

Indian Currency Recognition

Under the Guidance of

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Presented by

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A little bit about the IDEA!

- ❑ While recognizing any country's currency, there seems to be a huge gap between visually impaired and a normal visioned person.
- ❑ The idea is to reduce this gap for Indian currency by proposing a deep learning based currency recognition system.
- ❑ By collecting data from various sources, a convolution neural network will be trained to extract features from the images.
- ❑ Later, an object detection algorithm, will take earlier extracted features into consideration while classifying a denomination.



Inspiration for this idea

- ❑ Money is important to everyone, if someone speaks otherwise then either they are lying or they are rich.
- ❑ A thing of such importance needs to be evaluated correctly by a person.
- ❑ Imagine it takes you a lot of efforts to procure money, every single time, just because you simply are unable to recognize the denomination as quickly as others.
- ❑ That is exactly what visually impaired people go through DAILY.
- ❑ As an Engineer and now a budding data scientist it is our sole duty to make people's life easier, hence this PROJECT.



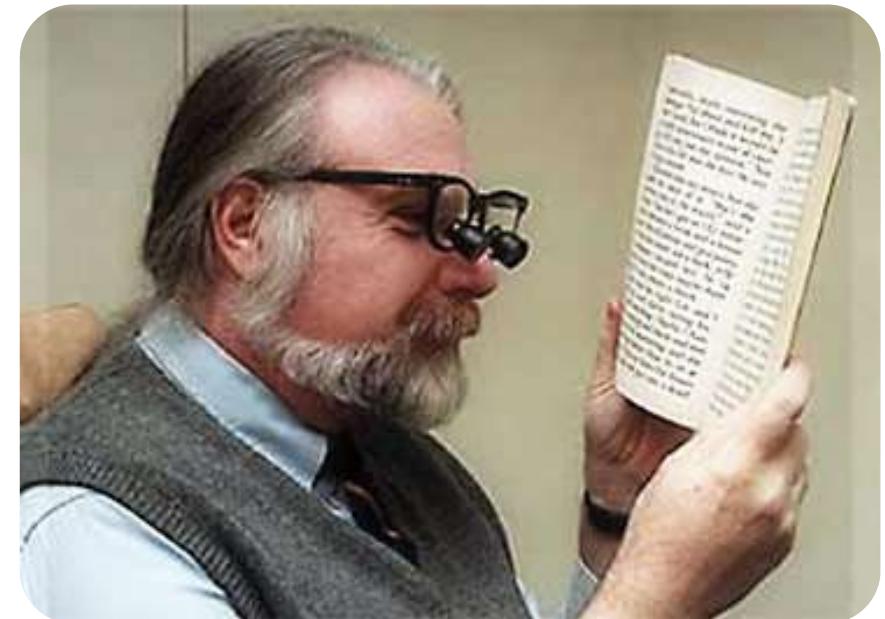
Who will benefit from the idea ?

Blind or Visually Impaired People



Who will benefit from the idea ?

Older people



Who will benefit from the idea ?

Foreigners visiting India



Journey so far...

