

E.P.I.C.

Early Parkinson's Image Classification

Gina Santana

Background

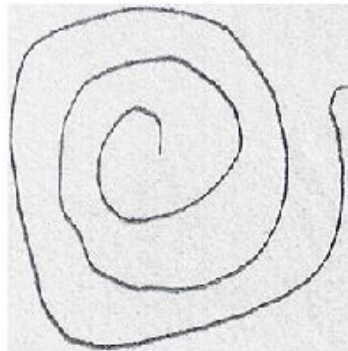
- Parkinson's Disease (PD) characteristics
 - Tremor
 - Rigidity
 - Bradykinesia
 - Imbalance
- Drawing/handwritten tests for diagnosing early PD
 - Interpreted by experts



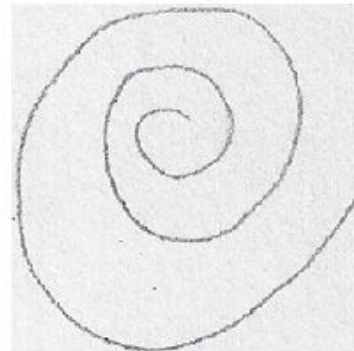
Spiral Data

- Training
 - 36 Healthy
 - 36 PD
- Testing
 - 15 Healthy
 - 15 PD
- Image Dimensions
 - 256 x 256

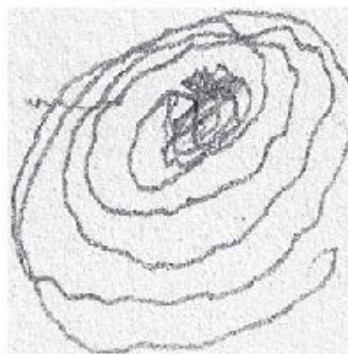
Healthy 1



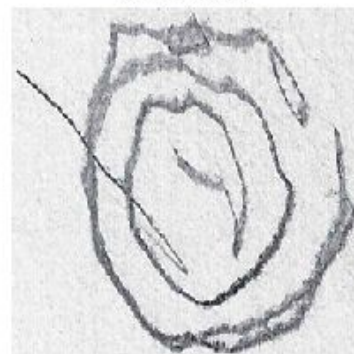
Healthy 2



Parkinson's 1



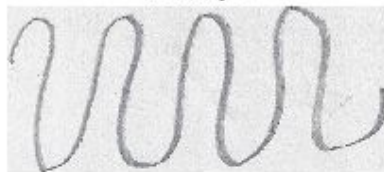
Parkinson's 2



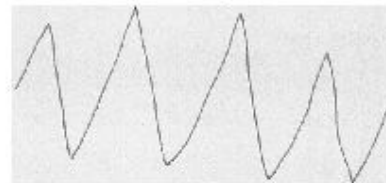
Waves Data

- Training
 - 36 Healthy
 - 36 PD
- Testing
 - 15 Healthy
 - 15 PD
- Image Dimensions (resized to)
 - 128 x 128

