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\subsection{Background}

\indent The island spotted skunk (Spilogale gracilis amphialus), endemic to Santa Cruz Island (SCI) in Southern California, has been the subject of study by student researchers in the University of California Santa Barbara-Smithsonian Scholars Program since 2017. This student-led project utilizes infrared camera traps positioned across the island to capture images of these skunks with the goal of monitoring the population and determining if the island spotted skunk is endangered. The ecology of the island spotted skunk has been historically understudied, so this project is the first of its kind. Over the course of the project, nearly 1 million individual images have captured life on Santa Cruz Island. To date, analysis of the data has been impossible, because a researcher would need to look through and classify tens or hundreds of thousands of images each year to observe any information about skunk presence or absence. While this task is essentially impossible for a human to perform, a machine learning (ML) model can complete this task efficiently and accurately. It does so by identifying the presence or absence of skunks by using many statistical and mathematical techniques in a specific and unique order to recognize color patterns in images. \\ \\

In collaboration with the Smithsonian Institution’s Data Science Lab, our research team developed a plan to implement computer vision machine learning techniques for data analysis. Specifically, we are using Efficientnet\\_lite3, an architecture that was designed to run on edge devices. This model was trained using labeled images from the Labeled Information Library of Alexandria: Biology and Conservation (LILS BC), which includes over 240,00 images across 7 different classes. Integrating machine learning techniques will be a huge milestone, but we will finally be able to find answers to some of the project's core research questions.

\subsection{Purpose}

This document serves as a procedural guide for various processes, detailing explicitly how tasks have been accomplished and how to navigate the current model and data collection system so future interns and users of this software can understand and navigate it with ease.

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\section{Camera Trap Data Package}

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Camera trapping is a well-established method of collecting field data on animal abundance, distribution, behaviour, temporal activity, and space use. However, a common data exchange format is needed to effectively exchange camera trap data between infrastructures and to harmonize data into large-scale wildlife datasets (CITE: BISS Camera Trap DP). Camera Trap Data Package (Camtrap DP) is a data exchange format for camera trap data, which is managed by the Machine Observations Interest Group of Biodiversity Information Standards (TDWG). Data in Camtrap DP are organized as three related resources (CSV files): deployments, media and observations. These Tabular Data Resources are described as resources in the datapackage.json file (CITE CAM TRP DP WEBSITE).

\subsection{datapackage.json}

Ask dr white what this means and what it contains

\subsection{deployments.csv}

In this section, we are discussing what the deployments.csv contains and what each field in the file means. The deployments.csv file is a tabular data table that contains data for each camera trap that has been deployed contains the following columns: deploymentID\*, locationID, locationName, longitude\*, latitude\*, coordinateUncertainty, start\*, end\*, setupBy, cameraID, cameraModel, cameraInterval, cameraHeight, cameraTilt, cameraHeading, detectionDistance, timestampIssues, baitUse, session, array, featureType, habitat, tags, comments, \\_id.\footnote{According to TDWG, column names marked with an asterisk are required to have an entry, while those that don't contain an asterisk aren't required to have an entry.}

\subsubsection{deploymentID\*}

deploymentID should be a \textbf{unique identifier for each deployment} (camera trap) that has been set up, we are currently using a schema that concatenates the deployments locationName \& locationID. This will be \textbf{auto filled} when executing deploymMediaObs.py

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Example: UCSB02\\_2A

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\subsubsection{locationID}

Throughout Santa Cruz Island, we have many camera locations which host up to 2 or 3 cameras. Each camera within each location has a unique ID which is made of a combination of letters and numbers . These unique IDs are referred to as locationID within the camera trap DP. This will be \textbf{input by user} when executing deploymMediaObs.py

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Example: 2A

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\subsubsection{locationName}

Throughout Santa Cruz Island, we have many camera locations which host up to 2 or 3 cameras. Each location has a unique ID which is made of a combination of letters and numbers. These unique IDs are referred to as locationID within the camera trap DP. This will be \textbf{input by user} when executing deploymMediaObs.py

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Example: UCSB02

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\subsubsection{longitude\*}

longitude should be the \textbf{longitude sampling location} in decimal degrees \textbf{using the World Geodetic System (WGS84) datum}. Longitude must have 5 decimal place accuracy, have a maximum of 180 degrees, and a minimum of -180 degrees. This will be \textbf{input by user} when executing deploymMediaObs.py

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Example: 175.12345

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\subsubsection{latitude\*}

latitude should be the \textbf{latitude sampling location} in decimal degrees \textbf{using the World Geodetic System (WGS84) datum}. longitude must have 5 decimal place accuracy, have a maximum of 90 degrees, and a minimum of -90 degrees. This will be \textbf{input by user} when executing deploymMediaObs.py

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Example: 23.12345

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\subsubsection{coordinateUncertainty}

coordinateUncertainty refers to the \textbf{horizontal distance in meters from the given latitude and longitud}e describing the smallest circle containing the location of the camera trap. This entry must be greater than 1 and is \textbf{not required by TWDG}. This will be \textbf{input by user} when executing deploymMediaObs.py

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Example: 57

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\subsubsection{start\*}

Date and time when the deployment started, as an nternational Organization for Standardization 8601 (ISO 8601) formatted string with time zone designator YYYY-MM-DDThh:mm:ssZ or YYYY-MM-DDThh:mm:ss±hh:mm. This will be \textbf{auto filled} when executing deploymMediaObs.py

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Example: 2020-03-01T22:00:00Z

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\subsubsection{start\*}

Date and time when the deployment ended, as an International Organization for Standardization 8601 (ISO 8601) formatted string with time zone designator YYYY-MM-DDThh:mm:ssZ or YYYY-MM-DDThh:mm:ss±hh:mm. This will be \textbf{auto filled} when executing deploymMediaObs.py

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Example: 2020-04-01T22:00:00Z

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\subsubsection{setupBy}

setupBy should be the name of the person who set up the camera for the deployment, this information can be found on the data sheet that was filled out while setting up the camera. This will be \textbf{input by user} when executing deploymMediaObs.py

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Example: Alan Feria

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\subsubsection{cameraModel}

Camera model of the camera used for the deployment, this will be \textbf{auto filled} when executing deploymMediaObs.py

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Example: HYPERFIRE 2 COVERT

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\subsubsection{cameraInterval}

\subsubsection{cameraHeight}

\subsubsection{cameraTilt}

\subsubsection{cameraHeading}

\subsubsection{detectionDistance}

\subsubsection{timestampIssues}

\subsubsection{baitUse}

\subsubsection{session}

\subsubsection{array}

\subsubsection{featureType}

\subsubsection{habitat}

\subsubsection{tags}

\subsubsection{comments}

\subsubsection{\\_id}