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The Role of AI in Fighting Current & Future Pandemics

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Outline

1. Introduction
2. Responses to COVID-19 That Employed AI Technology
3. Future Role of AI in Conjunction with Digital Health
4. Challenges That Could Keep AI Behind

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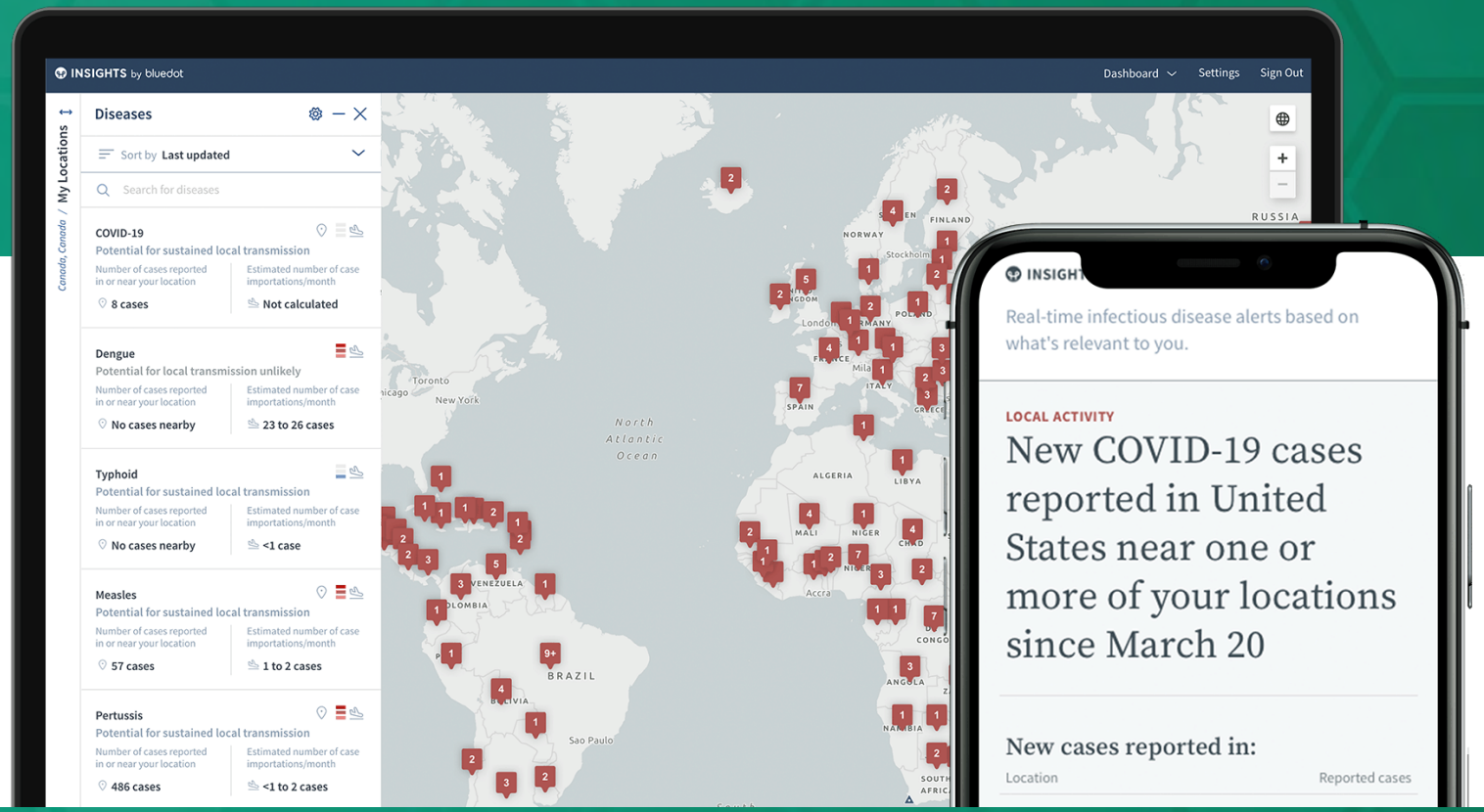
So, AI you Say ?

bluedot



Introduction – The Fight Against Pandemics

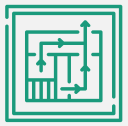
In the fight against pandemics, medical staff are the first to respond, forming the front line, and risking their own lives to save the lives of others

However, behind that front line and in support of it, the war should be fought by various entities taking advantage of the latest technologies and AI to transform the war into a domain where people have the advantage over the pandemic.