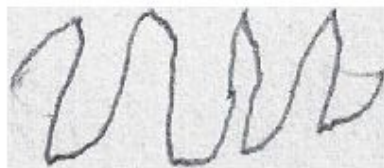
Healthy 3



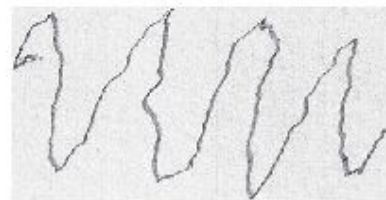
Healthy 4



Parkinson's 3



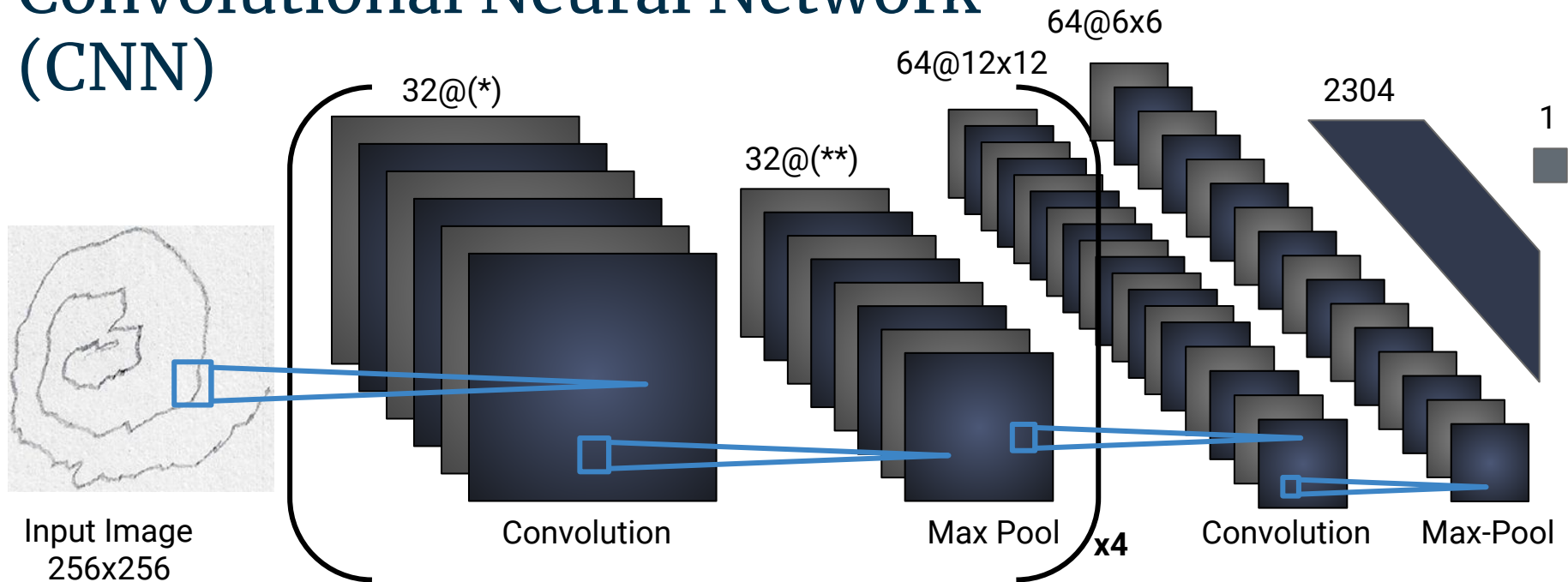
Parkinson's 4



Spiral CNN Model



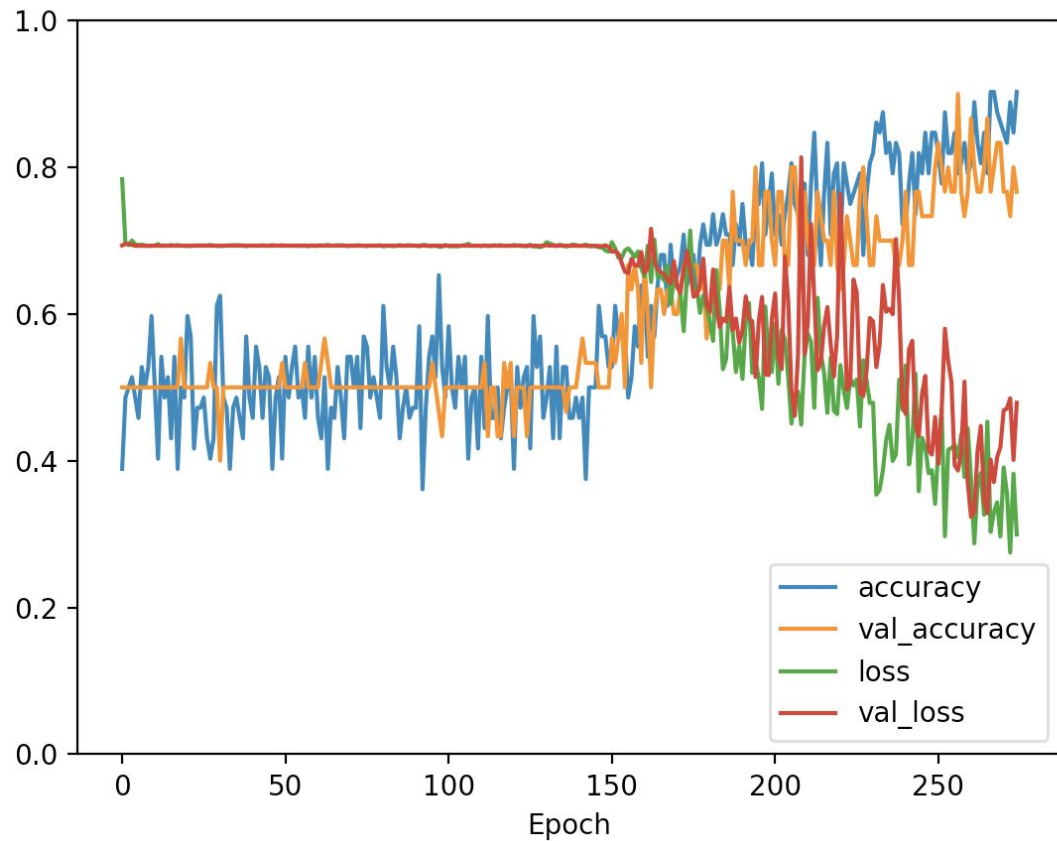
Convolutional Neural Network (CNN)