Part 1. Literature Review

Qian Zhang

Nijil Raj N, Anandu S Ram, Aneeta
Binoo Joseph, Shabna S

Kushal Bhavsar , Keyurbhai Jani ,
and Rakeshkumar Vanzara



Part 2. Data Collection

Collection of data from various sources

Adding some data from my side



Part 3. Data Preparation

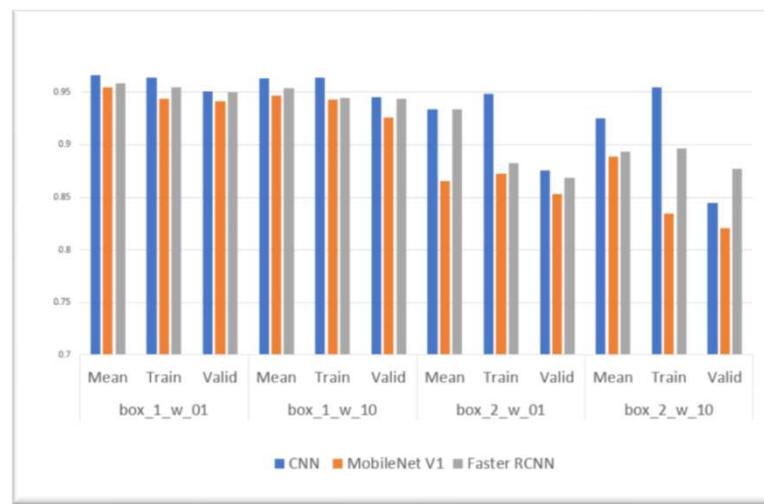
Label Images

Data Augmentation

Part 1. Literature Review - I

Currency Recognition Using Deep Learning - Qian Zhang (Auckland University of Technology in 2018)

- ❑ Collected front and back sample images of 5NZD, 10NZD, and 20NZD as the sample denomination of the dataset.
- ❑ Used CNN for feature extraction and Single Shot Multi Box Detector (SSD) for object detection and compared the results using MobileNet v1 and R-CNN in MATLAB.
- ❑ He observed that CNN reaches 96.9%, the accuracy of MobileNet is 95.4%, and the accuracy of Faster RCNN is 95.8%.



Part 1. Literature Review - II

Deep Learning Based Indian Currency Detection for Visually Challenged using VGG16 - Nijil Raj N, Anandu S Ram, Aneeta Binoo Joseph, Shabna S (IJRTE 2020)

- ❑ Collected Indian currencies of Rs20, Rs50, Rs100, Rs200 & Rs500 having various security features as well, with an aim of classifying them as correctly as possible. They didn't do any Object detection.
- ❑ Used VGG16 (CNN) for feature extraction and compared results with earlier existing systems in MATLAB.
- ❑ The resulting model produced an accuracy of 99.07% within just 10 epochs, compared to AlexNet based model which scored around 80%.

No. of Epochs	Accuracy
1	98.93
2	98.80
3	99.07
4	99.07
5	99.07
6	98.73
7	98.40
8	98.93
9	99.33
10	99.07

Part 1. Literature Review - III

Indian Currency Recognition from Live Video Using Deep Learning - Kushal Bhavsar , Keyurbhai Jani, and Rakeshkumar Vanzara (Ganpat University – 2020)

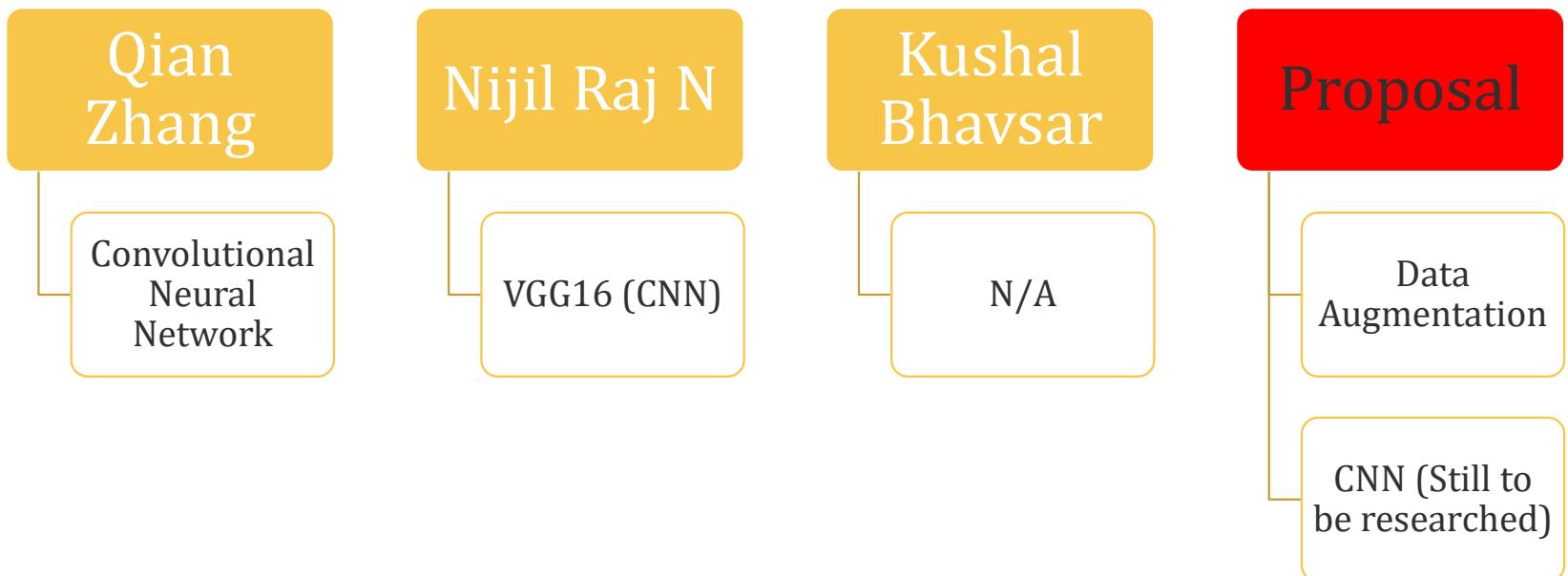
- ❑ Gathered Data in the form of high quality images, with around 200 samples of each denomination.
- ❑ Tried Faster RCNN(Restnet_50_coco model) which gave a accuracy of 87% but found that model was overfitting heavily.
- ❑ Proposed a better & faster model could be determined in the future, since they faced issues like GPU limitations.