Authority

Medical Researchers

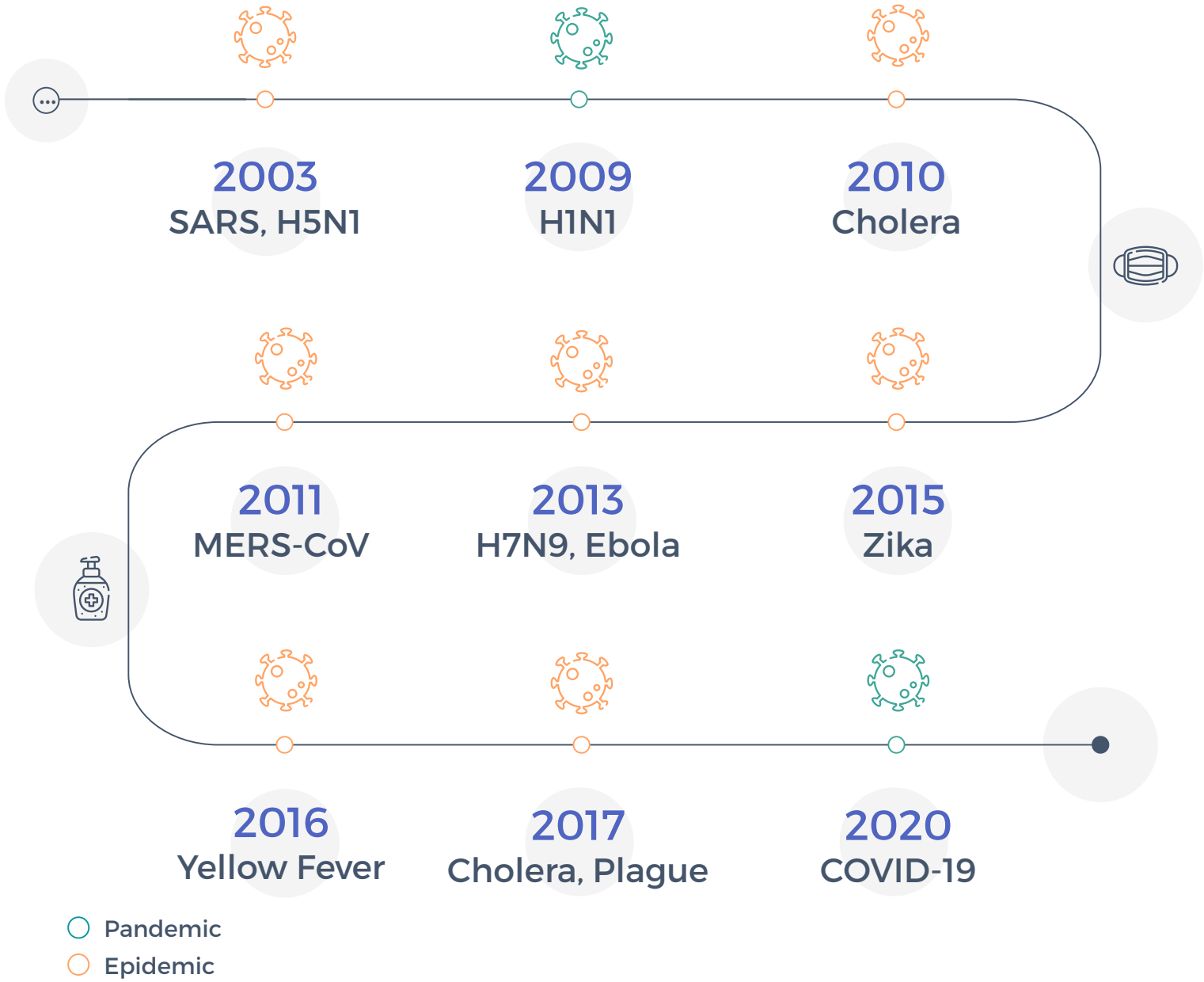
Data Scientists



Statisticians

Epidemics with different behaviors are occurring very frequently

Already in the first 2 decades of the 21st century, the world has experienced 12 different epidemics, 2 of which developed to pandemics.