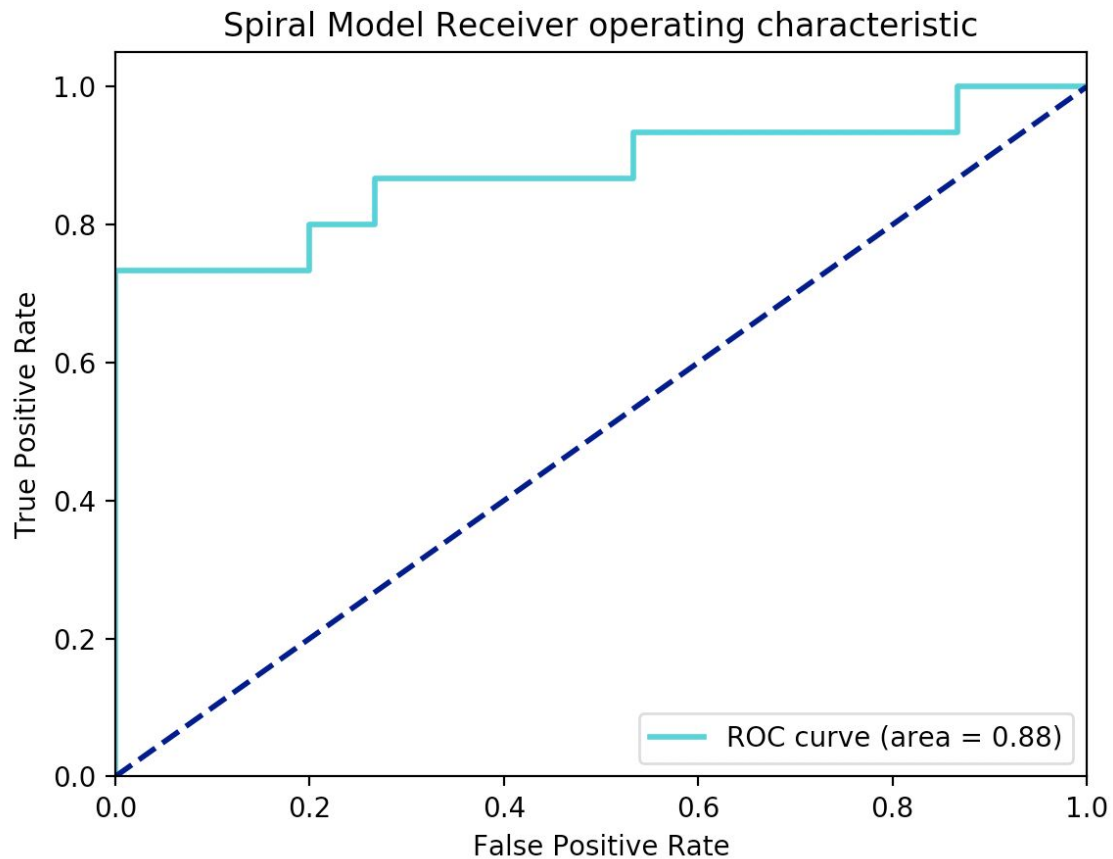
* (254 x 254), (125x135), (60x60),(30x30)

