

Saving Lives



With Artificial Intelligence



On March 8, 2014 a Boeing 777 carrying over 230 people vanished over the South Indian Ocean.

A major tragedy in aviation history, the case attracted major media attention.



CNN's coverage of the missing plane lead to a major spike in ratings, and they continued the segment on Flight 370 for weeks.

Commentators like Jon Stewart ridiculed the network's excessive coverage.

But what if a Boeing 777 vanished every day?

A photograph showing a vast, sprawling garbage dump. In the foreground, several people are seen from behind, carrying large woven baskets balanced on their heads. They are navigating through a dense, sprawling mountain of trash. The sheer volume of waste is overwhelming, stretching into the distance under a hazy sky.

But what if a Boeing 777 vanished every day?

Saving Lives with Artificial Intelligence

1. The Scale of Global Poverty.
2. Tools for Helping Those in Need.
3. Challenges That Make Fighting Poverty Hard
4. How Computer Vision can Help
5. How **We** will use Computer Vision



The Scale of Global Poverty



Deaths from **preventable illness** resulting from poverty amount to more than **40** commercial airplanes going missing **every day**.

The Scale of Global Poverty

About **half** of the World's Population lives on less **2.50\$** a day.

Those in **extreme** poverty must pay for all their food, shelter, clothing, medicine, on less than **9\$** a week.

Poverty affects every aspect of a person's life, from access to **food, water, education, and medical treatment**.



A photograph of a woman with a warm smile, wearing a green and white patterned headwrap and a light-colored shirt. She is holding a black solar panel against a wall. The background shows a rough, textured wall with visible pipes and a small, bright light fixture on the ceiling.

Tools for Helping Those in Need

Alleviating Poverty and its Symptoms

Fortunately, the technology exists to treat many global problems.



Mosquito Nets can protect up to 3 children from **Malaria** for only **5\$**.

Alleviating Poverty and its Symptoms



There's no shortage of food either. Today, we produce enough to feed **10 billion people**: The estimated world population for the year 2050.

Alleviating Poverty and its Symptoms

In fact, Oxfam estimates that we could **end global poverty** by spending **60 billion dollars a year.**



This is only about 10% of the United State's yearly budget for Military alone.

We have enough technology ...

We have enough food ...

We have enough money ...

So how do we decide where to send it?



The Importance of Data

Why are Data So Important?

First, we can use data to pick **where** and to **whom** we send **what** goods.



Obviously, we don't want to send Bed Nets to places where there's no Malaria!

Why are Data So Important?

Second, data can help us understand the **causes** of poverty.



Pollution



War



Natural Disasters

Treating hunger and illness is great! But to really stop poverty, we need to use science to understand *why* it happens to begin with.

