
Improving Government Form Processing Time with Handwritten Word Recognition

Alexandra Garney | Metis Project 6

July 9, 2021

A large amount of government forms tend to be paper



PUBLIC SERVICE LOAN FORGIVENESS (PSLF) & TEMPORARY EXPANDED PSLF (TEPSLF) CERTIFICATION & APPLICATION

William D. Ford Federal Direct Loan (Direct Loan) Program

OMB No. 1845-0110
Form Approved
Exp. Date 08/31/2023
PSFAP - XBCR

WARNING: Any person who knowingly makes a false statement or misrepresentation on this form or on any accompanying document is subject to penalties that may include fines, imprisonment, or both, under the U.S. Criminal Code and 20 U.S.C. 1097.

SECTION 1: BORROWER INFORMATION

Please enter or correct the following information.

☐ Check this box if any of your information has changed.

SSN _____
Date of Birth _____
Name _____
Address _____
City _____ State _____ Zip Code _____
Telephone - Primary _____
Telephone - Alternate _____
Email _____

For more information on PSLF, visit StudentAid.gov/publicservice. To apply online, visit StudentAid.gov/PSLF.

SECTION 2: BORROWER REQUEST, UNDERSTANDINGS, AND CERTIFICATION

request (1) that the U.S. Department of Education (the Department) determine whether I qualify for PSLF or TEPSLF, and discharge any qualifying loans that I have, and **(2)** if none of my loans qualify for PSLF or TEPSLF when I submit this form, determine how many qualifying payments I have made towards PSLF and TEPSLF.

☐ I just want to find out how many qualifying payments I have made or if my employer is a qualified employer.

☐ I believe I qualify for forgiveness under PSLF or TEPSLF right now.

☐ If I indicated that I believe I qualify for forgiveness now, I want a forbearance while my application is being processed, but understand that periods of forbearance do not count towards forgiveness.

understand that:

- To qualify for forgiveness, I must have made 120 qualifying payments on my Direct Loans while employed full-time by a qualifying employer. Neither the 120 qualifying payments nor employment have to be consecutive.
- To qualify for forgiveness, I must be employed full-time by a qualifying employer when I apply for and get forgiveness.

PHILADELPHIA PARKING AUTHORITY

RESIDENTIAL PERMIT PARKING
35 N. 8th STREET, PHILA., PA 19106 (215) 683-9730

RETURN THIS COMPLETED FORM WITH COPIES OF THE FOLLOWING DOCUMENTS. ALL DOCUMENTS MUST BE AT CURRENT RESIDENCE WITHIN RESIDENTIAL PERMIT PARKING DISTRICT:

- VEHICLE REGISTRATION CARD
- PROOF OF RESIDENCE (I.E., LEASE OR UTILITY BILL OR DRIVER'S LICENSE)
- CHECK OR MONEY ORDER PAYABLE TO "PPA PERMIT PARKING"

PLEASE PRINT

NAME _____
ADDRESS _____
APARTMENT # _____
CITY _____ STATE _____ ZIP _____

☐ CHECK BOX IF CORRECTIONS ARE NEEDED (SEE BELOW).

DO NOT SEPARATE THIS FORM

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PLEASE PRINT

NAME _____
ADDRESS _____
APARTMENT # _____
CITY _____ STATE _____ ZIP _____

Annual Fee based on # of vehicle permits in household

☐ 1st Vehicle Permit \$35 ☐ 2nd Vehicle Permit \$50
☐ 3rd Vehicle Permit \$75 ☐ 4 or more Vehicle Permits \$100

☐ REPLACEMENT \$10 (If permit is lost, stolen, damaged in an accident, when license plate is changed for any reason or moved to a different district)

☐ If your rear windshield is tinted or louvered, please check here. We will enclose a reflective dot with your permit.

