

SHIP CLASSIFICATION USING IBM WATSON

1. INTRODUCTION

1.1. Overview

In this project, we introduce a new convolutional neural network classification algorithm capable of classifying five classes of ships, including cargo, military, carrier, cruise and tanker ships, in inland waterways. All the images are present in a single folder so we will first be dividing them into categories with the help of a train.csv file that contains all the filenames of the training images.

The model used to train the model is VGG16, a computer vision model which is based on Convolutional Neural Networks (CNN). We will be using the pre-trained weights of the model and modify the top layer for performing our custom classification. The model is deployed using the Flask framework.

1.2. Purpose

The purpose of ship classification is to identify various types of ships as accurately as possible, which is of great significance for monitoring the rights and interests of maritime traffic and improving coastal defense early warnings.

2. LITERATURE SURVEY

2.1. Existing problem

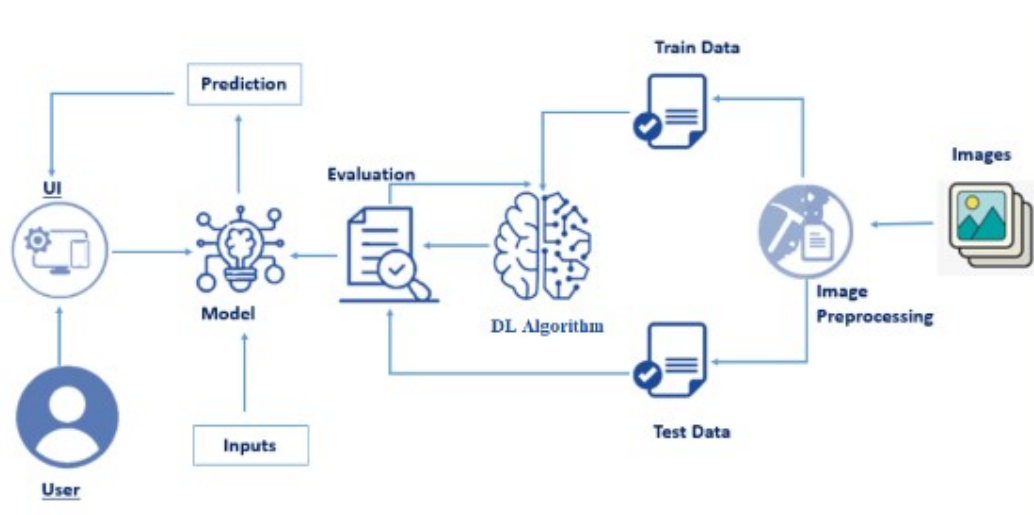
In recent years, deep learning has been used in various applications including the classification of ship targets in inland waterways for enhancing intelligent transport systems. Various researchers introduced different classification algorithms, but they still face the problems of low accuracy and misclassification of other target objects. Hence, there is still a need to do more research on solving the above problems to prevent collisions in inland waterways.

2.2. Proposed solution

In order to solve the problems for the accuracy of the classification system, we proposed a new classification model. First, based on the pretrained models, the models were fine-tuned with the public dataset we used. Based on their performance, the best model was selected in order to further adjust the performance for high accuracy in classifying ships in inland river waterways. After selecting the best model, the model was adjusted, and classification was conducted based on the modification of the network.

3. THEORITICAL ANALYSIS

3.1. Block diagram



3.2. Hardware/software design

Software

- **Anaconda Navigator :** Anaconda Navigator is a free and open-source distribution of the Python and R programming languages for data science and machine learning-related applications. It can be installed on Windows, Linux, and macOS. Conda is an open-source, cross-platform, package management system. Anaconda comes with so very nice tools like JupyterLab, Jupyter Notebook, QtConsole, Spyder, Glueviz, Orange, Rstudio, Visual Studio Code. For this project, we will be using a Jupyter notebook and Spyder.

Python packages:

- **NumPy :** NumPy is a Python package that stands for 'Numerical Python. It is the core library for scientific computing, which contains a powerful n-dimensional array of objects.