Pandemics are more than just COVID-19

Lethality, sources, and spreading nature of different diseases require different precautions and strategies, & what is considered acceptable for COVID-19 is not necessarily functional for others.

In shaping the future guard against pandemics, we should push towards a holistic approach that considers different behaviours of epidemics and tackles them in multiple domains

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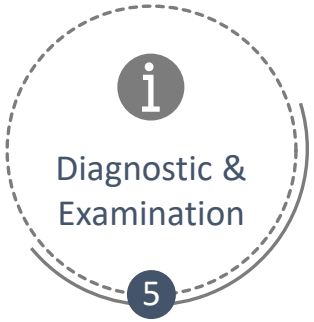
AI-Based Responses to COVID-19 can be categorized under 5 Major Categories

AI and statistical models that rely on current & previous pandemic data, health data, and demographic data to predict the future development of the pandemic and suggest best responses

AI-based models and mobile apps that are used to track the spread of the disease on individual level to help contain the pandemic

Efforts related to training AI models to find the most effective approved medicines for the pandemic based on its chemical properties in addition to efforts in developing vaccines by employing AI

Pairing AI with latest technology to implement monitoring solutions that can be used in quarantine environments and prevent risking medical staff lives



Pairing AI with latest technology to bring fast, touchless, and reliable solutions that can serve as initial identification of infection

AI-Based Responses to COVID-19

1. Prediction Models
2. Contact Tracing
3. Medicine Development
4. Patient Care
5. Diagnostic & Examination

KSA COVID-19 Index

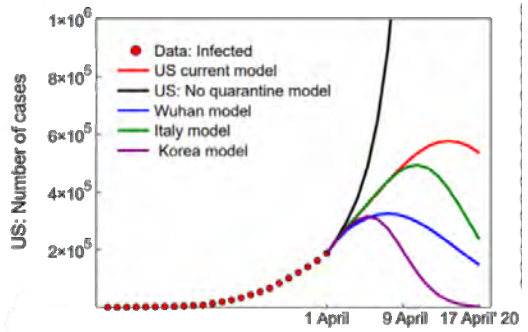
- Geographical & Demographical Patterns
- Mortality Prediction
- COVID-19 Spreading Prediction
- Beds & ICU Demand Prediction
- Ventilators Demand Prediction

Decision Making Support Through

- Assessing Health Resources Management
- Predicting Healthcare Demand for Procurement
- Analyzing Policies Impacts
- Providing transitional plans from curfew to normality

Quarantine Impact Prediction on COVID-19 Spread

- Complement SEIR with AI
- Study quarantine measures from different countries
- Future cases based on quarantine measures



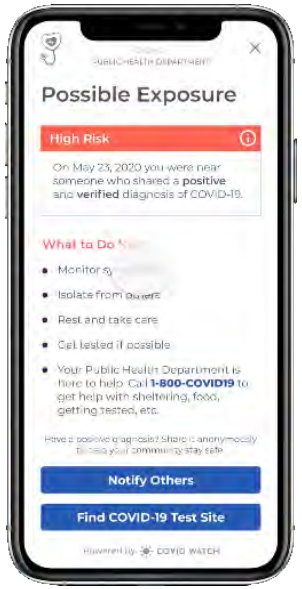
AI-Based Responses to COVID-19

Prediction Models 1 | Contact Tracing 2 | Medicine Development 3 | Patient Care 4 | Diagnostic & Examination 5

TAWAKALNA App

- Alert the user upon potential contacts with infected cases.
- Automatically alert the user upon permit violation
- Alerting the user regarding the geographical permit limit

Covid Watch



- Works by interchanging anonymous IDs when two devices come in close proximity.
- The app doesn't rely on GPS or involve any tracking.

AI-Based Responses to COVID-19

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Harvard HII

Human Immunomics Initiative (HII) is an initiative established by Harvard Chan School to design AI-powered models of immunity that can accelerate vaccine development and testing for a wide range of diseases, including COVID-19.

BenevolentAI

Benevolent build technology in the service of science - to augment human intelligence and inspire the discovery of new medicines for the thousands of diseases that have no treatment.

