Deep-Learning Models Benchmarking with Multi-Class Plankton Image

Benchmarking CNN and GCN for Plankton Classification

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Update 1

- Selected and prepared plankton dataset from IFCB source
- Chose 4 plankton classes with balanced data samples
- Preprocessed data: resized, normalized, augmented
- Performed EDA to visualize class distribution

Introduction

- **Objectives**: To benchmark and compare the performance of various deep learning models, including Convolutional Neural Networks (CNNs) and Graph Convolutional Networks (GCNs), on plankton classification tasks.
- **Goals**: Identify the most effective architecture for accurately classifying plankton species.
- **Dataset**: Images from the Imaging FlowCytobot (IFCB)
- **Variables**: Class labels (species), image files
- **Data Cleaning**: Choosing 4 classes from the raw data folder:
- Represents a genus (no mixing, no non-plankton image, etc)
- Every class contains similar amount on files

Data Science Methods

- Image preprocessing: resizing, normalization, augmentation
- Modeling methods: CNNs (ResNet50, EfficientNet, DenseNet, MobileNet) and GCNs
- Tools: TensorFlow, seaborn, matplotlib

Exploratory Data Analysis

Explanation of Dataset

Plankton Class	Count
Dinobryon	588
Pseudonitzschia	578
Dactyliosolen	532
Corethron	447

- Data classes: Image files (PNG)
- Labels: Plankton genus

Data Preparation

- Resized images to 224x224 pixels
- Normalized pixel values to [0, 1]
- Performed data augmentation (flipping, rotation)
- Split into training and test datasets

Data Visualizations

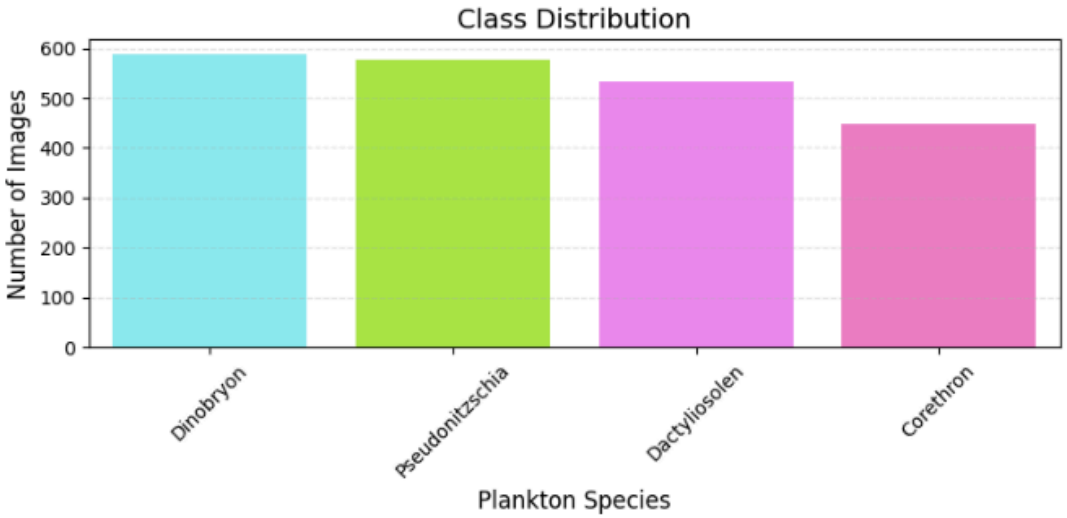

Figure 1: Distribution of image count across selected plankton classes.

