

Problem Statement

Ethologists/Ecologists face spatial & temporal bias in behavioral analysis due to coarsely populated location data. These location gaps are due to the obstacles in battery consumption, size, & signal strength that animal-bourne GPS devices face. The current approach of using linear path-interpolation is insufficient because it over-simplifies the path & indirect nature of animal movement.

Data



Figure 1) Input training and testing data: Turkey Vulture geolocation data from movebank.org

Model

Based on environment & behaviors we track, what are these reward systems? Essentially learning rewards given policy and information about how the agent moves from states with actions

Given policy π , environment states S , actions A , & reward function R :

The diagram consists of two blue rounded rectangles side-by-side. The left rectangle contains the text "Known:" above the equation $\pi : S \rightarrow A$. The right rectangle contains the text "Unknown:" above the variable R .

Agent - model that acts and learns within our environment

Environment - the limited space that the agent exists within that defines rules of what is possible

State - relevant information about environment
with respect to agent's actions and results

$$s_{t+1} = f(s_t, a_t)$$

Actions (a_t) - agent can perform actions that alter the state

Policy - the set of rules an agent follows to determine action it should take given its observations about the environment

$$\pi : s \rightarrow a$$

Returns - environment provides returned value to agent after it takes an action (reward or punishment)

$$R(\tau) = \sum_{t=0}^T \gamma^t r_t$$

- Maximum Entropy Inverse Reinforcement Learning:
<https://www.aaai.org/Papers/AAAI/2008/AAAI08-227.pdf>
- Implementation from: <https://github.com/yrlu/irl-imitation>

Improving Coarsely Populated Geolocation Data with Inverse Reinforcement Learning

