# INTRODUCTION

13   
that there must always be at least one input layer in an artificial neural network. This   
layer would be in charge of receiving the data. Then, the neurons would do calculations   
on the input data before sending it to the hidden layer. The hidden layer would take in   
a set of weighted inputs. Finally, the output layer would be the last layer of neurons that   
would produce outputs.   
 There were many types of artificial neural networks. They were classified based   
on their structure, data flow, neurons, layer s, etc. Since each type of artificial neural   
network had their differences, each type also had their own strengths. According to the   
study by Mehta (2022) entitled “A Comprehensive Guide to Types of Neural   
Networks,” it was stated that such types of artifi cial neural networks include   
Feedforward Neural Network, Radial Basis Function Neural Network, Multilayer   
Perceptron, Convolutional Neural Network, Recurrent Neural Network, Modular   
Neural Network, and Sequence -To-Sequence Models. But of all these types,   
convolutional neural networks were the most effective in image recognition.   
Convolutional Neural Network (CNN)   
 A convolutional neural network was a type of artificial neural network.   
According to the study by Mishra (2020) entitled “Convolutional Neural Ne tworks,   
Explained,” a convolutional neural network (CNN), or ConvNet, specializes in   
processing data that has a grid -like topology, such as an image. A convolutional neural   
network typically has three layers: a convolutional layer, a pooling layer, and a f ully   
connected layer, where the convolutional layer was its core building block.   
As stated above, a convolutional layer was a fundamental component of a   
convolutional neural network. It would be responsible for performing feature extraction   
on input data, particularly images. Feature extraction in convolutional neural networks

# RESEARCH OBJECTIVES

3   
Therefore, based on the findi ngs stated, the researchers came up with “Dinder:   
A Dog Matching Web -Based Application Using Convolutional Neural Networks with   
EfficientNetB0 Transfer Learning” to classify dog breeds, coat colors, and types, and   
provide image display of their offsprings in a way that would significantly reduce time   
and work. Also, this could potentially result in more precise results of searching for a   
matching dog partner.   
Specifically, the study aimed to answer the following research problems: (1)   
How to design and deve lop a dog matching web application prototype with image   
recognition of breeds, coat colors, and types as well as image display of offsprings for   
Labrador Retrievers, Pomeranians, Poodles, Pugs, and Shih -Tzus ? (2) How to conduct   
model evaluation based on th e accuracy, precision, recall, and F1 -score of pre -trained   
CNN models, ResNet50, VGG16, and EfficientNetB0, with distinct numbers of   
parameters, to determine which transfer learning model to integrate? (3) How to   
examine the performance of the models devel oped integrated into the prototype through   
actual testing?   
Research Objectives   
 Generally, the study aimed to design and develop a prototype for dog matching in   
the form of a web application integrated with deep neural networks, particularly transf er   
learning -based convolutional neural network (CNN) models, with the transfer learning   
model selected through evaluations of several pre -trained CNN models having distinct   
numbers of parameters or weights for the benefit of dog owners in potentially reduc ing   
the time and effort taken to search for a preferred dog partner for their dogs.   
Specifically, this study sought:

# LITERATURE OF THE STUDY

Hardware and Software Resources   
Hardware   
● 1.00 TB Disk Storage   
● 8.00 GB RAM   
● Intel® Core™ i3 -1115G4 Processor   
Software   
● Visual Studio Code 1.73.1   
● Figma   
● SQLite 2.2.0   
● Google Colab   
● Python 3.10.7   
● Git 2.38.0

# METHODOLOGY - Research Design

CHAPTER III   
RESEARCH METHODOLOGY   
In this chapter, the methodologies employed by the researchers to accomplish   
the objectives of the study would be presented. It would enumerate the research design,   
fact-finding technique, algorithm analysis, data model generation, model evaluation,   
image recognition, offspring image display, development methodology, prototype   
actual testing, and software used in the development.   
Research Design   
This study was conducted with the use of experimental and developmental   
research design methods. As stated by Arikunto (2006), an experimental research   
design was a study that aimed to know if there was an effect on the variable being   
studied. This method was utilized in order to determine the best -performing pre -trained   
convolutional neural network model in terms of image classification with respect to the   
datasets collected.   
Furthermore, as defined by Richey (1994), developmental research was the   
systema tic study of designing, developing, and evaluating instructional programs,   
processes, and products that must meet the criteria of internal consistency and   
effectiveness. The researchers used developmental research to determine the features   
to be developed for the system. It was also used to assess the system's consistency and   
efficacy during development.