** (127x127), (62x62), (30x30), (14x14)

Trainable params: 1,200,137



Spiral Model Evaluation | Model Accuracy = 80% (400 epochs)

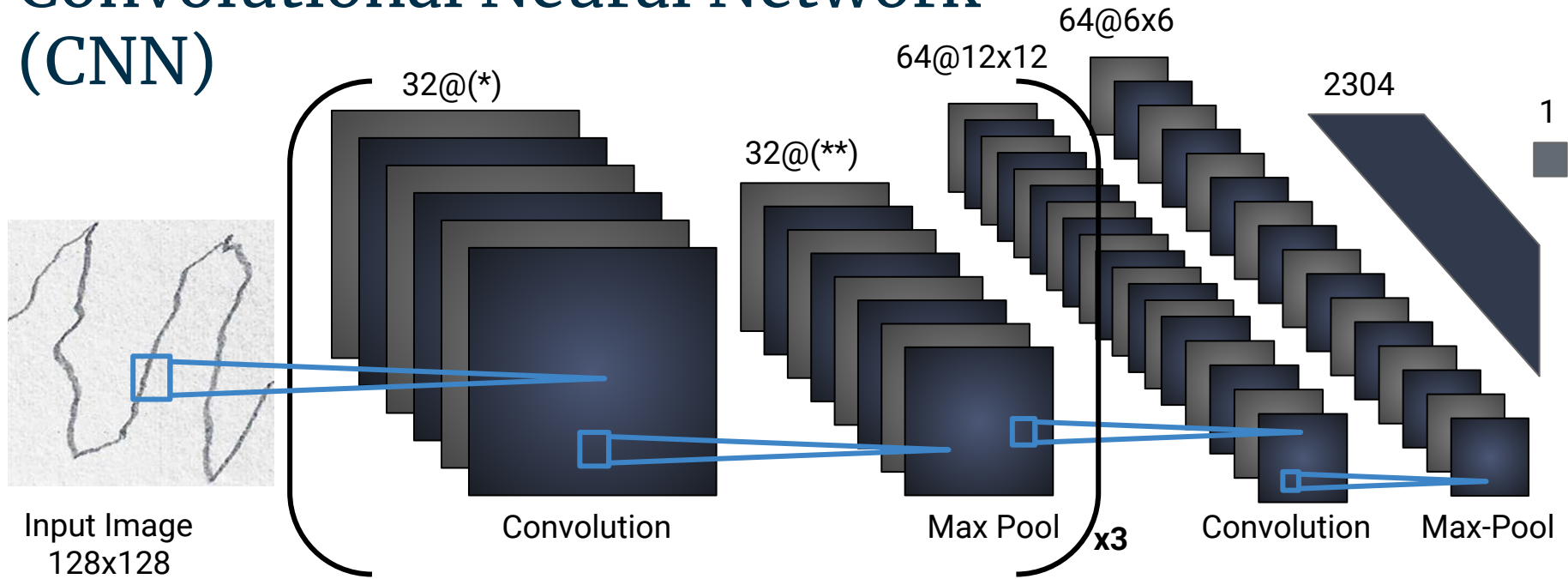


Spiral Model ROC Curve | AUC = 0.88