PLATE NO. _____ STATE _____ VEH. MAKE _____ VEH. MODEL _____
DAY PHONE _____ EMAIL ADDRESS _____

OFFICIAL USE ONLY

DISTRICT # _____ CC _____ CK _____ MO _____
EXPIRES _____ DATE PAID _____
PERMIT # _____ ACCT. # _____
AMOUNT \$ _____ CLERK _____

Annual Fee based on # of vehicle permits in household

☐ 1st Vehicle Permit \$35 ☐ 2nd Vehicle Permit \$50
☐ 3rd Vehicle Permit \$75 ☐ 4 or more Vehicle Permits \$100

☐ REPLACEMENT \$10 (If permit is lost, stolen, damaged in an accident, when license plate is changed for any reason or moved to a different district)

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PLATE NO. _____ STATE _____ VEH. MAKE _____ VEH. MODEL _____
DAY PHONE _____ EMAIL ADDRESS _____

OFFICIAL USE ONLY

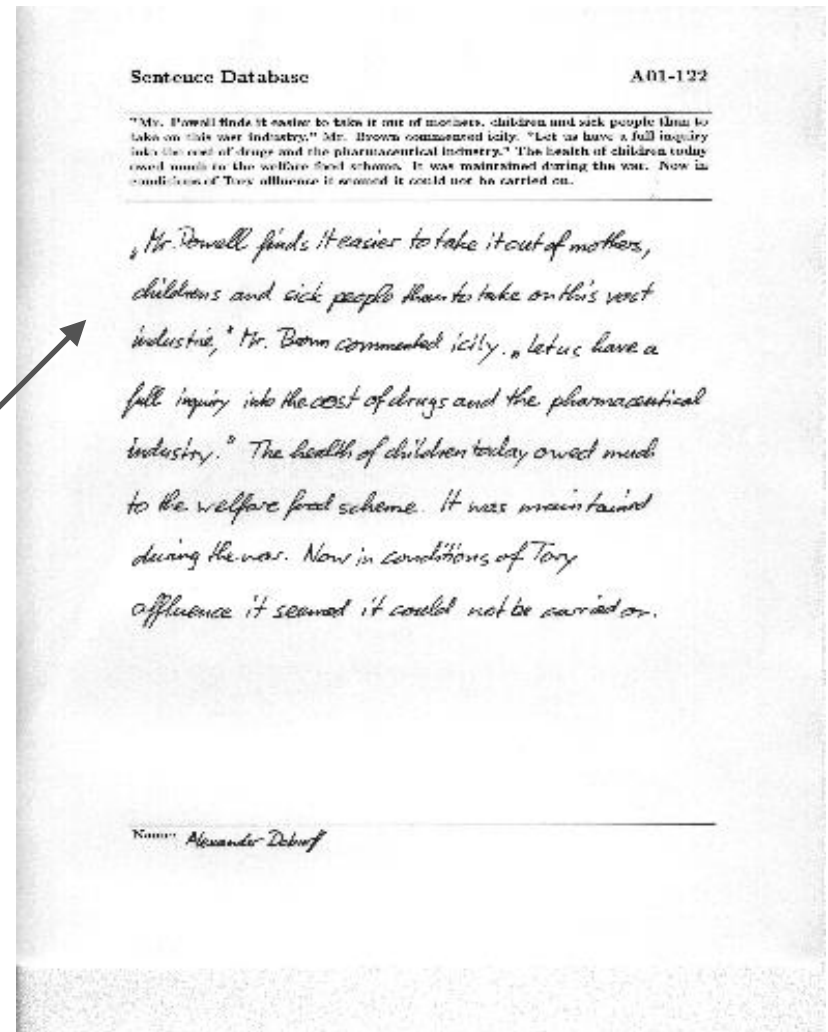
DISTRICT # _____ CC _____ CK _____ MO _____
EXPIRES _____ DATE PAID _____

Paper forms increase the risk for lost information and slower processing times.