- Medicine search through AI
- Focuses on Approved medicines
- finds medicines that can be useful with COVID-19

AI-Based Responses to COVID-19

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Emerald

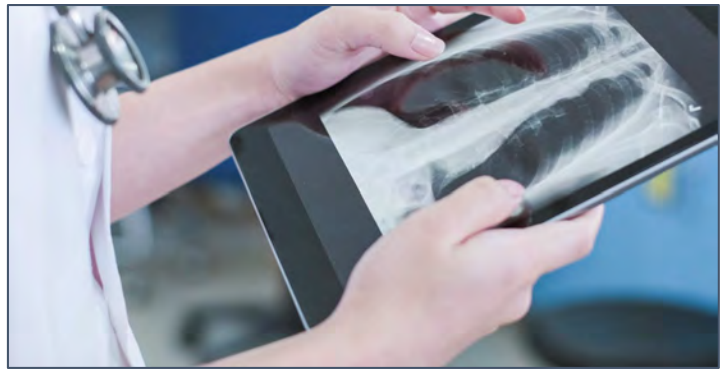
Touchless sensor & ML platform

Performs health analytics

Remote monitoring of patients without direct access

X-Ray Inspection

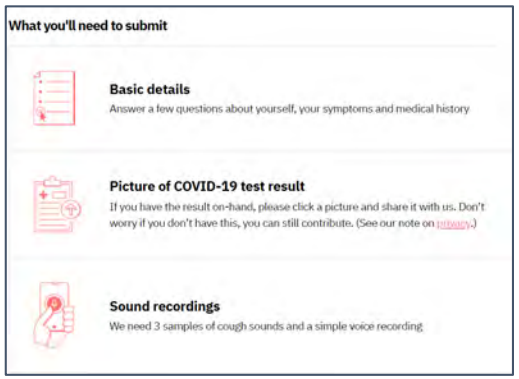
The Royal Bolton Hospital has used an artificial intelligence system (qXR) to help diagnose emerging coronavirus patients through X-rays.



AI-Based Responses to COVID-19

Cough Against COVID

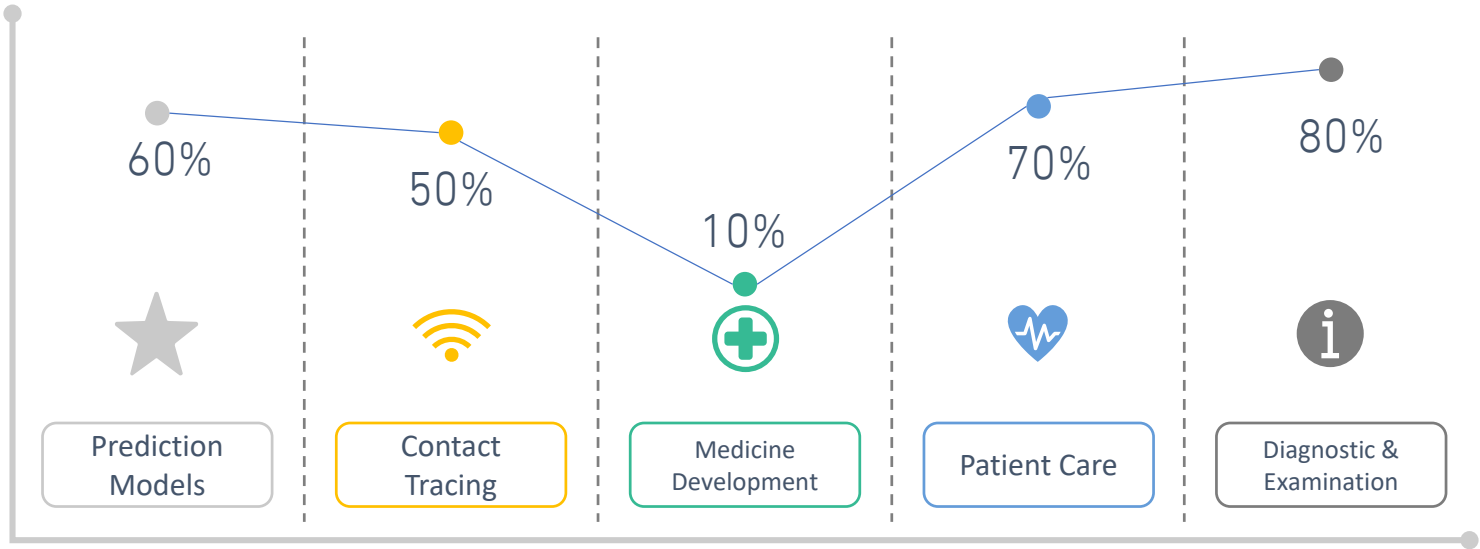
Collecting Cough Sounds to Build dataset that can be used to train a model for diagnosing COVID-19 through cough sound



Remote Diagnostic

The 'Smart AI Epidemic Prevention Solution' can detect a fever within an accuracy of 0.3°C because it integrates sophisticated AI algorithms with infrared thermal technology.

