

The background features a series of concentric, hand-drawn circles in a light gray color. A solid white circle is positioned on the right side of the image, partially overlapping the gray circles.

DTSA  
5511

# Parkinson's Disease Detection

Using Hand-Drawn Images

# OUTLINE

## PART 1

Introduction

## PART 2

EDA

## PART 3

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## PART 4

Results

## PART 5

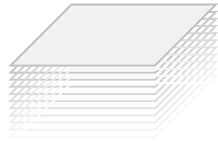
Discussion

## PART 6

Conclusion

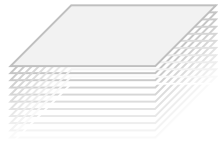


# 01 Introduction



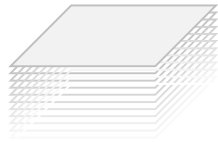
## Motivation

The increasing prevalence of Parkinson's Disease (PD) highlights the need for early, accurate, and automated detection using hand-drawn patterns.



## Problem

PD affects motor skills, making early detection critical. Can deep learning accurately classify PD vs. non-PD based on hand-drawn images?



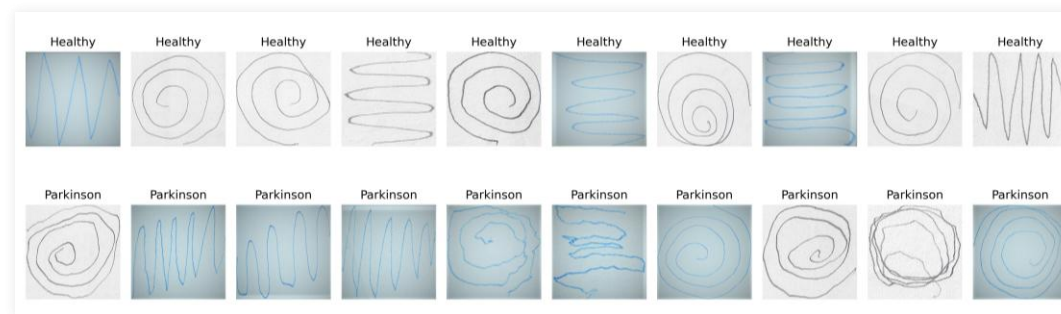
## Approach

Applied CNN-based models for classification and compared their performance with some traditional machine learning models.

# 02 EDA

3,264 Images (1,632 Healthy 1,632 Parkinson)

This dataset consists of hand-drawn spirals and waves.



# 1

## Data Splitting

80% for training  
20% for testing

# 2

## Data Cleaning

0 missing file  
0 corrupted image  
0 extreme value

# 3

## Data Preprocessing

Resize all images to  
256x256 pixels.

Load image data for deep  
learning.

Extract features for  
traditional models.

## Deep Learning

(Custom)

CNN

(Transfer Learning)

