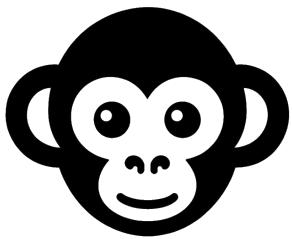


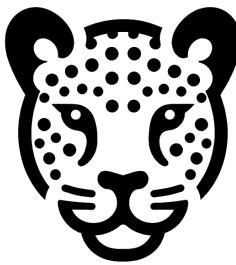
# Project TNP WildVision

Wildlife Image Classification in West Africa

# Team Introduction



Philipp



Andreas



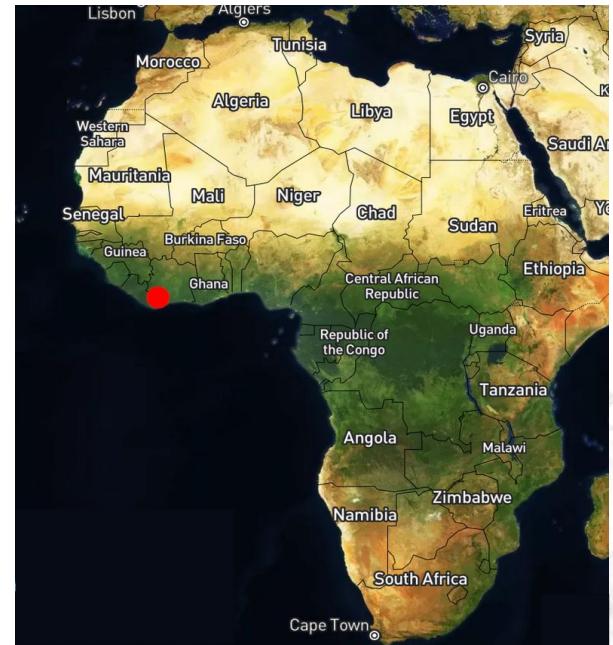
Gunther



Gabriel

# Our Stakeholder: Taï National Park

- Largest remaining rainforest in West Africa, located in Côte d'Ivoire
- Member of UNESCO's network of biosphere reserves in 1978 and added to the World Heritage List in 1982
- Home of 1,300 species of higher plants and 47 of the 54 species of large mammals known from the humid rainforests of Upper Guinea



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# Our Stakeholder: Taï National Park

- Main business goals are conservation and ecotourism
- These goals have the potential to conflict with each other
- This conflict could be alleviated by better estimations of animal counts and distribution



# Our Stakeholder: Taï National Park

- Conservation
  - More efficient allocation of resources preferentially to areas where vulnerable species are located
  - Steer tourists from areas where critically endangered species need to recover
  - Detecting sudden population drops is required to guide remedial efforts
- Tourism
  - Find locations with the most interesting wildlife
  - Keep tourists out of areas with dangerous animals
  - Increased tourism revenue can in turn boost conservation funding



# Our Data Product: TNP WildVision

- Wildlife survey expeditions are costly and would fail to count animals that flee from human presence
- Camera traps left in the rainforest are a big step forward, but manual photo analysis is still time-consuming and expensive
  - Many “false positive” sightings due to humid and warm climate
- Our solution: a machine-vision-based model to classify animals in camera trap pictures automatically

# Our Data Product: TNP WildVision

- This model can be used by park administration to make sense of their data and respond quickly to changes in wildlife patterns
  - Streamlined conservation efforts decrease park maintenance costs
- Also included: An interactive dashboard app for ecotourists that can help them plan their tour on a map and make their park experience more rewarding while delivering supplementary data to the park (details forthcoming)
  - Better tourist experiences can lead to increased revenues from ecotourism
  - "Individualizing" trips could sway customers that were previously undecided and is popular with our target demographic (wealthy Westerners)

