

WHAT ARE ATMOSPHERIC AEROSOLS?

AMBIENT AEROSOL CONDITIONS

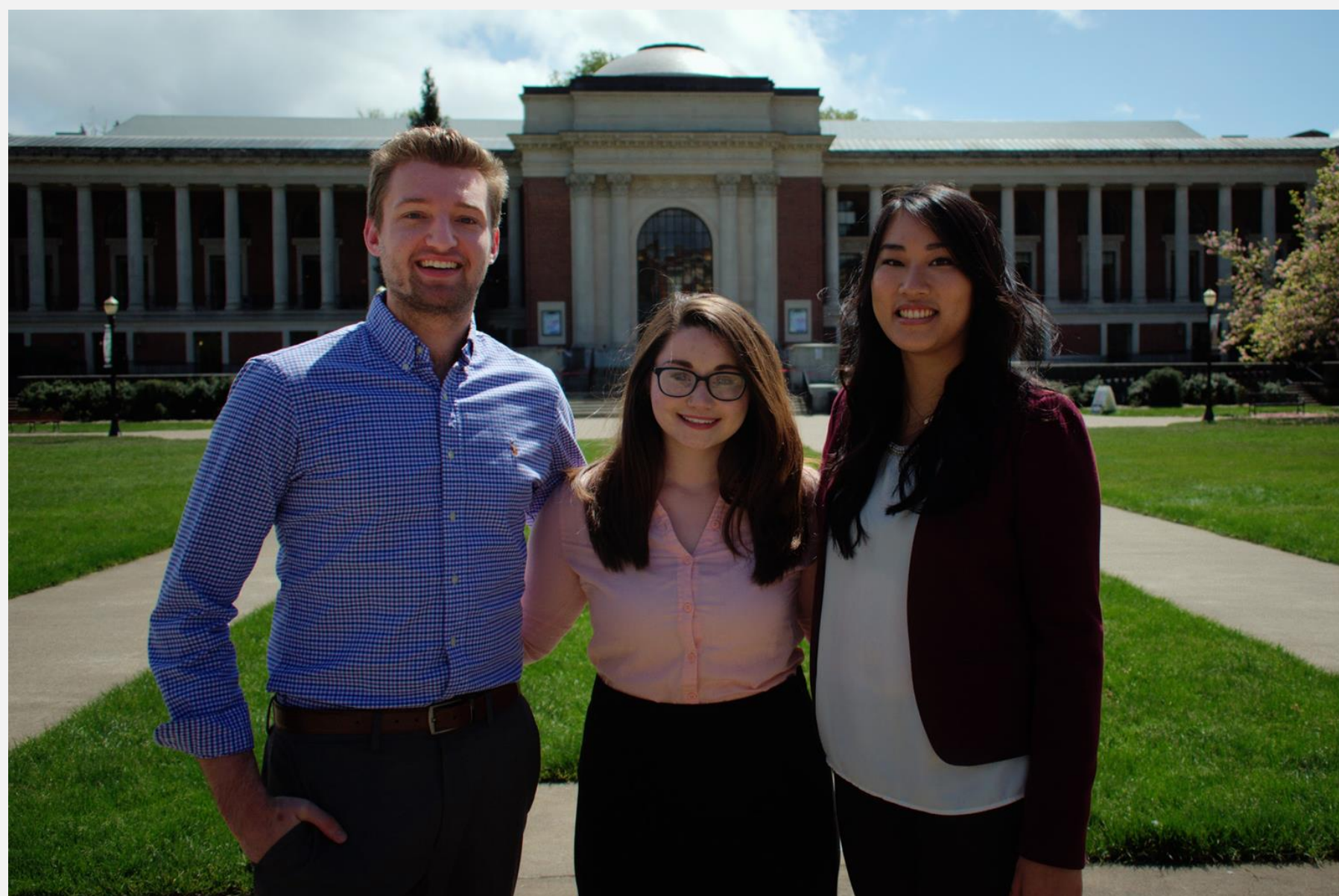
Aerosols are minute particles suspended in the atmosphere. When these particles are sufficiently large, we notice their presence as they absorb sunlight. Their scattering of sunlight can reduce visibility (haze) and redden sunrises and sunsets.

Aerosols interact both directly and indirectly with the Earth's radiation budget and climate. As a direct effect, the aerosols scatter sunlight back into space, as well as back to Earth. As an indirect effect, aerosols in the lower atmosphere can modify the size of cloud particles, changing how the clouds reflect and absorb sunlight, thereby affecting the Earth's energy budget. [1]

- There are three major types of aerosols that affect the Earth's climate: volcanic aerosol, mineral dust, and human-made aerosol.
- All of these aerosols make their way into the atmosphere and reflect, scatter, or absorb sunlight, effectively changing the view of the sky.
- These visible changes reflect the amount of aerosol in the atmosphere, offering insight about the health of the Earth's climate.