# METHODOLOGY - System Development Methodology

50   
There were many SDLC models to be used for software development, each with   
their own strengths and weaknesses, but the Rapid Application Development (RAD)   
model was chosen for the development of this study.   
According to Dopico (2019), RAD was a form of agile software development   
methodology that prioritizes rapid prototype releases and iterations. As a result, it could   
deliver developed software and make changes q uickly while aiming to deliver a product   
that more closely fits the needs of the user through consistent testing and tweaking. The   
process of RAD as shown in the figure above consisted of four (4) main phases that   
steer the development process. The process es of the researchers during the phases of   
analysis and quick design, prototype cycles, testing, and implementation, were   
discussed in the following:   
 Analysis and Quick Design   
In this phase, the researchers defined the requirements, scope, and goals   
of the web application, Dinder. Through intensive brainstorming and research   
from existing matching applications, the researchers were able to determine the   
features developed. With the requirements set out, the researchers then set up   
meetings in order to det ermine the scope and goals of the study which included   
the timeline of the development.   
Prototype Cycles   
The researchers started building out the prototype during this phase. Due   
to the lengthy process of gathering cross breed dog images for the online   
application, this phase took quite some time. This phase continued until the   
researchers determined that the product was ready to be finalized.

# RESULTS AND DISCUSSION - Overall Record of Actual Testing

ISO Forms

# RESULTS AND DISCUSSION - RESEARCH OBJECTIVE 1:

Dataset Screenshots

# RESULTS AND DISCUSSION - RESEARCH OBJECTIVE 2:

● six==1.16.0   
● SQLAlchemy==1.4.42   
● tensorboard==2.8.0   
● tensorboard -data-server==0.6.1   
● tensorboard -plugin -wit==1.8.1   
● tensorflow==2.8.0   
● tensorflow -io-gcs-filesystem==0.27.0   
● termcolor==2.1.0   
● tf-estimator -nightly==2.8.0.dev2021122109   
● typing\_extensions==4.4.0   
● urllib3==1.26.12   
● Werkzeug==2.2.2   
● wrapt==1.14.1

# RESULTS AND DISCUSSION - RESEARCH OBJECTIVE 3:

67   
   
   
   
Figure 36. Black pug and black shih -tzu possible offspring images.   
   
The possible offspring images for black pug and black shih -tzu returned   
by the prototype seemed logical upon observation.

# CONCLUSION

68   
CHAPTER V   
SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS   
This chapter would briefly discuss the summary of findings, conclusions, and   
recommendations for future researchers that were reached by this study’s researchers   
after conducting their research.   
Summary   
The study aimed to design and develop a dog matching web application   
prototype as well as image display of offsprings for Labrador Retrievers, Pomeranians,   
Poodles, Pugs, and Shih -Tzus. During the course of the study, the researchers   
discovered that in most of the studies, the ResNet50 pre -trained model always   
outperformed the other pre -trained models with the large datasets the other researchers   
used. Moreover, through the intense reading of various literature regarding deep   
learning, particularly artificial neural networks, the researchers learned that there was   
more to Artificial Intelligence (AI) than si mply focusing on machine learning   
algorithms. Most importantly, the researchers discovered that one cannot simply apply   
any pre -trained models to their model just because it was said to be the most accurate   
several factors, especially the size of the datas et affect accuracy.   
Conclusions   
Based on the findings of the study from the objectives, the researchers have   
reached the following conclusions and generalizations:   
1. In developing the prototype, the researchers discovered that the use of Flask as   
the backend framework for the prototype fit very well with the RAD software   
development methodology’s quick process of development.

# RECOMMENDATIONS

APPENDIX C   
Curriculum Vitae