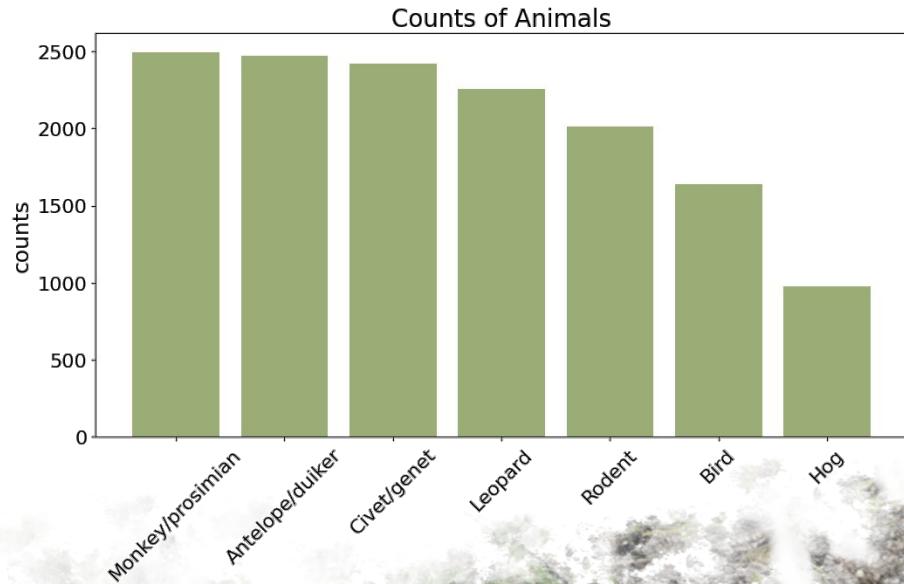
# Data Situation

- About 16500 camera trap pictures from different locations in the park are available
- The product supports a wide variety of photo quality and conditions
  - Night vs daytime, color vs grayscale, occasional timestamps
  - Animals can be partially visible
- Site identification information is obscured and randomly generated for demonstration
  - This prevents poachers and other unauthorized individuals from accessing the information
  - The customer gets full functionality via inclusion of a simple mapping



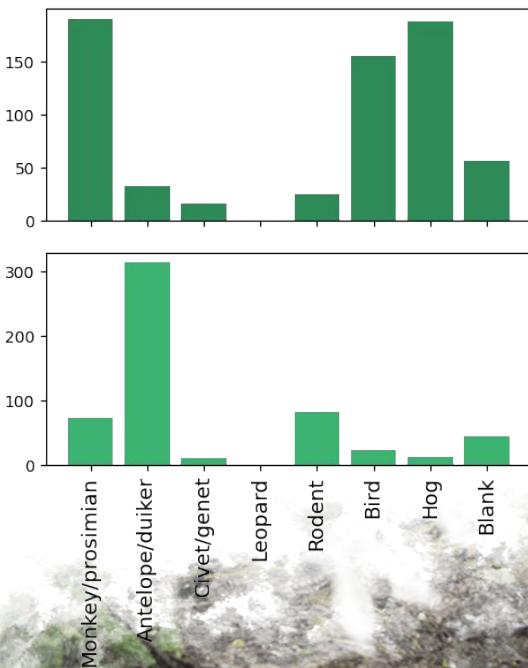
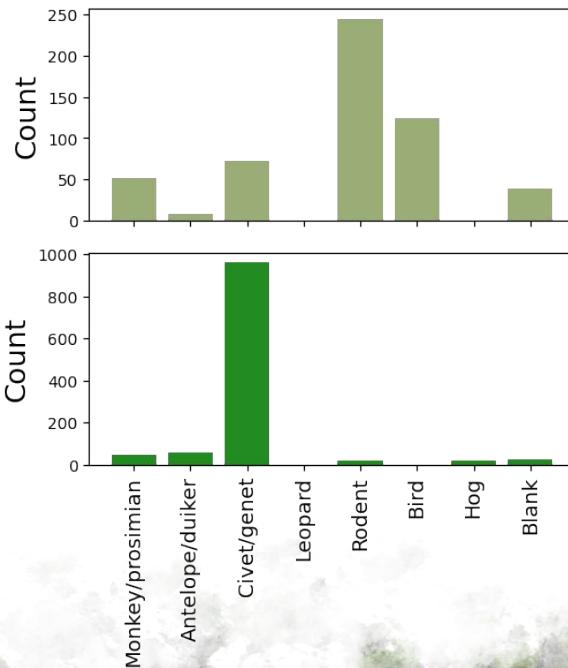
# Data Situation