The Role of AI in Current Pandemic



Prediction Models

Prediction models are not very accurate and change frequently because of the rapid daily changes

Patient Care

Patient care have been used to handle 100s of requests and filter the severe cases based on AI which was useful in managing the pandemic

Contact Tracing

Many efforts have been done to trace spread while taking privacy into account, but collaboration is required to insure effectiveness

Diagnostic & Examination

Many effort have been done under this track with high effectiveness. It is used in many situations and helped identifying infections from big crowds

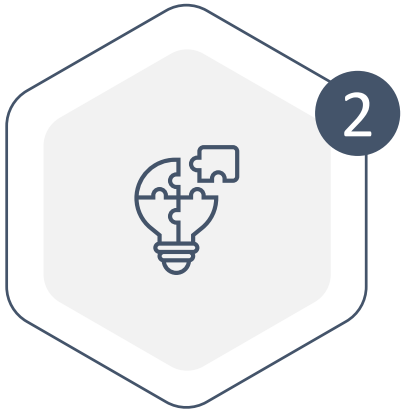
Medicine Development

This track is not that active as it requires a lot of custom data and knowledge in addition to high processing capability

And yet, the current AI capability is not truly utilized due to being

Reactive not Proactive

Time is a critical factor when it comes to epidemics. Lagging the event could make it develop into a pandemic & go out of control, or isn't that what actually happened?



Non-Complementary

COVID-19 has been approached from different angles. However, those efforts don't contribute to, or complement, each others where it is possible to do so.

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AI Role in Fighting Future Pandemics

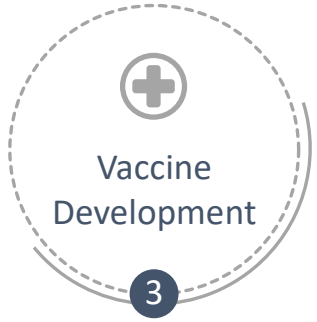
AI Can Lead the Fight Against Future Pandemics By Developing 3 Pillars

Be Proactive

Powered by smart health services, AI should keep harvesting health data from all sources to detect epidemics at their very early stages

Contain the Spread

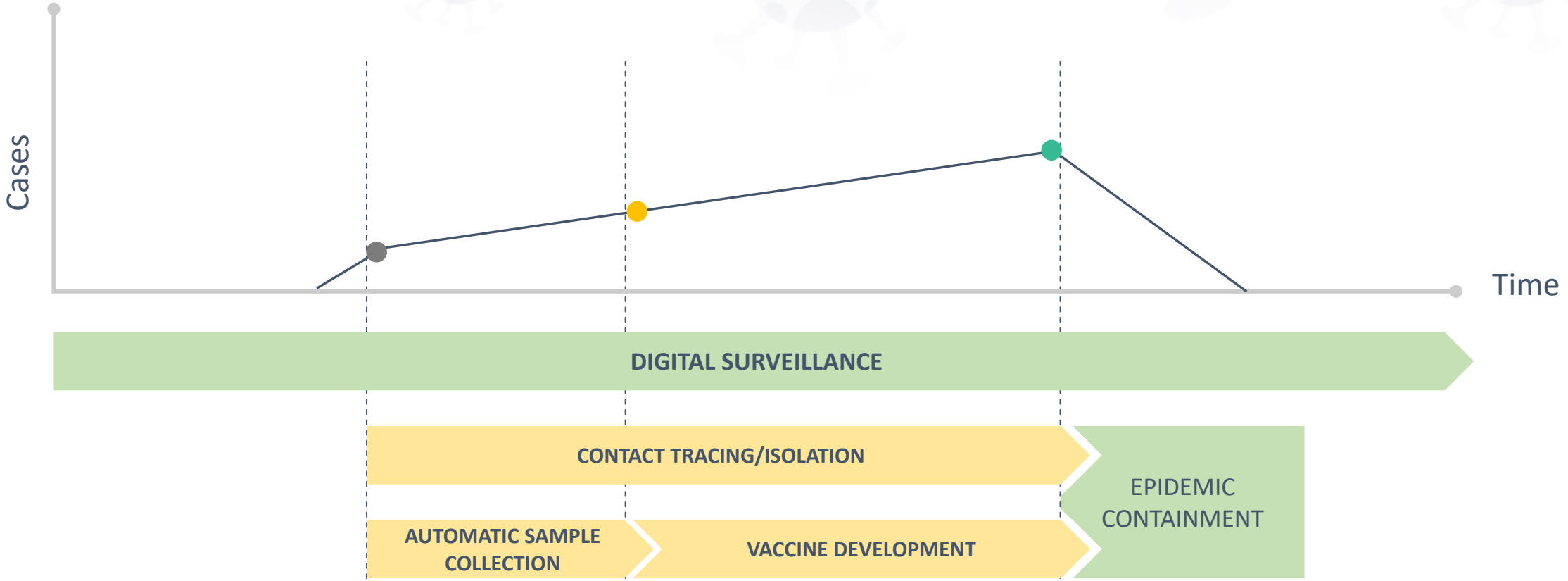
Relying on IoT, contact tracing should be linked to digital surveillance to automatically trace contacts at early stages and chase the spread