- Pandas : pandas is a fast, powerful, flexible, and easy-to-use open-source data analysis and manipulation tool, built on top of the Python programming language.
- Matplotlib: It provides an object-oriented API for embedding plots into applications using general-purpose GUI toolkits
- Keras: Keras is an open-source library that provides a Python interface for artificial neural networks. Keras acts as an interface for the TensorFlow library. Up until version 2.3, Keras supported multiple backends, including TensorFlow, Microsoft Cognitive Toolkit, R, Theano, and PlaidML. Designed to enable fast experimentation with deep neural networks, it focuses on being user-friendly, modular, and extensible.
- TensorFlow: TensorFlow is just one part of a much bigger, and growing ecosystem of libraries and extensions that help you accomplish your machine learning goals. It is a free and open-source software library for data flow and differentiable programming across a range of tasks. It is a symbolic math library and is also used for machine learning applications such as neural networks.
- Flask: Web framework used for building Web applications

Hardware

Device name : DESKTOP-J5SC39S

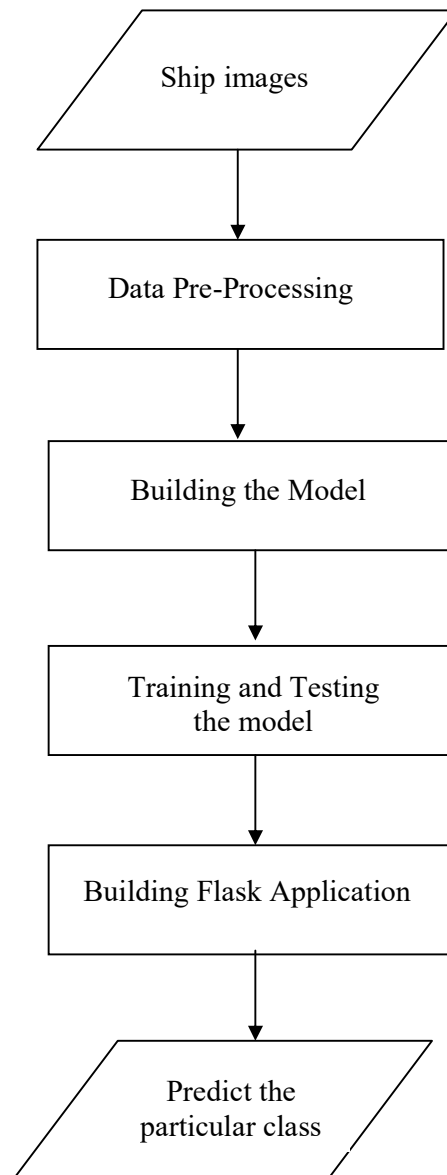
Processor : Intel(R) Pentium(R) Gold G5420 CPU @ 3.80GHz
3.79 GHz

System type : 64-bit operating system, x64-based processor

4. EXPERIMENTAL INVESTIGATIONS

The images need to be organized before proceeding with the project. The original dataset has a single folder known as images. We will be using the train.csv file to fetch the image ID's of training images. Then we are creating subdirectories with in train folder and move images to them. The dataset images are to be pre-processed before giving to the model. We will create a function that uses the pre-trained VGG16 model for predicting custom classes. Then we have to test and train the model. After the model is build, we will be integrating it to a web application.

