FGAI4H-L-035-A01

E-meeting, 19-21 May 2021

Source:	Institute for Technology & Global Health (ITGH)	
Title:	Technology, Economics, & Policy: AI for Sanitation and Public Health - Att.1: Presentation	
Purpose:	Discussion	
Contact:	Khahlil A. Louisy Harvard University/Institute for Technology & Global Health United States of America	Tel: +1-857-330-5341 Email: klouisy@hks.harvard.edu
Contact:	Alexander Radunsky Institute for Technology & Global Health United States of America	Email: apr814@mail.harvard.edu

Abstract: This PPT summarizes the content of L-035 with the proposal for an approach to use of AI for sanitation and public health, for presentation and discussion during the meeting.

Institute for Technology and Global Health
PathCheck Foundation

Artificial Intelligence for Sanitation

Technology, Economics, and Public Policy

FG-AI4H | 05.20.2021

Contents

The 17 Sustainable Development Goals

Part 1:

The Problem

Objectives

Understand the applicability of AI technologies to sanitation issues

Evaluate the social, economic, and behavioral impact of implementing these novel technologies, as well as ethical and privacy implications

Is this technology scalable and under which conditions.

Image source: The South African

Today, sanitation continues to be a major global health issue, with approximately 3.8 trillion litres of waste left untreated or lost and 892 million people in the world still practicing open defecation

(UNICEF/WHO JMP, 2017)

South Africa has one of the world's highest rates of mortality for children under the age of five, with about 10% of those deaths resulting from diarrhoea.

South Africa and india's Sanitation Issues

Issue

In a survey in South Africa, the Department of Water Affairs: Green Drop Certification (2011) found that 55% of wastewater treatment plants, especially smaller ones, do not meet effluent standards and some do not even measure effluent quality.

Issue

According to a World Bank report, Africa Infrastructure Country Diagnostic (AICD), the total expenditures are less than half of what would be required to achieve the Millennium Development Goals in Sub-Saharan Africa.

Issue

In India, it is estimated that as a direct result of poor sanitation, about S54bn of GDP is lost annually and 200,000 human lives are lost.

Tackling the Problem

HYPOTHESIS

Advances in technological innovation can not only help with the early detection of disease-causing pathogens.

Externalities from these early detections could have positive impacts on economic output.

The use of AI technology to analyse waste products in sewage systems has the potential to mitigate the spread of disease by alerting health workers of impending outbreaks.

Note: the sanitation-related diseases, relevant to this proposal, are those that result in pathogen shedding in excreta and have an environmental transmission factor, e.g. Typhoid.

Organizations Involved

esa

TOILET BOARD COALITION

woodco

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Part 2:

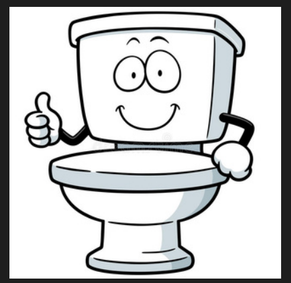
The Project

Goal

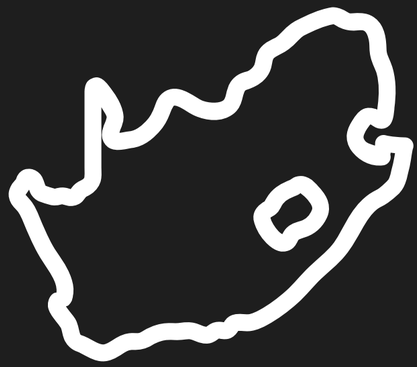
The goal of the project is to deliver predictive health monitoring, which will require data from multiple sources. To correlate environmental data with detected disease events we need to physically collect faecal samples and process these.

How it Works

The system incorporates EO based data which is merged with the terrestrial data derived from the sensors in the environs of the toilet blocks.

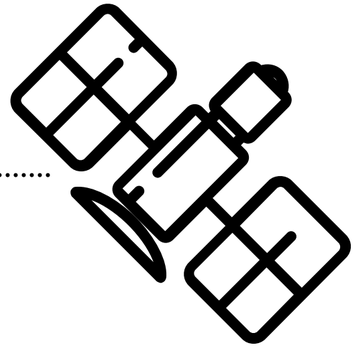


Sensors can connect to Edge computing gateway which uses the local cellular network. Sends sensor data using NB-IoT



Target

link EO data to terrestrial sensor data, waste sample analysis and toilet block monitoring. The data sets will be added to the sensor data collected from the IBM acoustic sensors and the floating lab sensor to develop machine learning systems which can output artificial intelligence data.



Part 3:

The Data

Measuring Progress

1 **Key update 1**

The trial will last one calendar year

2 **Key update 2**

Release 1 deployment will take up to 5 months to complete

3 **Key update 3**

Data collection, machine learning models, and AI output

Collecting data of varying types (both structured and unstructured) and from different sources. We then plan to incorporate varying degrees of AI from simple if/else control statements to complex deep learning models for different purposes.

The general high-level approach will be to benchmark against:

- What measurements are being taken at the moment in the areas where the solution is being deployed and what are they achieving.
- What is the state of the art using AI and not using AI (not confined to what is being done on the ground at the moment).
- We will benchmark the AI-based solution against the existing largely manual and in-laboratory testing.
- We will also benchmark it against the state of the art AI and non-AI capabilities that are comparable to the solution.
- From a machine learning perspective, we have used transfer learning and have compared performance for the proof-of-concept using a large dataset of evenly distributed class samples with 80/20 training/validation splits with a number of machine learning architectures with the above constraints in mind. e.g. VGGNet, MobileNet and Resnet architectures.

About the Institute for Technology & Global Health

The Institute for Technology and Global Health (ITGH) is an applied research and policy organization, exploring the potential for novel technologies and their applications to improve public health outcomes, while interrogating public policy questions related to their implementations. The non-profit organization is an independent initiative of PathCheck Foundation, which was founded at the Massachusetts Institute of Technology (MIT) to develop privacy-preserving technologies in response to health crises. The foundation and the institute are comprised of faculty and researchers from MIT and Harvard University, as well as professionals across a range of relevant industries and sectors, including government, public health, technology, and academia, among others.

PathCheck Foundation has developed and launched several pieces of technology in response to the COVID-19 pandemic that are currently being utilized by several jurisdictions internationally, including exposure notification systems used to augment contact tracing processes and digital vaccination credentials. ITGH is conducting studies on the use of these applications including adoption and behavioral insights, implementation policies, and ethics and privacy.

Next Steps

1 Action Step 1

Formation of working group with experts across relevant fields

2 Action Step 2

Begin formulating evaluation frameworks and methodologies

3 Action Step 3

Implementation and Pilot

4 Action Step 4

Test data collected and used for modeling

5 Action Step 5

Monitoring

6 Action Step 6

End of pilot period, data collection, and evaluation

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Thank you!

Contact us if there are any questions.

Website ..... www.itgh.org

Email Address ..... klouisy@hks.harvard.edu
alex.radunsky@mail.harvard.edu