Target the Root of the Problem

With both digital surveillance & contact tracing in operation, time can be spared, & reliable data can be fed to highly developed technology to analyze the virus and develop a vaccine

AI Role in Fighting Future Pandemics



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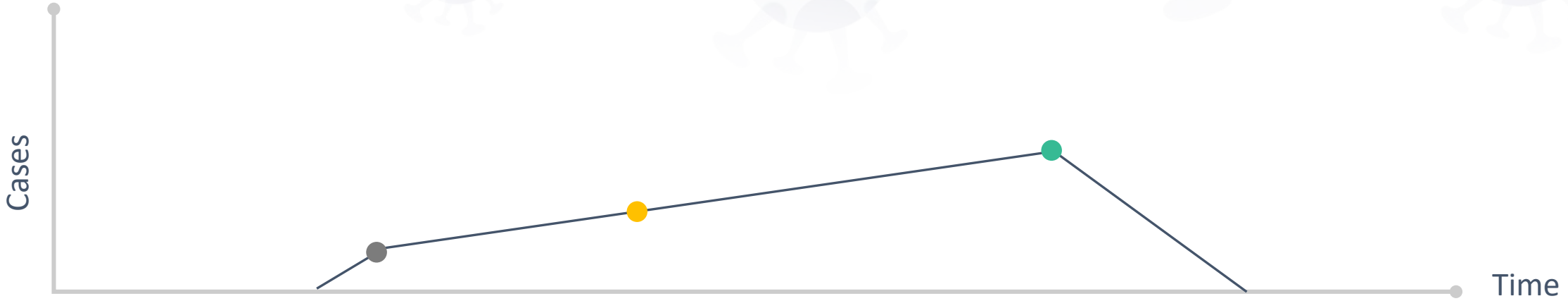