5. FLOWCHART



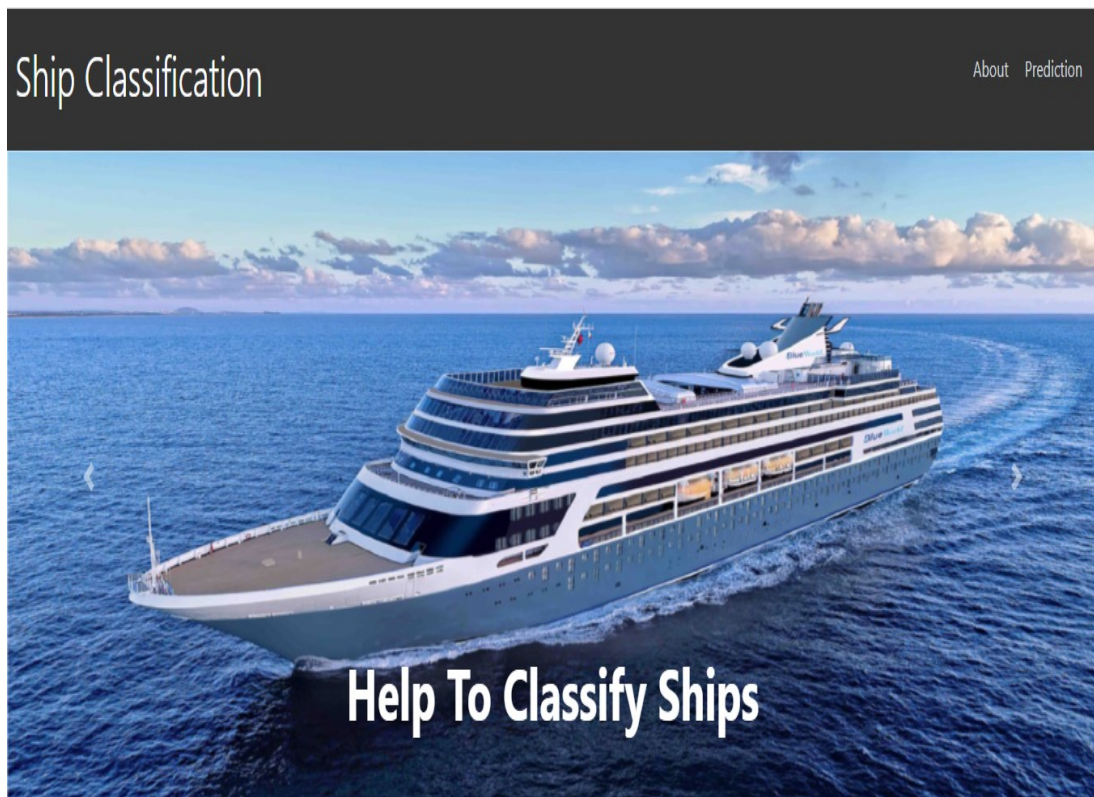
6. ADVANTAGES

- Easy to use
- Time efficient
- Cost efficient

7. RESULT

The output of this project is if we are giving an image of ship then it will predict which category it belongs to.

Screenshot



ABOUT PROJECT

Problem:

Ship or vessel detection has a wide range of applications, in the areas of maritime safety, fisheries management, marine pollution, defence and maritime security, protection from piracy, illegal migration, etc.

Solution:

In this project, we will be building a deep learning model that can detect and classify various types of ships. A web application is integrated with the model, from where the user can upload an image see the analyzed results.

WE CLASSIFY



CARGO

A cargo ship or freighter is a merchant ship that carries cargo, goods, and materials from one port



CARRIER



world's seas and oceans each year, handling the bulk of international trade.

At its most basic level, a carrier ship is simply a ship outfitted with a flight deck -- a runway area for launching and landing airplanes. This concept dates back almost as far as airplanes themselves.

Cruise ships are large passenger ships used mainly for vacationing. Cruise ships typically embark on round-trip voyages to various ports-of-call, where passengers may go on tours known as shore excursions.



MILITARY

A military ship is a ship used by navy. Generally, military ships are damage resilient and armed with weapon systems.



TANKERS

Ships that facilitate the supplying of mass quantities of liquefied freight are referenced as tanker ships. They also carry liquefied gaseous substances.



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CRUISE

8. CONCLUSION

This project was about classifying the ship. This project improved the performance of the classification model for classifying ships in inland waterways. The new proposed method achieved high accuracy compared with the other existing algorithms. It was compared with other existing algorithms in classifying different classes of ships in inland waterways, and our proposed method achieved better results compared with the others.

9. FUTURE SCOPE

In future works, the proposed method will be improved in order to classify the ships in different weather conditions using more advanced technology.

10. BIBILOGRAPHY

- <https://www.mdpi.com/2078-2489/12/8/302/htm>
- <http://cs229.stanford.edu/proj2017/final-reports/5244159.pdf>
- <https://www.kaggle.com/code/teeyee314/classification-of-ship-images/log>

11. APPENDIX

Source code

<https://github.com/smartinternz02/SI-GuidedProject-319676-1664623583>