CSCI470: Machine Learning

Seth Asadi, Zach Mills, Alex Pollock, Leah Reeder, & Dominic Quintana

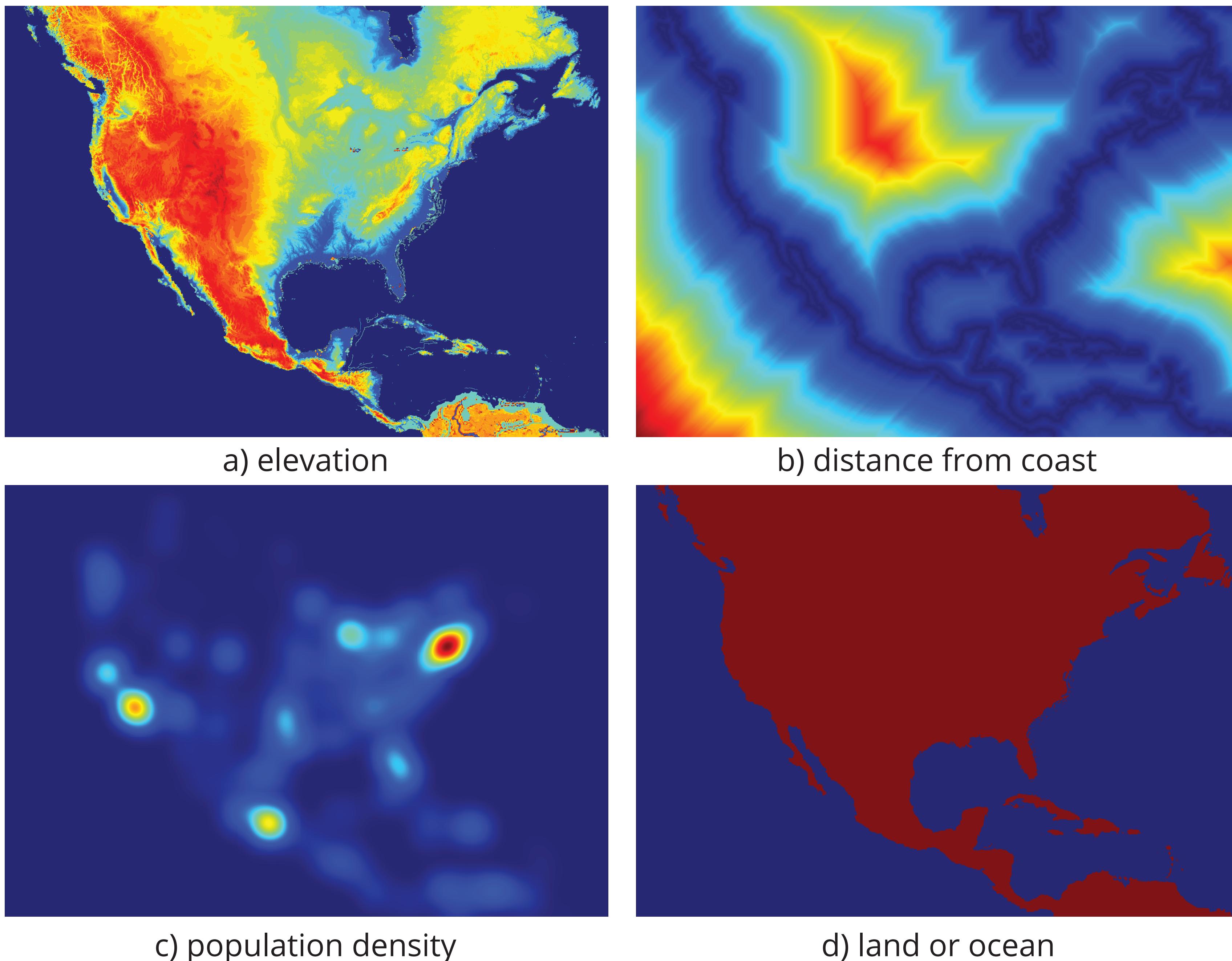


Figure 2) Generated reward maps of features: (a) elevation (b) distance from coast (c) population density (d) ocean or water

Preliminary Results

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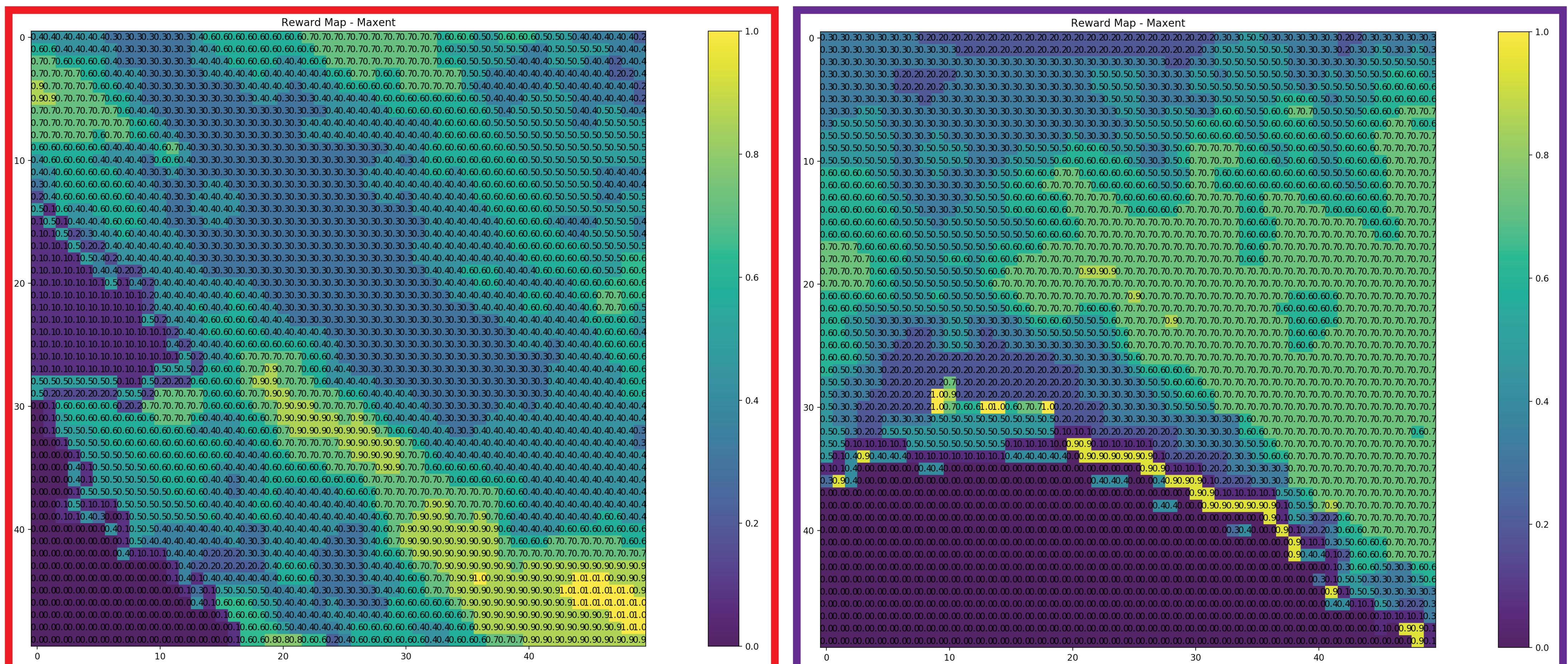


Figure 3) Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua.

Preliminary Results (continued)

Future Steps

- 1) Parallelizing the code to enable reasonable computation time for running the code over the entire dataset
 - 2) Also using deep learning (why??)