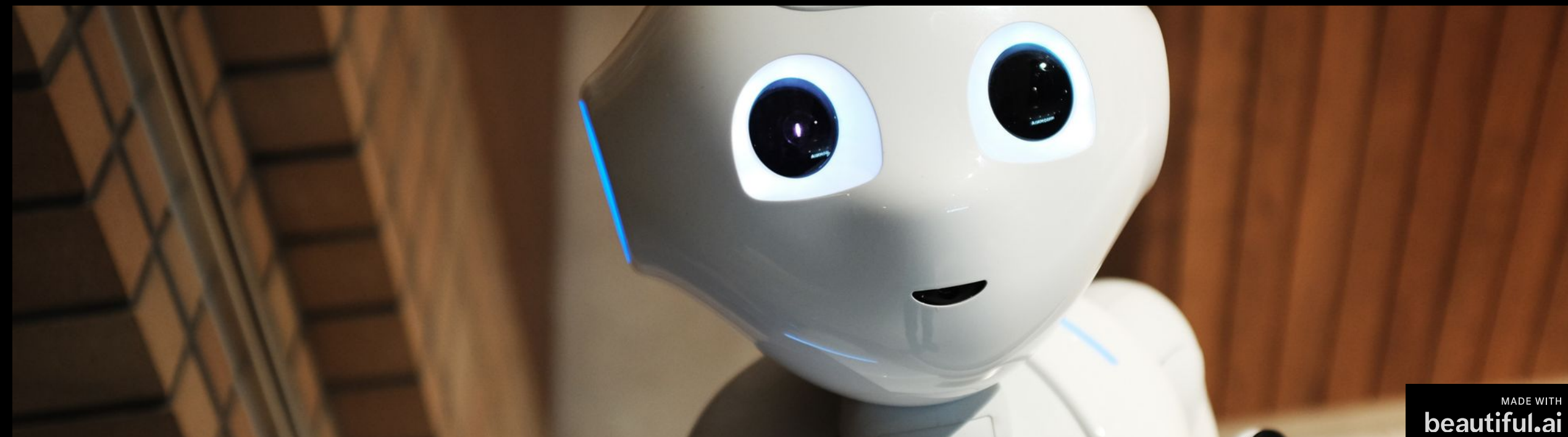
PROCESS

The complete modeling and prediction workflow can be broken down in the following four steps:

Feature Selection

People

Neural Network
Implementation

Interpretation
Layer

Decision Tree
implementation

FATE

FATE ANALYSIS

FAIRNESS

The model is fair as it distributes vaccines to the countries according to their need.

Bilateral deals play a role but the distribution is not done by risking the population of some country.

F

ACCOUNTABILITY

The model is designed by collecting data & inputs from all the vaccine producers.

They are accountable for all the system decisions.

A

TRANSPARENCY

T

Model is transparent as it will be visible to all the countries .

Officials and representatives of countries can monitor real time data and ask questions.

E

ETHICS

The system is ethical as it does not violate the vaccine distribution and supply chain principles laid down by any country or international organization.