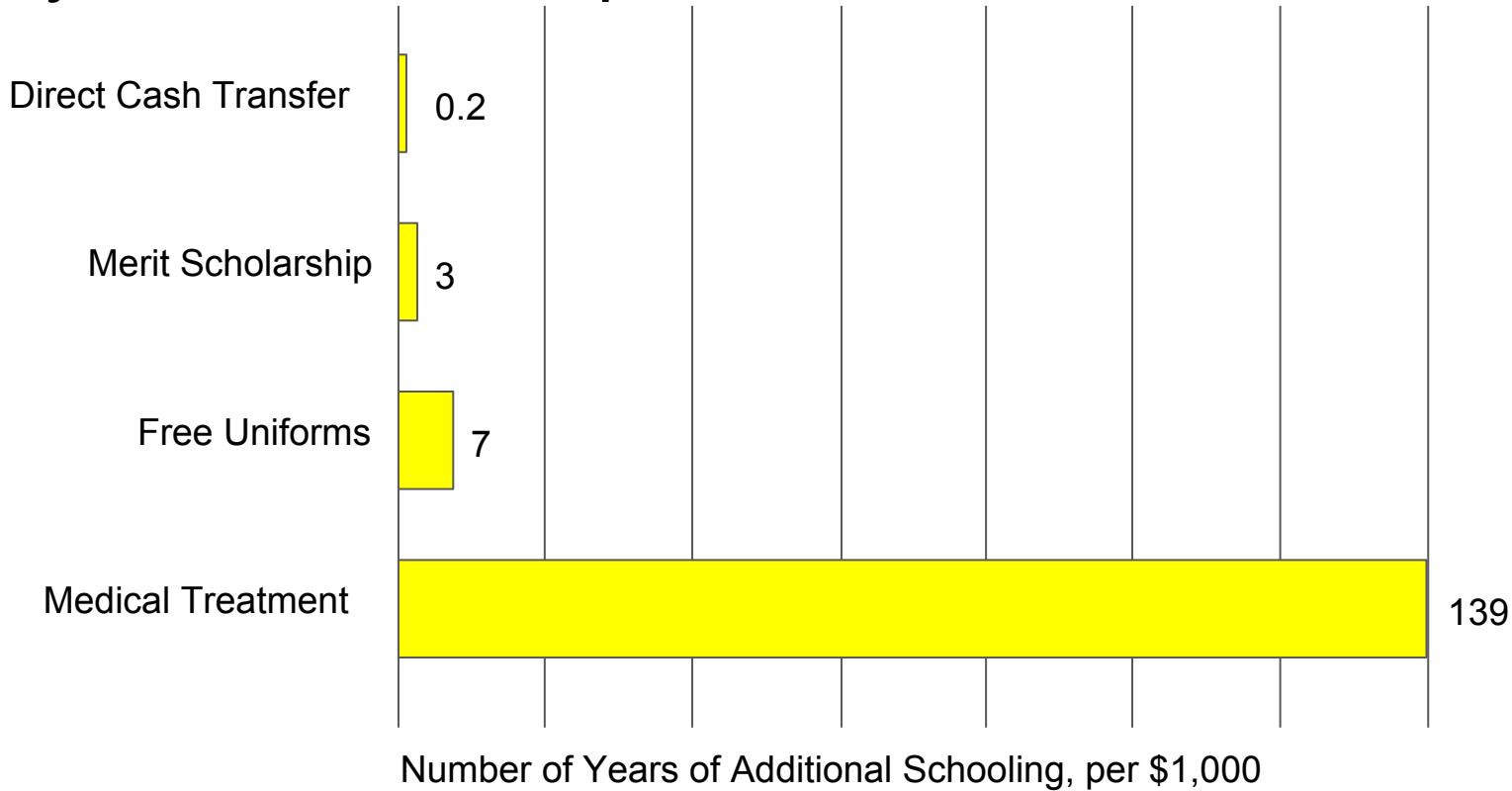
Why are Data So Important?

Third, data can be used to tell us what types of aid work the best.

For example, can you guess which intervention most helps to improve school attendance in developing countries?

1. **Direct Cash Transfer** to students or their families.
2. **Merit Scholarships** funding tuition for high achieving students.
3. **Free School Uniforms** for students.
4. **Medical Treatment** which might keep kids from staying home sick.

Why are Data So Important?



We need to gather data!



Traditional Methods rely on **Surveys**. Someone goes door to door, conducts interviews, and records:

Consumption Metrics: How much does a household spend every day? What do they spend their money on?

Asset Metrics: What sorts of things does a family own? Do they own a refrigerator? A bicycle? Running water?

Surveys are typically carried out by the government.

**Can you think of some problems with
measuring poverty using surveys?**

Limitations of survey data

Surveys are typically **expensive** and **time consuming!**



Trained professionals need to travel all over the country.

Must assess each household individually.

Poor countries can not afford to conduct surveys, and we need their data the most!

Limitations of survey data

Some populations may be hard to reach, or dangerous places to travel.

For example, **La Rinconada** (Peru) is home to 30,000 people, but can only be reached by winding mountain roads after days of driving.



Limitations of survey data



Some countries may have unreliable surveys, or provide fake data for political reasons.

Survey Data

Advantages:

- Can help us decide where to send resources.
- Helps us judge which aid programs work, and which do not.

Disadvantages:

- Costs too much time and money.
- Many populations are hard to survey.
- Some data may be faked.

What other ways can we detect poverty around the world?



What other ways can we detect poverty around the world?

Satellite Images

Google makes theirs available to the public (including you and me!)

Examples exist for every location on Earth (even La Rinconada).

