**UNIVERSIDADE ESTADUAL DE MARINGÁ**
**PRÓ-REITORIA DE ENSINO**

# PROGRAMA DE DISCIPLINA

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|---|---|---|---|
| Curso: | Programa de Pós-Graduação em Bioestatística (Mestrado) | | |
| Departamento: | PBE | | |
| Centro: | De Ciências Exatas | | |
| **COMPONENTE CURRICULAR** | | | |
| Nome: **Introduction to machine learning with applications** | | | Código: **DES4076** |
| Carga Horária: **45 horas** | Crédito: **3** | **OPTATIVA** | Ano Letivo: **2022** |

## 1. EMENTA

The goal of the course is to familiarize students with popular methods of machine learning and train them in the application of those methods to real data.

## 2. OBJETIVOS

Expected learning out comes. Following completion of this course students will be a bleto:

1. Comprehend and evaluate primary literature on various aspects of machine learning.
2. Compare and evaluate alternative techniques used in machine learning.
3. Apply a machine learning approach to environmental data.

## 3. CONTEÚDO PROGRAMÁTICO

1. Introduction to machine learning, R and R Studio.
2. Version control using Gitand Git Hub. Description of the project data and data set release.
3. Clustering (hierarchical, k-means/medoids, methods for time series clustering).
4. Regression trees, random forests.
5. Neural networks, differentty peso flayers, deep learning.
6. Convolutional neural network (CNN).
7. Long short-termmemory (LSTM) network.
8. Cross-validation and forecasting.

## 4. METODOLOGIA

The coursewillbe in the English language using board, audiovisual and written aids.
The course will include lectures, coding demonstrations, and students working in small groups to implementthe concepts in practice. In particular, R, RStudio, and Git Hub will be introduced in the first sessions. Then the students will receive a data set of real ocean observations, such as a multi-year data set from Argo float sor Chesapeake Bay monitoring program for a number of variables, to practice the methods, coding, and collaboration on the analysis. Whe never possible, the groups will combine students from different backgrounds for the students to collabor ate across disciplines. Each session (each day) will introduce a new concept, with time att heendo feach session allotted to work in small groups on the project.

## 5. AVALIAÇÃO

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The learning progress evaluation and feedback will be provided by the instructor and peersat two sessions of group project presentations, att heendo feach week of the course.

6. REFERÊNCIAS

6.1- Básicas (Disponibilizadas na Biblioteca ou aquisições recomendadas)


BERK, R. A. (2016). Statistical learning from a regression perspective. 2nd Ed. Springer, Cham.

GOODFELLOW, I., BENGIO, Y., & COURVILLE, A. (2016). *Deep learning*. MIT press.

GIGLIO, D., LYUBCHICH, V., & MAZLOFF, M. R. (2018). Estimating oxygen in the Southern Oceanusing Argo temperature and salinity. *Journal of Geophysical Research: Oceans*, *123*(6), 4280-4297.

HASTIE, T., TIBSHIRANI, R., & FRIEDMAN, J. (2009). The elements of statistical learning. 2nd ed. Springer.

NESSLAGE, G., LYUBCHICH, V., NITSCHKE, P., WILLIAMS, E., GRIMES, C., & WIEDENMANN, J. (2021). Environmental drivers ofgoldentilefish (Lopho latilus chama eleonticeps) commercial landings and catch per unit effort. *Fisheries Oceanography*.


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