Wave CNN Model

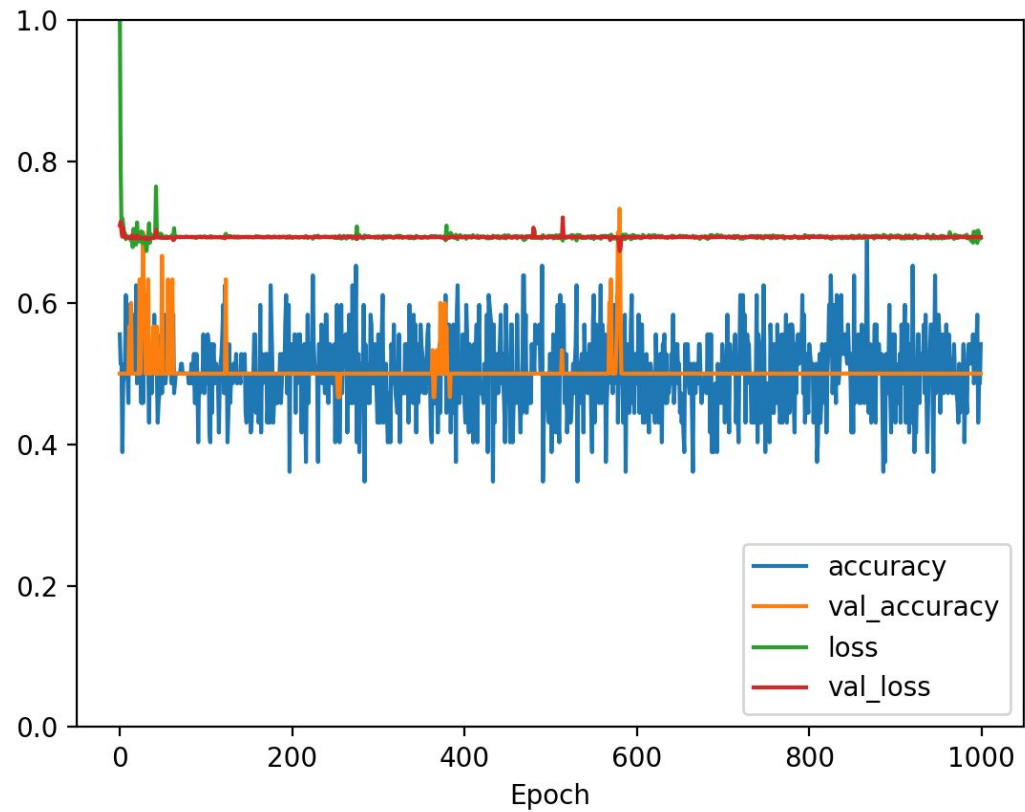


Convolutional Neural Network (CNN)

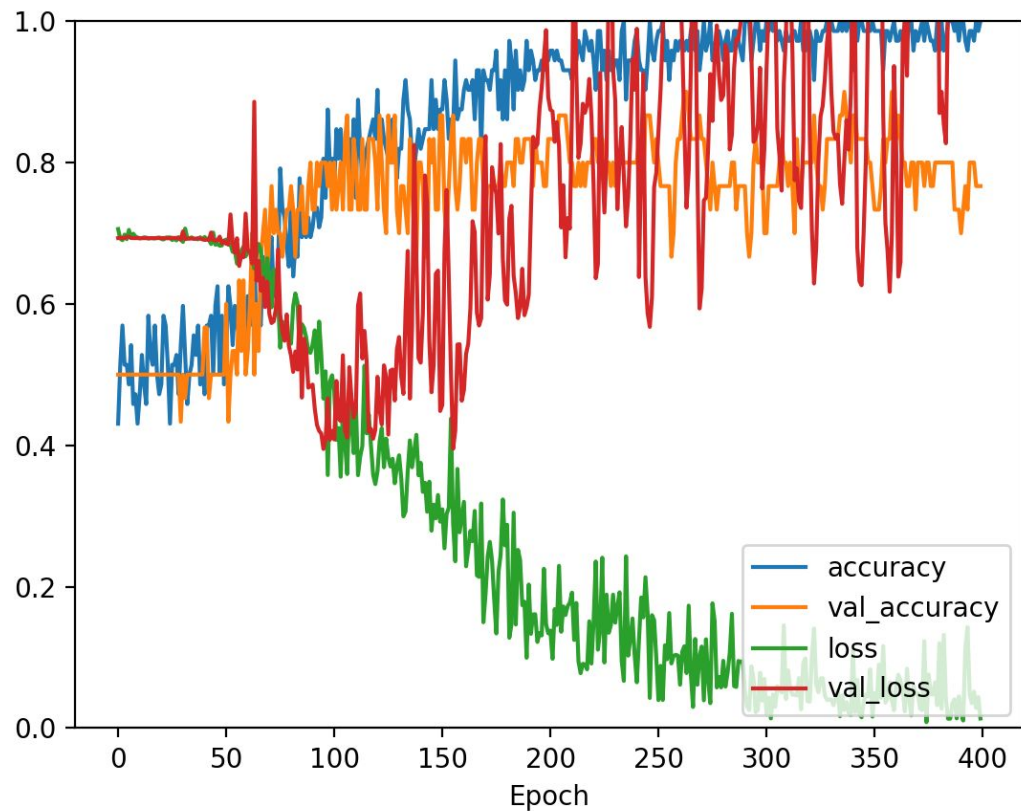


* (126 x 126), (61x61), (28x28),
** (63x63), (30x30), (14x14)