Label	# of training samples	# of testing samples
10_new_note	201	50
10_old_note	201	52
100_new_note	204	47
100_old_note	201	50
50_new_note	202	51
50_old_note	201	54
200_note	210	55
20_new_note	201	56
20_old_note	200	51
2000_note	201	48

Lets Compare – Data Collection



Lets Compare – Feature Extraction



Lets Compare – Object Detection

Qian
Zhang

Single Shot Multi
Box Detector

Nijil Raj N

N/A

Kushal
Bhavsar

Restnet_50_coco
(Faster RCNN)

Proposal

Yolo v3

Lets Compare – Issues

Qian
Zhang

Nijil Raj N

Kushal
Bhavsar

Proposal

MATLAB

Only 1%
increase in
accuracy

MATLAB

Good Accuracy
but took a lot
of time

MATLAB

Model
overfitted

Resource
Exhausted

Python

Less chances of
Overfitting

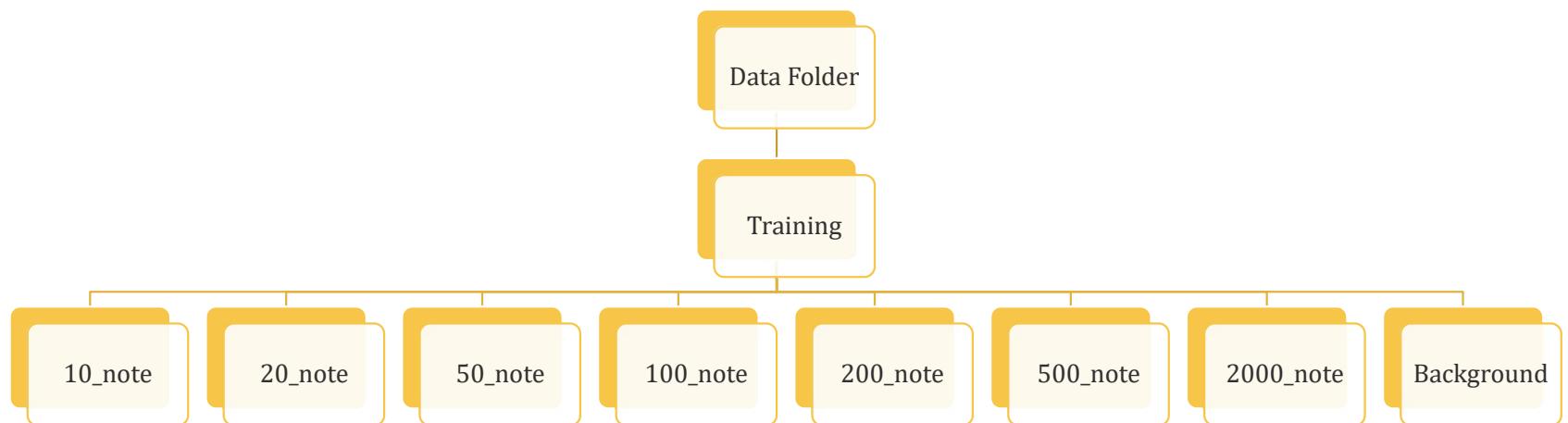
Efficient Usage
of GPU



Part 2. Data Collection

- ❑ The dataset includes various mixtures of new & old Indian currencies, with around 100-120 samples of each denomination.
- ❑ Around 250 images containing abstract background are also included, to make the model more efficient.
- ❑ Part of the data is collected from Kaggle, Google search and a small portion of high quality images are added from my side, just to make the dataset more wholesome.

Directory View

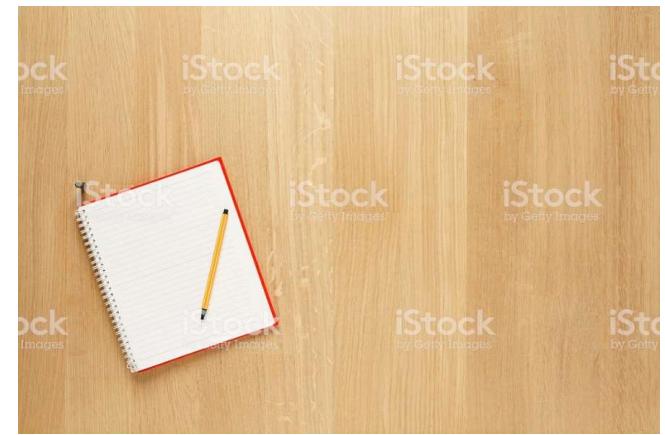


Sample Images



Images Added from my side

Google Images



Additional Background Images



Part 3. Data Preparation - Labelling

- ❑ After sufficient data is being collected, images are labelled using LabelImg.

- ❑ LabelImg is a graphical image annotation tool free sourced by PyPI.org.

- ❑ After labelling, 80% of dataset will act as training data, while rest 20% will be used for validation.



Part 3. Data Preparation – Augmentation

- ❑ Since, in real life, the notes are not as crisp as needed by the model, Data AUGMENTATION becomes a necessity.
