SENSEI-Panama: Visualizing and Analyzing GPS Data on the Island of Barro Colorado Using Machine Learning
An Analysis of Animal Movement Utilizing Artificial Intelligence
Presented by: Shyam Sai
Illinois Math and Science Academy
Dr. Andrew Johnson
EVL at UIC
IMSAlloquium 2017
The research

Outline

One:
Thesis Questions

Two:
Introduction and Background

Three:
Methods

Four:
Results and Discussion

Five:
Conclusions
Pre-research

Context and Motivation

SENSEI-Panama
SENSoR Environment Imaging

Old School Ecology vs. Big Data

Questions: Background · Methods · Results · Conclusions
Thesis Questions

The idea

Can we visualize animal movement data easily to facilitate observation by ecologists?

Is it possible to apply machine learning to predict and classify animal paths and species?
INTRODUCTION

How we began to think about the research

Island of Barro Colorado

The Animals
Kinkajous, Spider Monkeys, Coatis, and Capuchin Monkeys
What we used for the research

**Data**

*Data on the Island of Barro Colorado*
Aerial Imagery, Height Map, and Fruit Tree Positions

*Data on Animal Movement*
Latitude, Longitude, and Height on 23 animals over 90 days
A Timeline of the Research Project

Key Step 1: Reading and Parsing the 10GB of animal movement data

Key Step 2: Visualizing the paths of animals in an easy-to-use UI

Key Step 3: Observing using this UI and finding patterns in the data

Key Step 4: Applying Machine Learning algorithms to the Data

Key Step 5: Predicting animal positions and classifying animal species

Questions:
1. Can we visualize the data for efficient observation?
2. Can we apply artificial intelligence to predict the animal’s species and position?

Methods

Background

Results

Conclusions
Visualizing the data

Species Proximity

Questions · Background · Methods · Results · Conclusions
Fruit Tree Proximity

Visualizing the data

Ateles geoffroyi
Nasua narica
Cebus capucinus
Potos flavus

Questions
Background
Methods
Results
Conclusions

Percent of time spent within 100 feet to fruit trees
The Artificial Intelligence
### Classifying Species using Location

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<th>Ateles geoffroyi</th>
<th>Cebus capucinus</th>
<th>Nasua narica</th>
<th>Potos flavus</th>
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Different Animal species spend time in different parts of the island

74.6% accuracy
Classifying Species using Location and Proximity to Fruit Trees

Accurate Prediction System
93.2% accuracy
Predicting Animal Position
Conclusions

- Animals very often travel in groups based on species
- *Nasua Narica* and *Ateles Geoffroyi* spend significantly more time in proximity to fruit trees than other species
- Classification of Species by Location has 74.6% accuracy
- Classification of Species by Location and Proximity to Fruit Trees has 93.2% accuracy
- It is possible to predict the location of an animal 5 minutes in the future given its current location
Meet the lab

The Electronics Visualization Laboratory at the University of Illinois Chicago

Dr. Andrew Johnson
Director of Research at EVL

Jillian Aurisano
Graduate Student at UIC EVL

James Hwang
Undergraduate Student at UIC EVL

Tanya Berger-Wolf
Professor of Computer Science

Questions · Background · Methods · Results · Conclusions
Thank You

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• University of Illinois Chicago