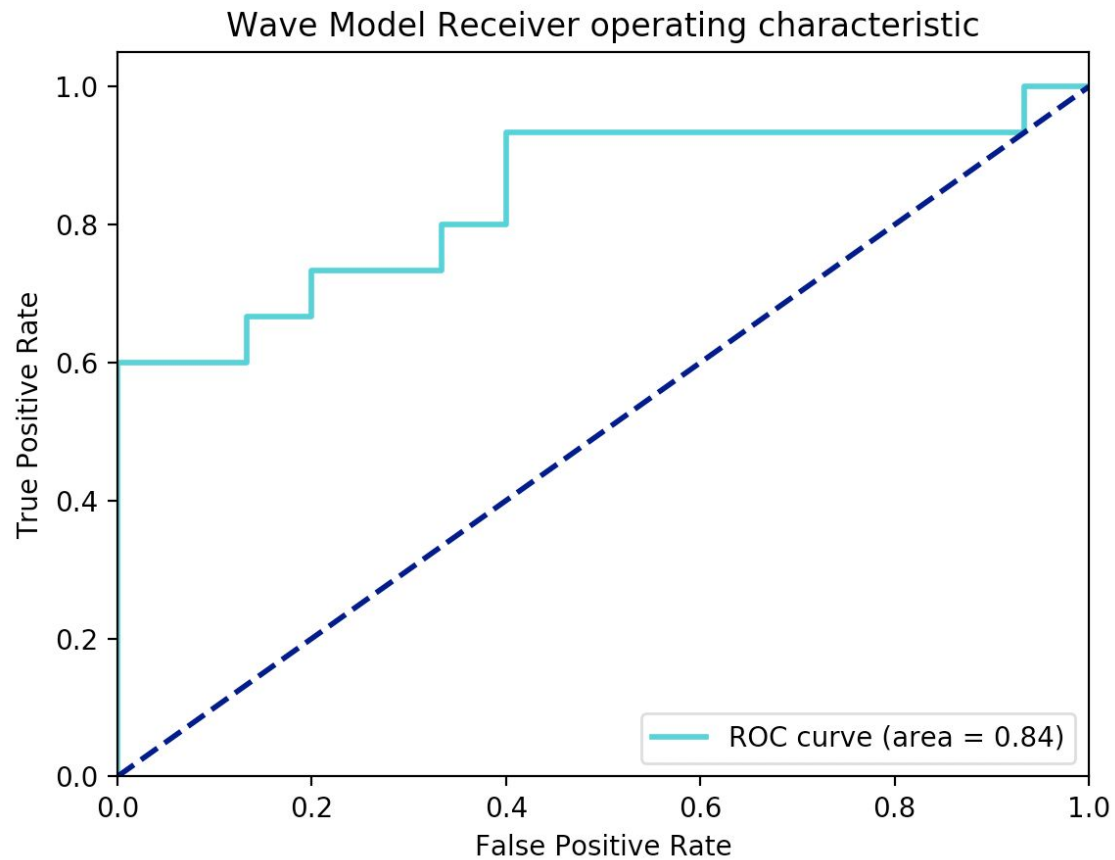
Trainable params: 1,190,889



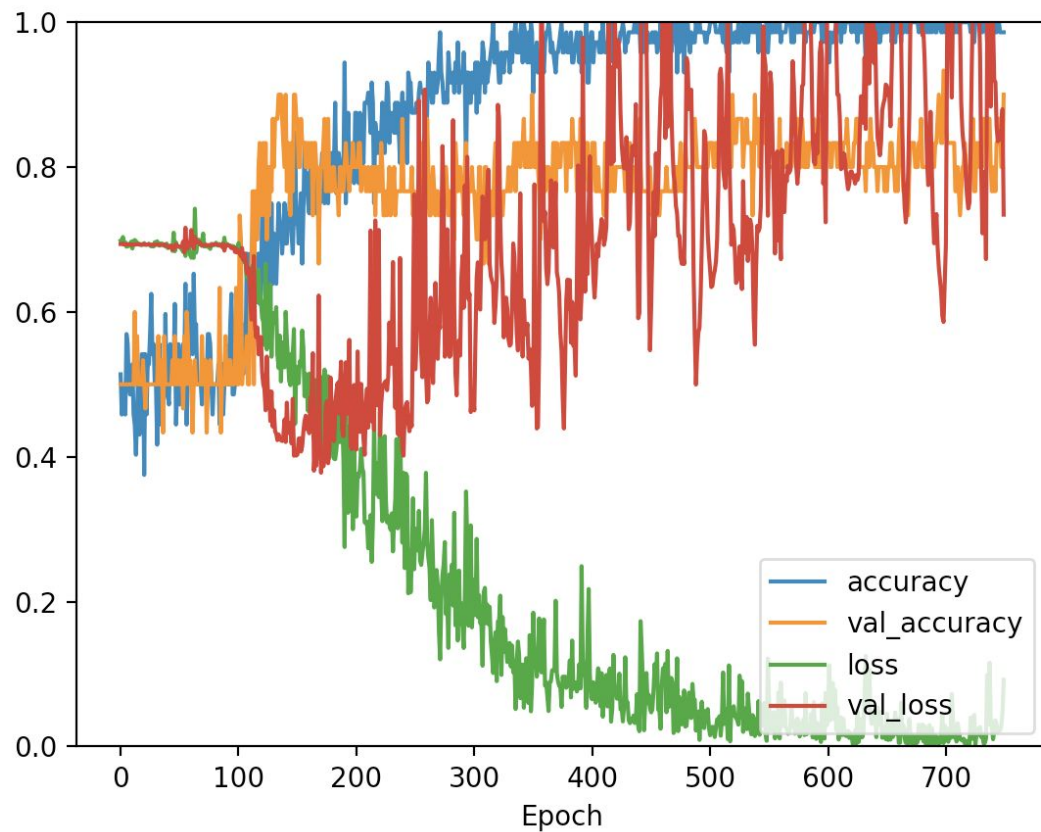