- ❑ Data augmentation in data analysis are techniques used to increase the amount of data by adding slightly modified copies of already existing data or newly created synthetic data from existing data. It acts as a regularizer and helps reduce overfitting when training a machine learning model.
- ❑ Using Adobe Photoshop, and Keras, images are rotated on various angles, and some are even cropped, to make the training process more robust.

Sample – Augmented Images



Normal Image

Rotated at 45 Degrees



Flipped Horizontal



Flipped Vertical



Flipped Vertically Horizontal



Future Work

- In the next phase, a CNN model will be used to extract important features from the dataset.
- Then for object detection part, a deep-learning based object detection model like YOLOv3 can be used.
- More augmentations to the dataset can be implemented if the data seemed insufficient for the model.



References

- **Deep Learning Based Indian Currency Detection for Visually Challenged using VGG16 - Nijil Raj N, Anandu S Ram, Aneeta Binoo Joseph, Shabna S,** (International Journal of Recent Technology and Engineering (IJRTE) ISSN: 2277-3878, Volume-9 Issue-2, July 2020 969 Published By: Blue Eyes Intelligence Engineering & Sciences Publication Retrieval Number: B3955079220/2020©BEIESP DOI:10.35940/ijrte.B3955.079220)
- **Indian Currency Recognition from Live Video Using Deep Learning - Kushal Bhavsar, Keyurbhai Jani , and Rakeshkumar Vanzara** (U. V. Patel College of Engineering, Ganpat University, Mehsana 384012, Gujarat, India)
- **Indian Currency Recognition using Neural Network Pattern Recognition Tool - Mr.Viranchi N Patel1, Dr.Udesang K Jaliya2 and Mr.Keyur N Brahmbhatt** (BVM Engineering College, V.V.Nagar, India)
- **Currency Recognition Using Deep Learning - Zhang Qian,Yan, Weiqi** (Auckland University of Technology, Master of Computer and Information Sciences,2018-11-18T03:45:35Z)



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