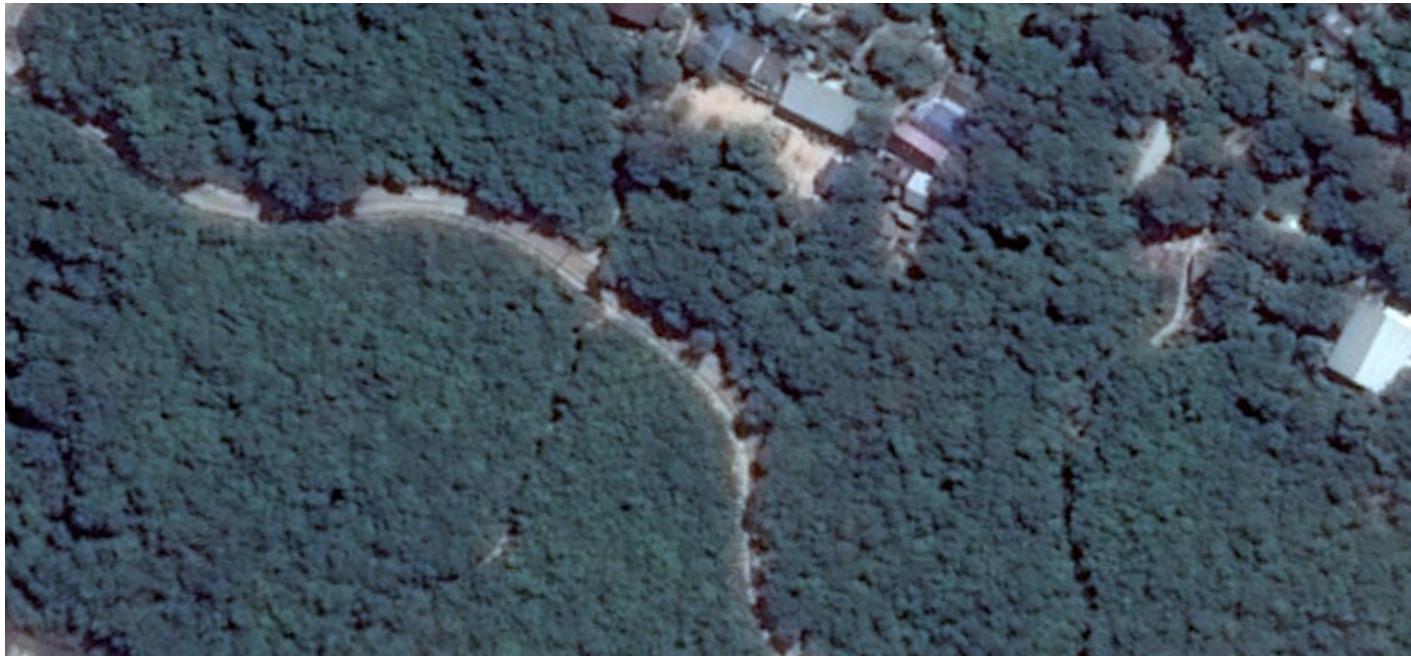
Images are always up to date.

Satellites don't lie.



Satellite Images

But what can you tell from this??



... Not much.

Mapping Poverty with Computer Vision



Artificial Intelligence can extract patterns in image data that humans can't see.

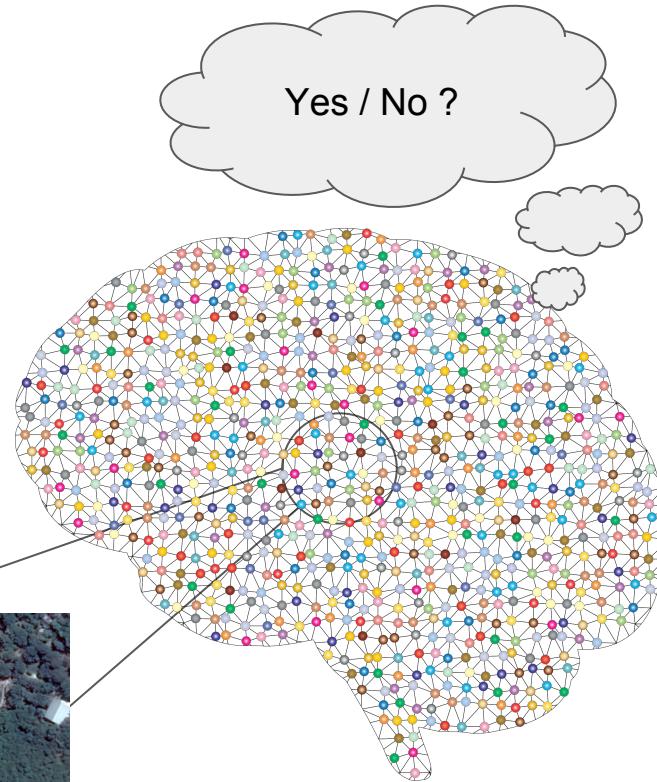
The **Ermon Lab** here at Stanford used a combination of Satellite Images and Labeled Survey data to train a **Neural Network** to identify poverty from images.

Mapping Poverty with Computer Vision

Neural Networks are a type of Learning Program.

After looking at lots of data, they learn to answer questions about it.