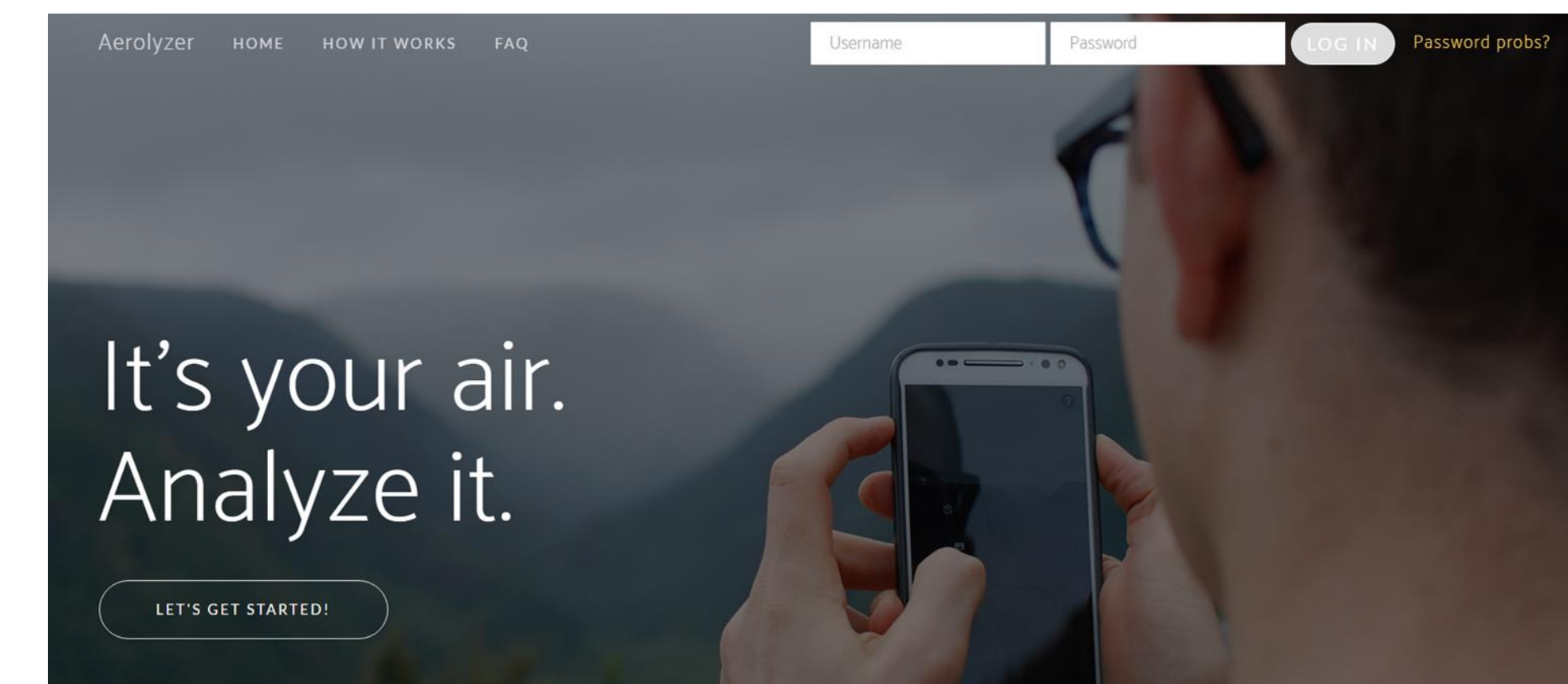
CS 46X GROUP 22 CAPSTONE TEAM

- Jesse Hanson, hansoj@oregonstate.edu
- Reilly Collins, colliell@oregonstate.edu
- Sophia Liu, liusop@oregonstate.edu
- Dr. Kim Whitehall
- Dr. Lewis McGibbney, NASA JPL
- Contact aerolyzer@googlegroups.com
aerolyzer.github.io