DIGITAL SURVEILLANCE

Fight Pandemics Before They Develop

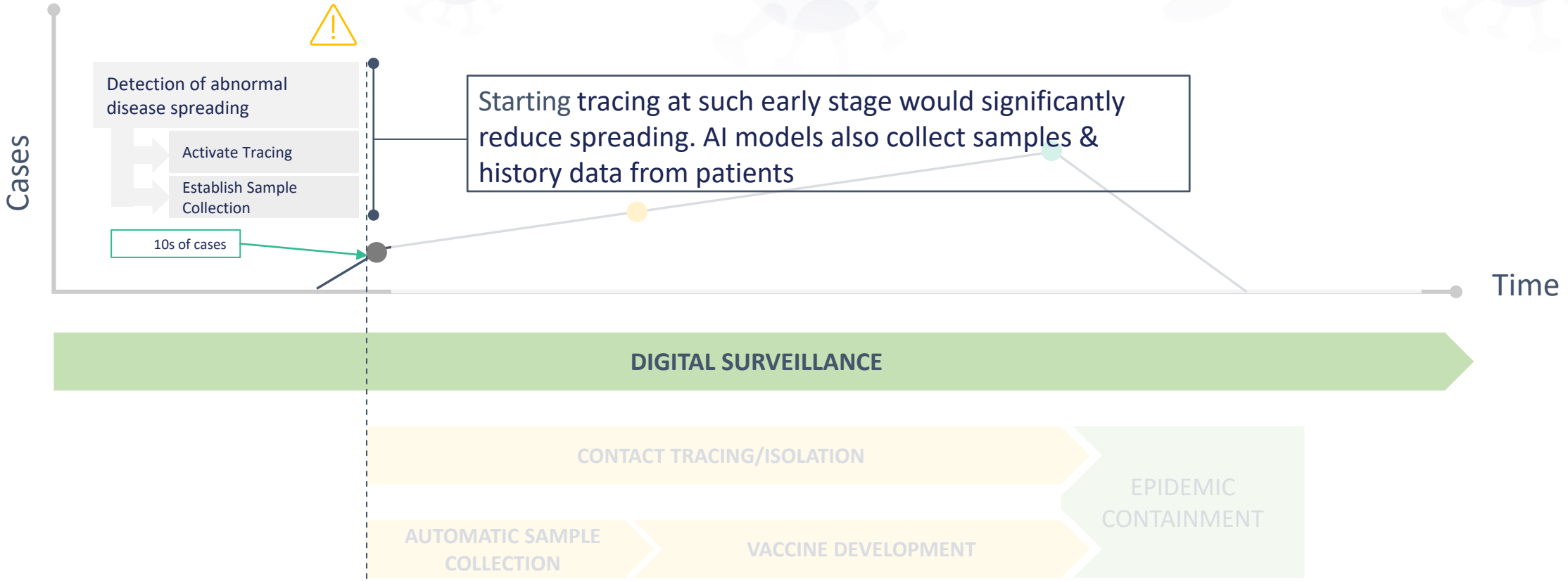
In all situations, AI keeps harvesting health data from various resources and performing digital surveillance