Questions like: “**Are the people who live here likely to poor or rich?**”



Mapping Poverty with Computer Vision

Neural Networks require example images and labels in order to learn.

In our project, images will come from **Satellites** and labels will come from **Surveys**

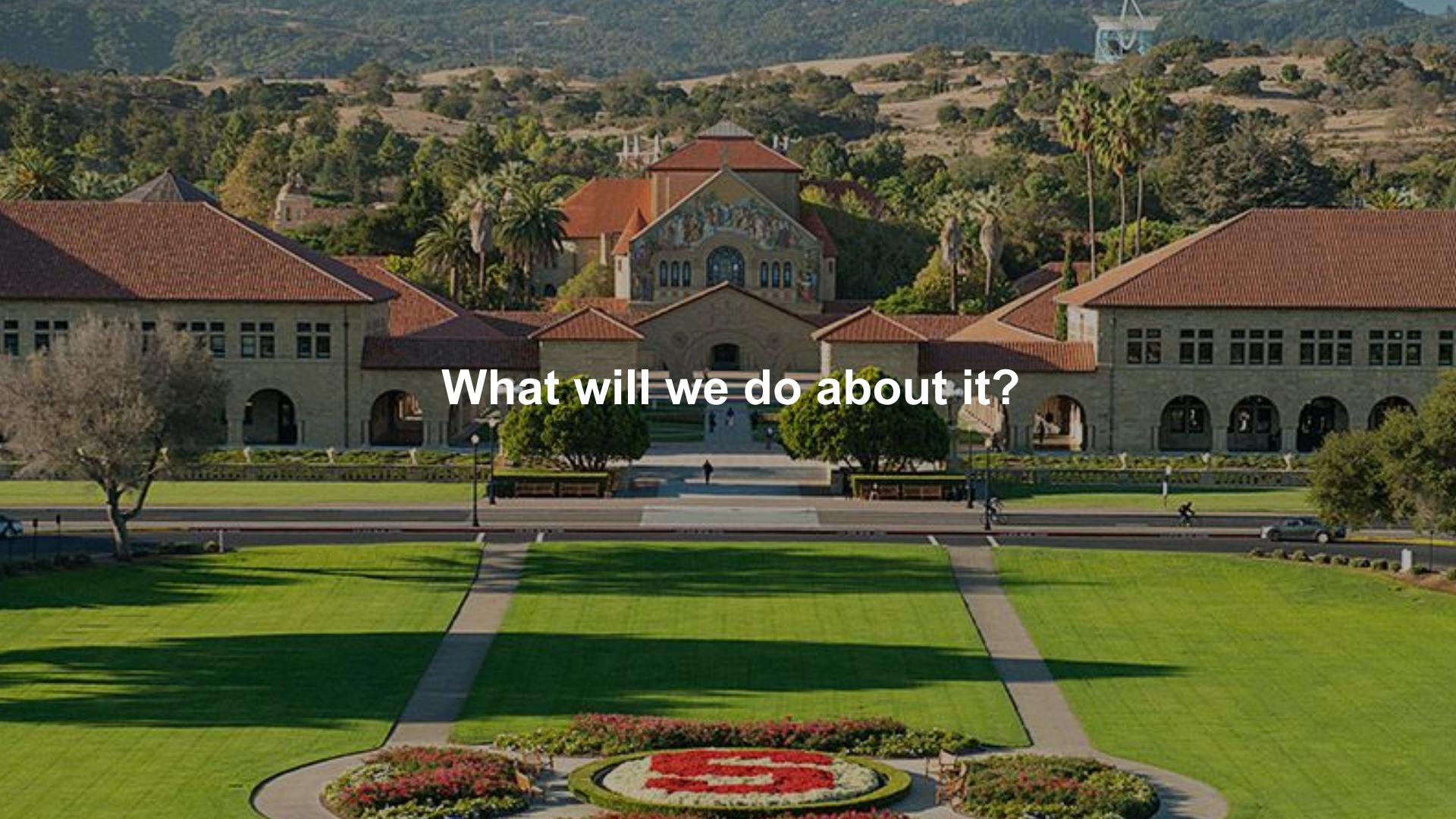


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What will we do about it?

Roadmap for AI4All

Part I: Representing the Visual World

- Collecting satellite data, reasoning about global poverty.
- Using code to work with images.
- Extracting meaning from pictures.
- Understanding how Neural Networks view the world.

Part II: Learning from Images

- Teaching your Neural Network to detect poverty.
- How to conduct and evaluate Artificial Intelligence experiments.
- Create a map of locations in Uganda that require aid.