AEROLYZER

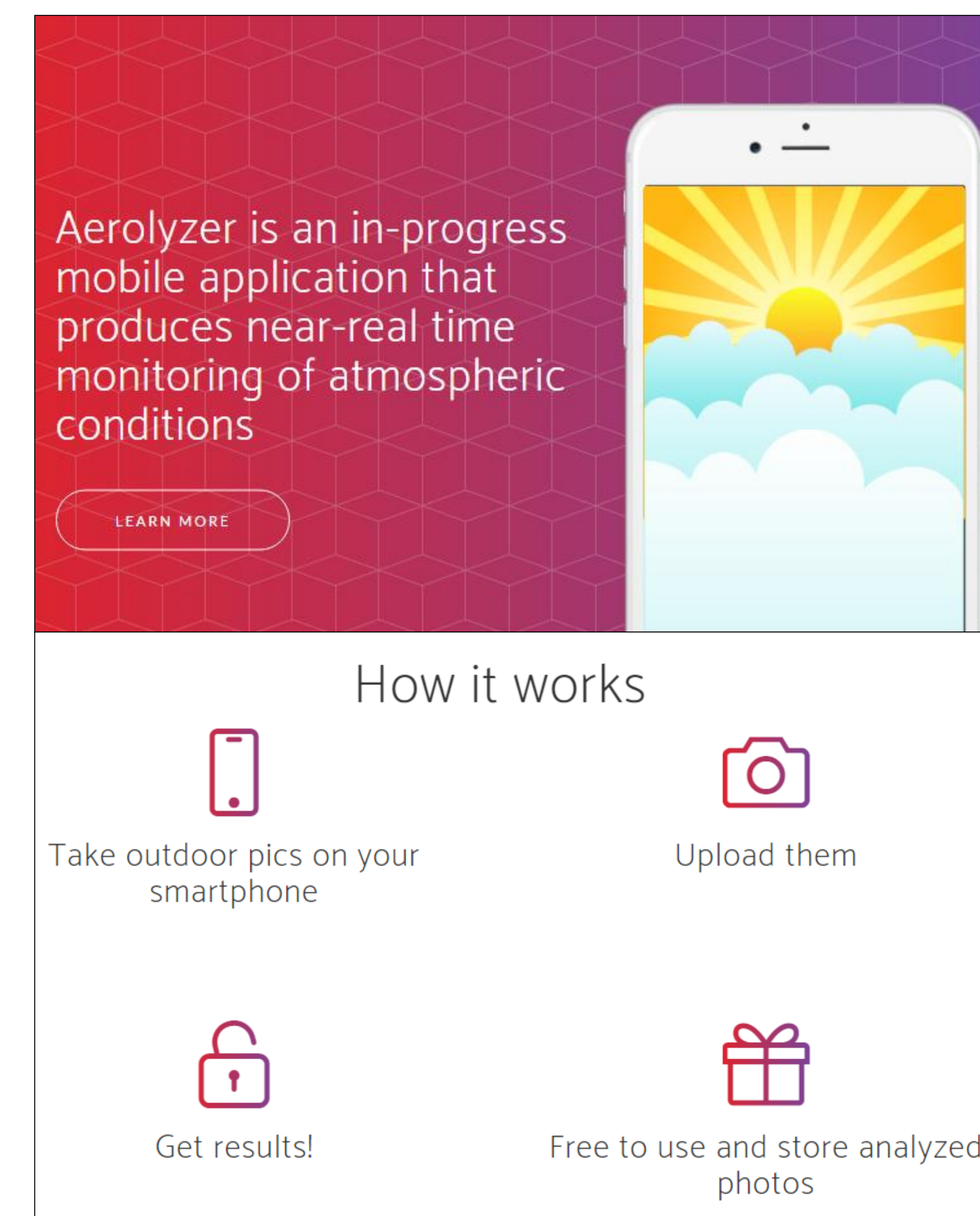
A mobile application capable of determining an image's ambient aerosol conditions



FROM USER IMAGES TO AEROSOL DATA

Aerolyzer is a web application that analyzes a mobile image and returns the image's ambient aerosol conditions. The image's EXIF data, coupled with machine learning techniques and meteorological information provided by the Weather Underground API [2], is used as input for an algorithm that accurately determines near real-time ambient aerosol conditions.

After creating an account, Aerolyzer users can upload images to be analyzed. They can later view gallery of all analyzed images, along with the resulting ambient aerosol conditions.



tinyurl.com/aerolyzer

USING MOBILE DEVICES FOR EARTH SCIENCES

THE PURPOSE

The purpose of Aerolyzer is to develop an application that provides scientists and the general public with the ability to understand content from images, and encourage human curiosity in nature.

THE IDEA

The idea for Aerolyzer stemmed from similar products which are exploring the value of images generated via digital cameras with limited capture wavelengths in regards to the Earth Sciences. These products can provision for the Earth Sciences what the Google Cloud Vision API is provisioning for industry.

THE GOAL

Our goal for Aerolyzer was to develop an application which feeds images captured on a mobile device through machine learning methods that couple the observations with meteorological information to produce near real-time monitoring of ambient aerosol conditions.

PYTHON-BASED WEB FRAMEWORK

- Django is used for the frontend framework of our web application
- PostgreSQL and SOLR makeup the backend databases for user accounts and image data, respectively
- Python scripts are used to extract EXIF data from images and verify that images meet our algorithm's requirements
- Using the image's location, a request is sent to the Weather Underground API to obtain atmospheric information for that location
- Our algorithm then uses this atmospheric information, along with the image's EXIF data, to determine and display the ambient aerosol conditions

github.com/aerolyzer

RESULTS FROM RUNNING AEROLYZER



EXIF METADATA

- Tags stored with the image, consisting of information from the point of capture
- Include GPS coordinates, colors, device taken on, create date, modify date, file size, file type, and image width/height

WEATHER DATA

- Captured using the image's GPS coordinates and the Weather Underground API
- Includes city, country, temperature in Fahrenheit, time of sunset, and time of sunrise

AEROSOL DATA

- Combines previous data to determine aerosol conditions at the time the photo was taken
- Output includes the amount of aerosol in the atmosphere and any other data about atmospheric aerosols that is able to be calculated

REFERENCES

[1] B. Dunbar. (2015, July 31). *Atmospheric Aerosols*. [Online]. Available: nasa.gov/centers/langley/news/factsheets/Aerosols.html

[2] Weather Underground API. Available: wunderground.com/weather/api