Variable Correlations

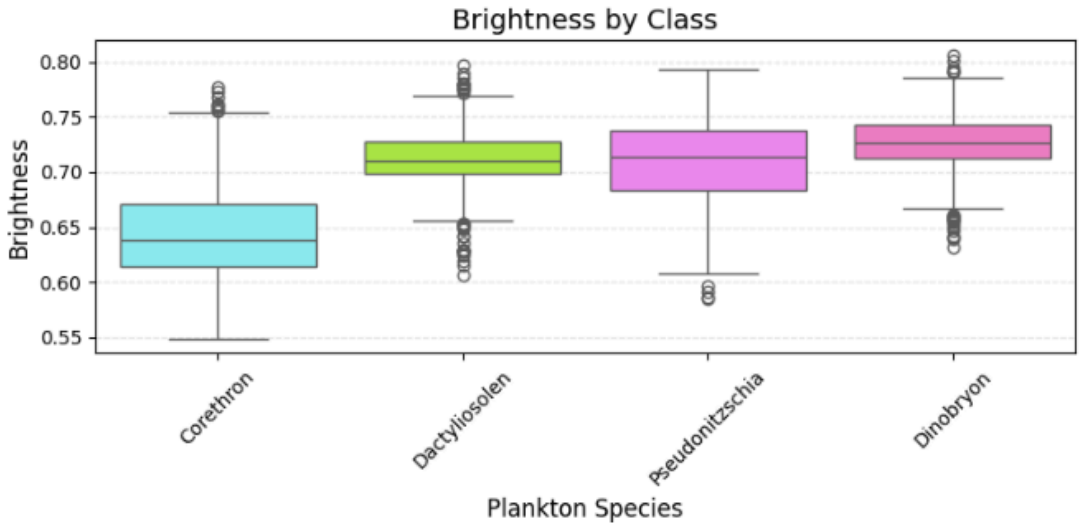

Figure 2: Brightness distribution across the selected plankton classes.

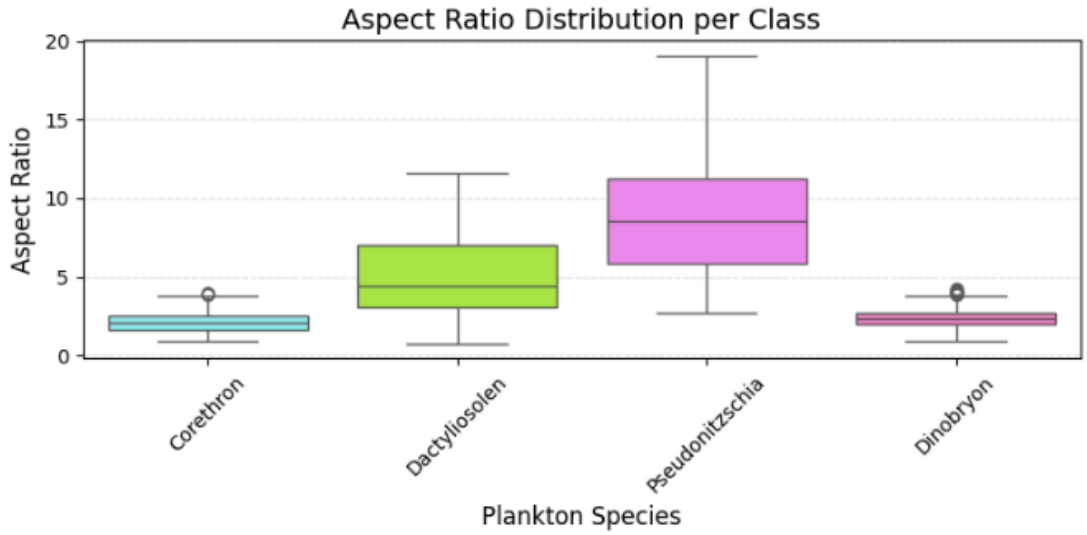

Figure 3: Distribution of aspect ratios for images in each plankton class.

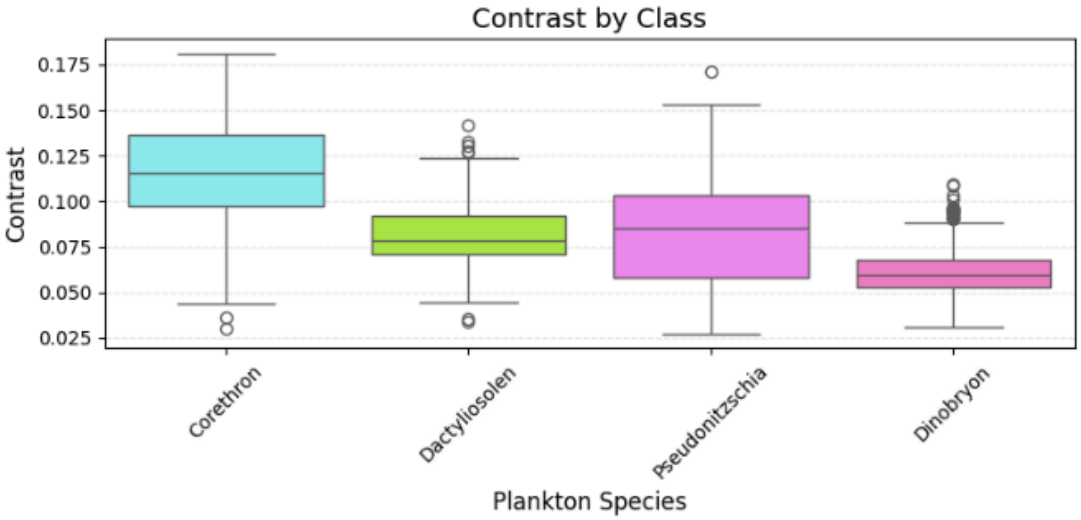

Figure 4: Contrast values distribution across the selected plankton classes.