Wave Model V1 Evaluation



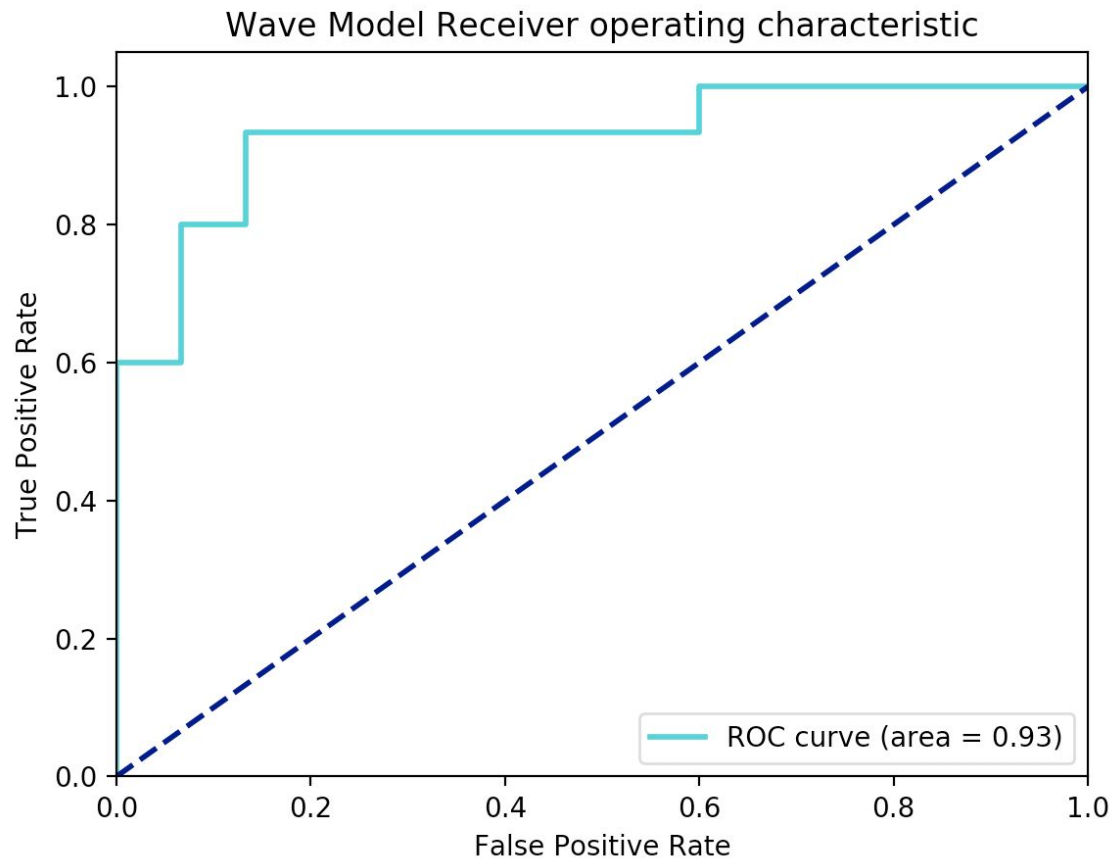
Wave Model V2 Evaluation | Model Accuracy = 77% (400 epochs)



