Digitizing Historical Forest Service Data

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adapt
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1. Problem Statement

- Ecologists record vegetation data by hand onto physical paper-sheets.
- Historical Forest Data is inaccessible for further analysis and research.

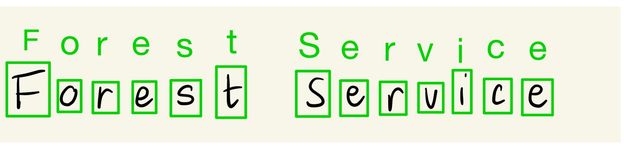
2. Motivation

Vegetation and soil condition data from the Sun Valley, Idaho area has been collected **by hand** and is laying into dusty filing cabinets.

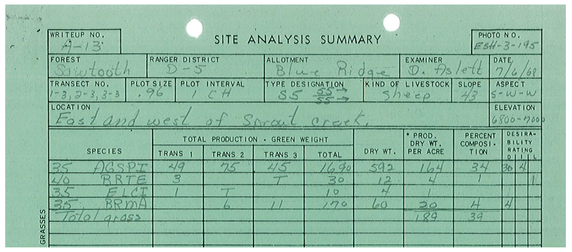
The goal of this project is to **digitize** the data forms to make them available for future scientific research.

3. Optical Character Recognition (OCR)

- Processes image.
- Recognizes ASCII characters in the provided image.
- Extracts the character and saves it into a machine-encoded text.



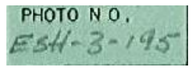
4. Process



Original data format

Ste 1. Identifying sub-fields in the form

- Extract sub-fields from the form using the OpenCV library.
- Each (x, y) coordinate is stored into a JSON file.



Field

Step 2. Bounding box around single characters

- Crop the image around each single character to feed to the model.

Field → Individual Cells

Step 3. Character Classification

- Feed the pre-processed images to a neural network (NN) to classify them.

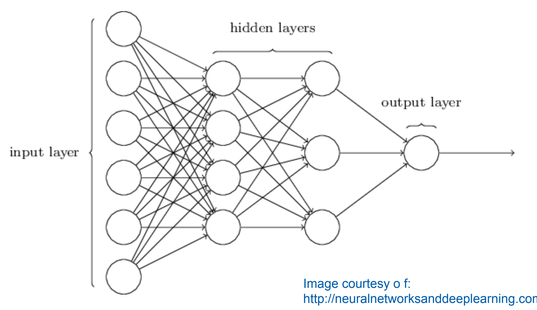


Image courtesy o f: http://neuralnetworksanddeeplearning.com/

5. Models

ResNet

The model used categorical cross entropy loss function, 50 epochs, the SGD optimizer.

The ResNet was trained on the MNIST and the Kaggle datasets.

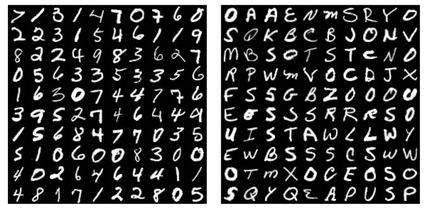


Image courtesy of: https://www.pyimagesearch.com/

Permutations of Convolutional Neural Networks

Five permutations of different models: different amount dense layers, convolutional layers, neurons per layers and dropout, 10 epochs.

The CNN was trained on the EMNIST dataset.

image courtesy of: https://www.researchgate.net/

6. Future Development and Challenges

Pre-process harder words

The letters "S" and "a" are connected by the same hand stroke..

- Letters in hand-written text are often connected by the same hand stroke.
- Learn how to preprocess images where words have connected letters.

Load data into database

- Previous work has been done to create a database where to store the collected digitized data from the Forest Service forms.
- Automate process to load the digitized data into database.

7. Acknowledgements

Boise State's Research Computing Department. 2017. R2: Dell HPC Intel E5v4 (High Performance Computing Cluster). Boise, ID: Boise State University. DOI: 10.18122/B2S41H