- One of eight different wildlife categories are provided with each photo, in addition to photos containing no wildlife ("blank")
- The label distributions are only slightly unbalanced



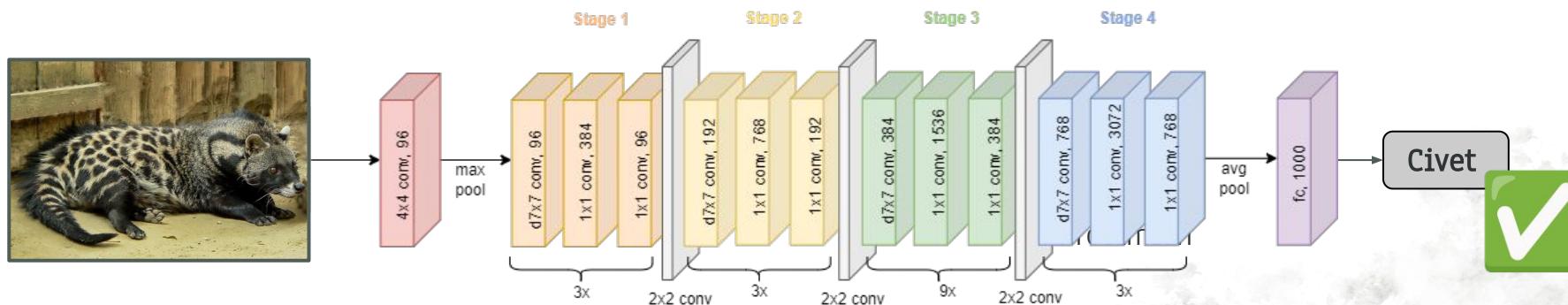
# Data Situation

Data splitting ensures that each of the 122 sites is exclusively included in one dataset while maintaining the original animal distribution.



# Modeling

- Multiclass classification realized via transfer learning building on the ConvNeXtXLarge convolutional neural network architecture
- Accuracy: training data 73%, validation data 57%, test data 46%



# Live Demonstration of Dashboard

## Interactive TNP Map

Choose your favorite animals [Show animal sightings of 2023](#)

I am a:

- Duiker Devotee
- Bird Buff
- Civet Connoisseur
- Hog Handler
- Leopard Lover
- Monkey Maniac
- Rodent Ruler

Animal sightings

Category	Sightings
Antelope/duiker	1050
Bird	700
Leopard	1700
Monkey/prosimian	1100
Rodent	1000

