Machine Learning Guidelines for Natural Resource Management Practitioners

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Contents

Chapter 1

Motivation

As machine learning (ML) has become a powerful tool, it is noted by some that ML has not been widely used in environmental studies. This booklet is meant to provide a concise guide for natural resource management practitioners. This book serves as a staring point rather than a comprehensive resource, so that practitioners can have a basic understanding of how ML works and how to utilize it to analyze data and answer research questions. When appropriate, we provide case studies and R code as well as other online resources to help the readers on the journey of gaining one powerful tool that seems to be omnipresent in the research world.

Chapter 2

Introduction

What is machine learning? Essentially, machine learning teaches computer models to look for patterns or make predictions. This might sound like magic or it might seem complicated, but you can think of machine learning models as finding underlying formulas that the data come from. To solve for such formula, many, many mathematical calculations are involved. As we human beings are prone to mistakes, as long as we can identify a framework, we can give the framework and data to a computer model. It is best at repeating meticulous calculations to find a best guess based on our believes of the system and the data we observed.

2.1 Supervised Learning

2.2 Unsupervised Learning

Chapter 3

Data

3.1 What to do with data?

One could argue that data is the single most important ingredient when it comes to machine learning models or any type of analysis. As one might say, junk in, junk out.

3.2 Data Requirement

Chapter 4

Evaluation

4.1 Continuous Responses

4.2 Discrete Responses

4.3 Cross Validation

Chapter 5

Machine Learning Methods

Here we provide a list of commonly used machine learning methods and some brief discussion.

5.1 Random Forest

Chapter 6

Presentation

It is also important to present the results in a way that aids rather than impede communication.

6.1 Table

6.2 Figure

Chapter 7

Ethical Considerations

7.1 Reproducibility

Chapter 8

Appendix

8.1 Do's and Don'ts