Wave Model V2 ROC Curve | AUC = 0.84



Wave Model V2.5 Evaluation | Model Accuracy = 90% (750 epochs)

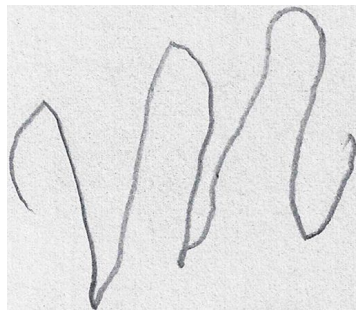


Wave Model V2.5 ROC Curve | AUC = 0.93

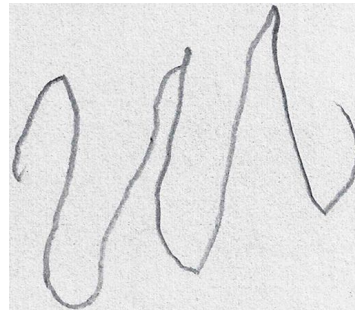
Challenges

- Very small dataset
 - Recall: 72 training images, 30 testing images
 - Resolved challenge by:
 - Data augmentation

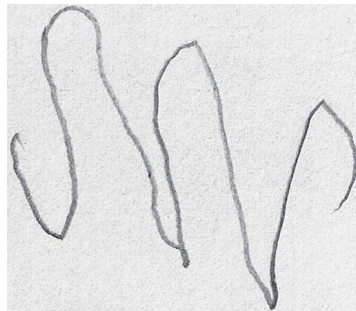
Original



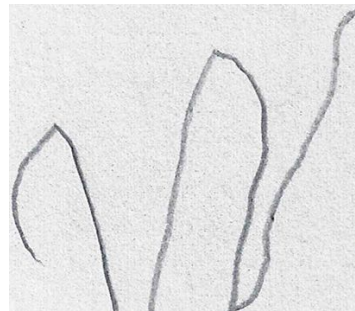
Rotated



Horizontal flip



Zoom



Potential Applications & Future Studies

- Potential Applications
 - Apps that may be able to take in a snapshot image of spiral or wave drawing
 - May be used in clinics or pharmacies for patients with suspected PD, family history of PD, or taking medications that may cause PD-related symptoms
 - Common offending drugs (select examples):

Therapeutic Class	Drug Name
Calcium-Channel Blockers	Flunarizine, cinnarizine
Atypical antipsychotics	Risperidone, olanzapine, ziprasidone, aripiprazole
Typical antipsychotics	Phenothiazine, chlorpromazine, promethazine
Dopamine depleters	Reserpine, tetrabenazine
Antiemetics	Metoclopramide

Questions?

- README for this project may be found at:
 - https://github.com/gina-santana/Parkinsons_image_classification