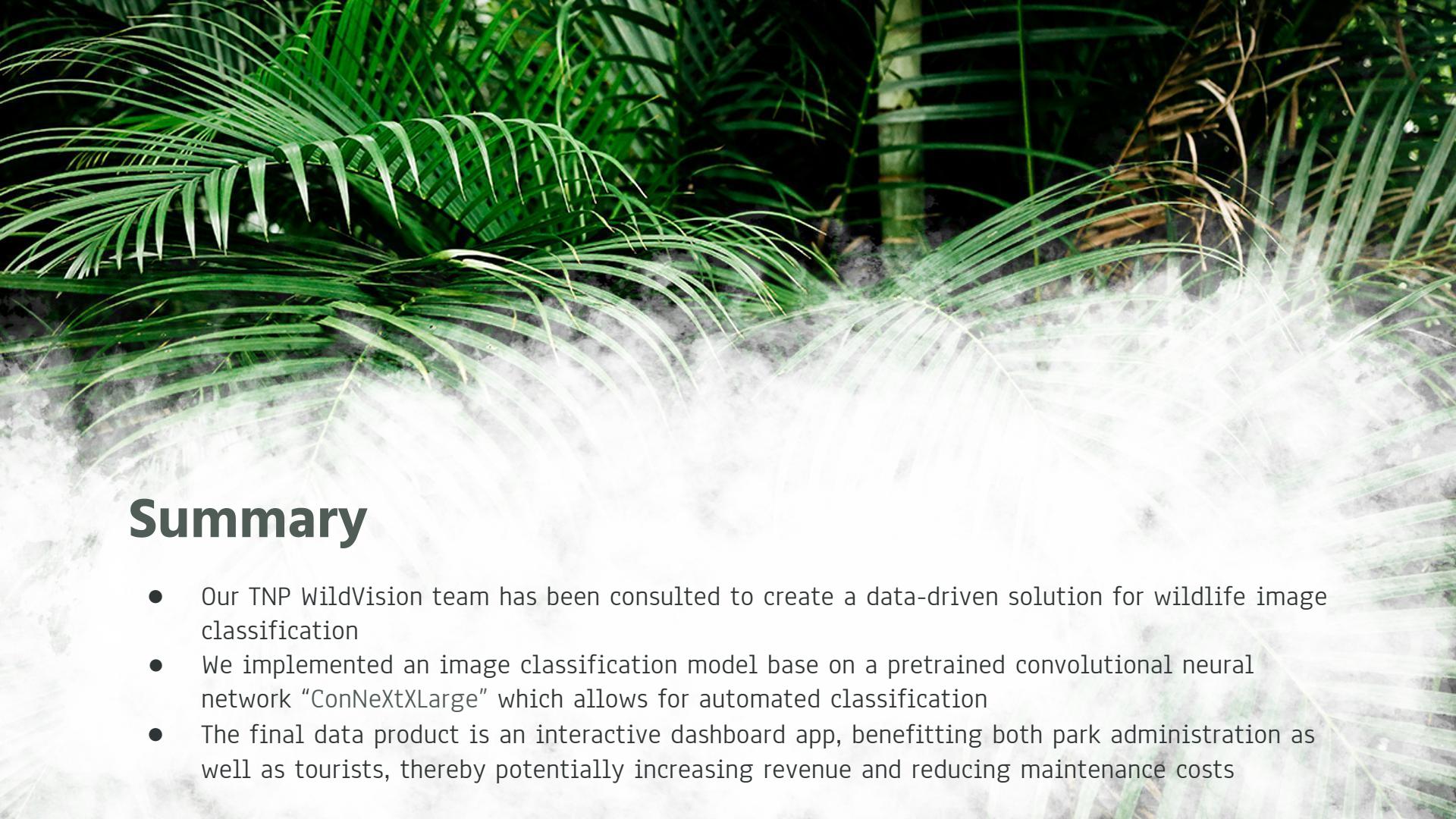
Loading... 100%

Where should I go?

# Future Work

- More error analysis
  - Identify cases in which image classification fails
- Real-time data integration to update dashboard
- Develop the mobile app version of the dashboard
  - Implement user customization
  - Integrate tools to analyze population trends
  - Include detailed information on identified animals
  - Integrate automated report generation for park administration
  - Potentially include more (fine-grained) animal classes
- Global expansion to other national parks



The background of the slide features a close-up photograph of green palm fronds. In the foreground, there is a bright, overexposed area that looks like a waterfall or a spray of water. The overall aesthetic is tropical and natural.

# Summary

- Our TNP WildVision team has been consulted to create a data-driven solution for wildlife image classification
- We implemented an image classification model base on a pretrained convolutional neural network "ConNeXtXLarge" which allows for automated classification
- The final data product is an interactive dashboard app, benefitting both park administration as well as tourists, thereby potentially increasing revenue and reducing maintenance costs

# Data Splitting

- Wildlife is not distributed evenly in our locations, which is important for focusing conservation efforts and individualizing tourist trips