MobileNetV2

VGG16

DenseNet121

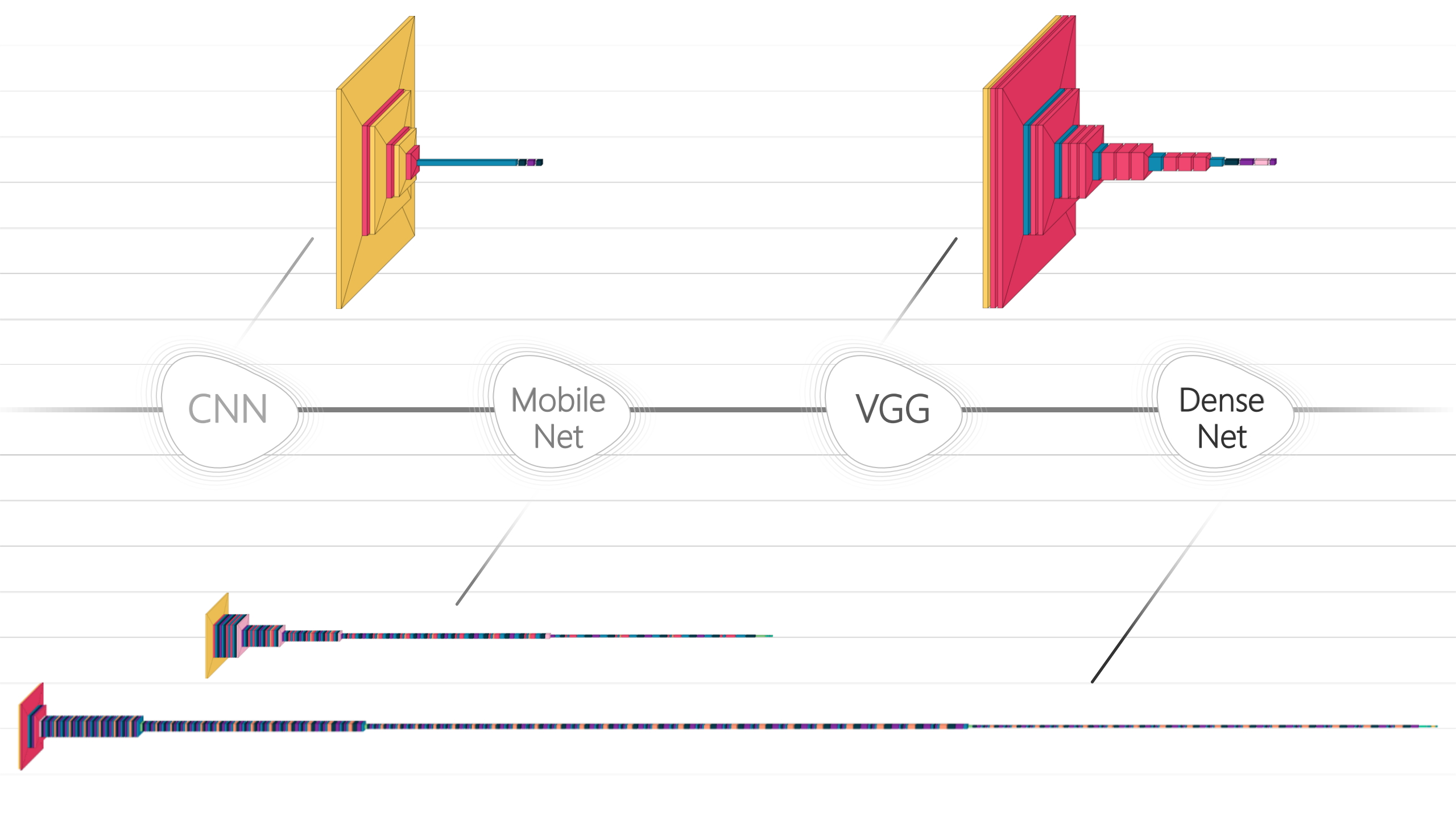
## Traditional ML

Support Vector Machine

K-Nearest Neighbor

Random Forest

# 03 Models



# 04 Results

Model	Accuracy (%)	Confusion Matrix	Error Rate (%)	Total Parameters	Model Size (MB)
CNN	96%	<div>[318 9 ]</div> <div>[ 15 311]</div>	3.68%	22.2M	84.86
MobileNet	97%	<div>[317 10 ]</div> <div>[ 8 318]</div>	2.76%	2.6M	9.87
VGG	92%	<div>[323 4 ]</div> <div>[ 51 275]</div>	8.42%	15M	57.14
DenseNet	97%	<div>[325 2 ]</div> <div>[ 18 308]</div>	3.06%	7.6M	28.85
SVM	92%	<div>[317 10 ]</div> <div>[ 41 285]</div>	7.81%	-	-
KNN	86%	<div>[321 6 ]</div> <div>[84 242]</div>	13.78%	-	-
RF	88%	<div>[313 14 ]</div> <div>[ 65 261]</div>	12.10%	-	-

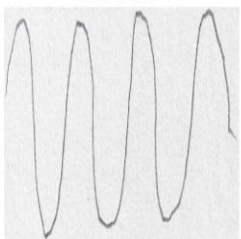
# 05 Discussion

## Misclassified Images (use MobileNetV2 as sample)

(True: 0, Pred: 1) - False Positives (FP): 10 samples (5 spirals, 5 waves)

(True: 1, Pred: 0) - False Negatives (FN): 8 samples (6 spirals, 2 waves)

Idx: 0 (FP)



Idx: 32 (FP)



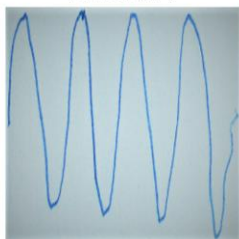
Idx: 60 (FP)



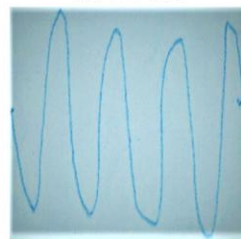
Idx: 83 (FP)



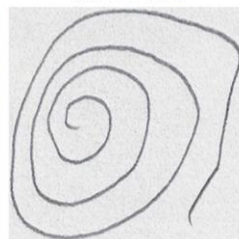
Idx: 89 (FP)



Idx: 194 (FP)



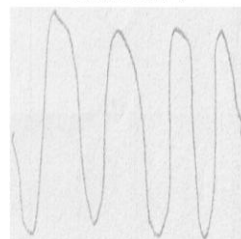
Idx: 219 (FP)



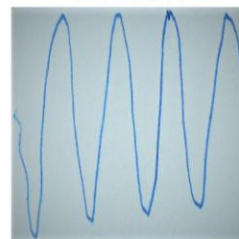
Idx: 247 (FP)



Idx: 265 (FP)



Idx: 282 (FP)



Idx: 404 (FN)



Idx: 522 (FN)



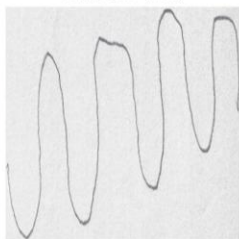
Idx: 525 (FN)



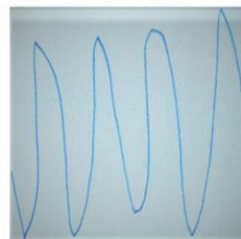
Idx: 559 (FN)



Idx: 585 (FN)



Idx: 598 (FN)



Idx: 603 (FN)



Idx: 605 (FN)





# 06 Conclusion

## Project Summary

This project explores deep learning (CNN, MobileNetV2, VGG16, DenseNet121) for early Parkinson's detection using hand-drawn images, compared with traditional models (SVM, KNN, RF).

## Key Findings

MobileNetV2 had the highest accuracy (97%) and smallest model size (9.87MB), confirming deep learning's superiority in detecting Parkinson's from hand-drawn images.

## Future Work

Future work includes expanding the dataset, incorporating multimodal data, optimizing model efficiency, exploring advanced techniques, and ensuring real-world clinical applicability.

The background features a series of thin, light-grey concentric circles that are slightly offset from each other, creating a tunnel-like or ripple effect. In the center of these circles is a solid, light-grey, irregular blob shape.

# THANKS.

[https://github.com/d93xup60126/Deep\\_Learning\\_PD\\_Detection](https://github.com/d93xup60126/Deep_Learning_PD_Detection)