AUTOMATIC SAMPLE COLLECTION

VACCINE DEVELOPMENT

CONTAINMENT

AI Role in Fighting Future Pandemics



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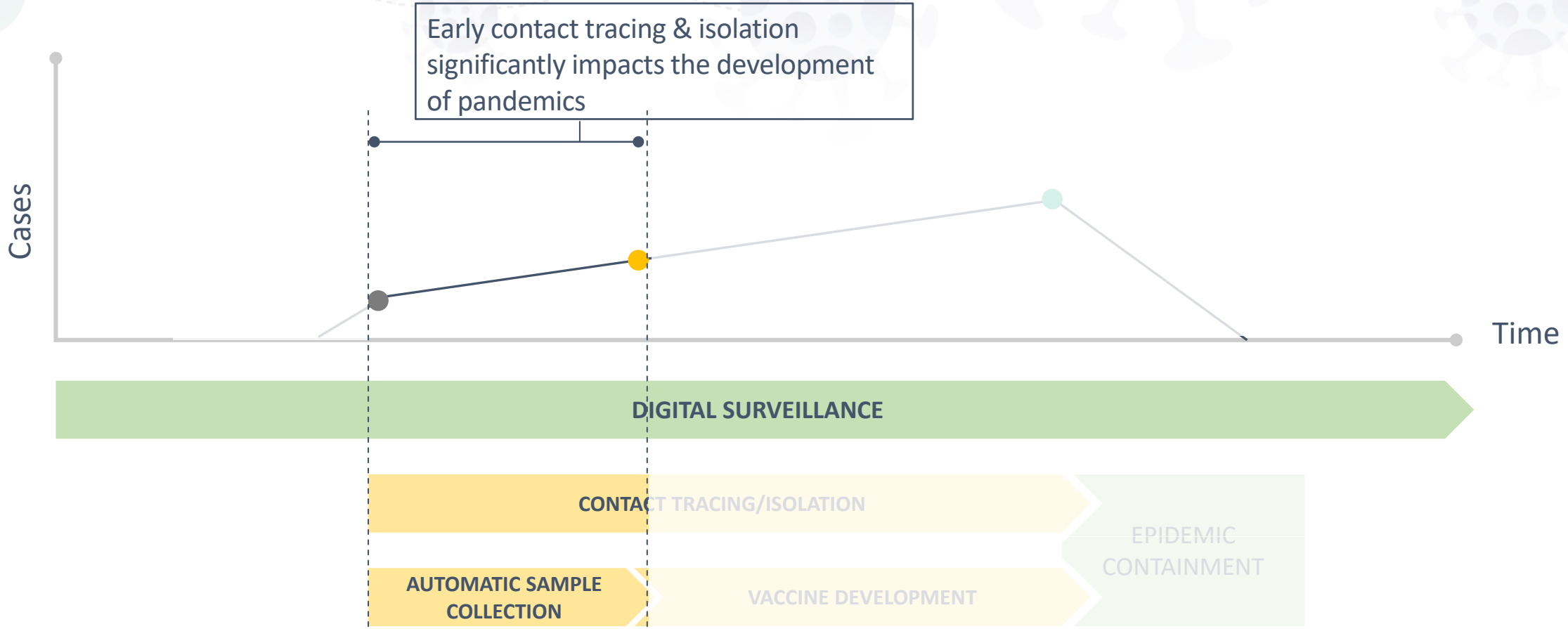
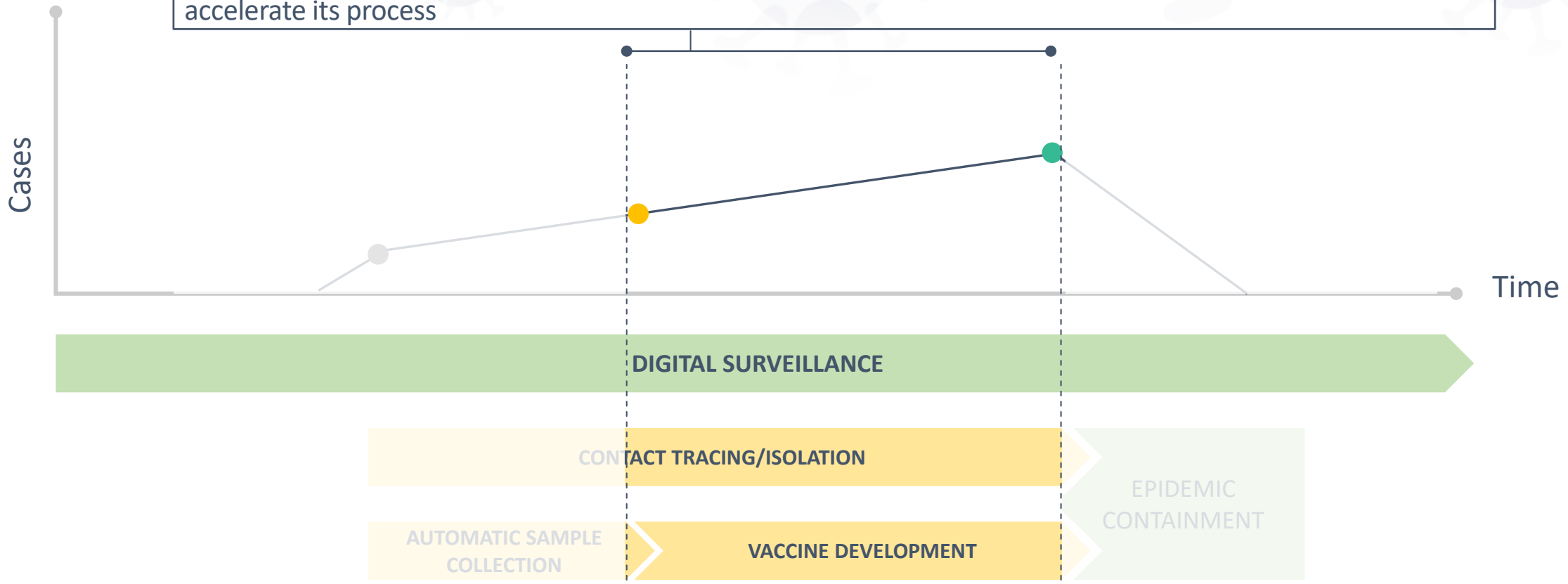


AI Role in Fighting Future Pandemics

AI takes relatively long time to decipher virus protein structure. Early detection of epidemic along with early contact tracing and sample collection into centralized pole, all spare the time for vaccine development and accelerate its process



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Challenges That Could Keep AI Behind

1

Processing Capability

2

Data

3

Interventions

THANK YOU

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