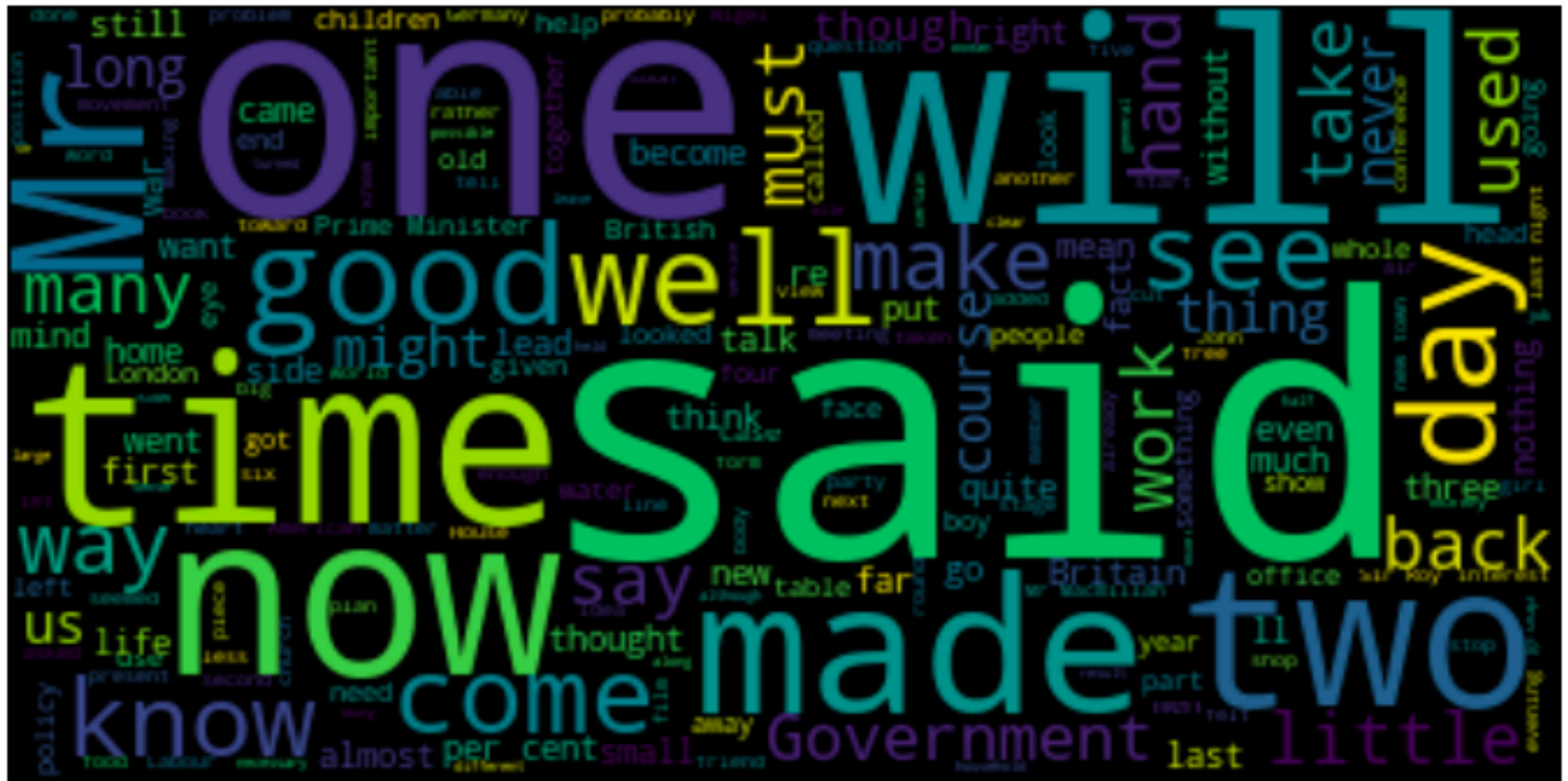
Aimed to create a way to process paperwork faster through Optical Character Recognition

- University of Bern's Research Group on Artificial Intelligence and Computer Vision (Switzerland)
- Over 600 writers

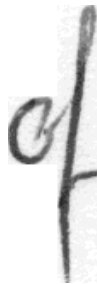
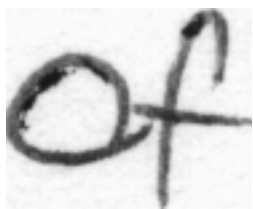
Sample of document words were extracted from



Dataset included ~115,000 handwritten words



10 classes with at least 500 words each were used for modeling



**Image
preprocessing**



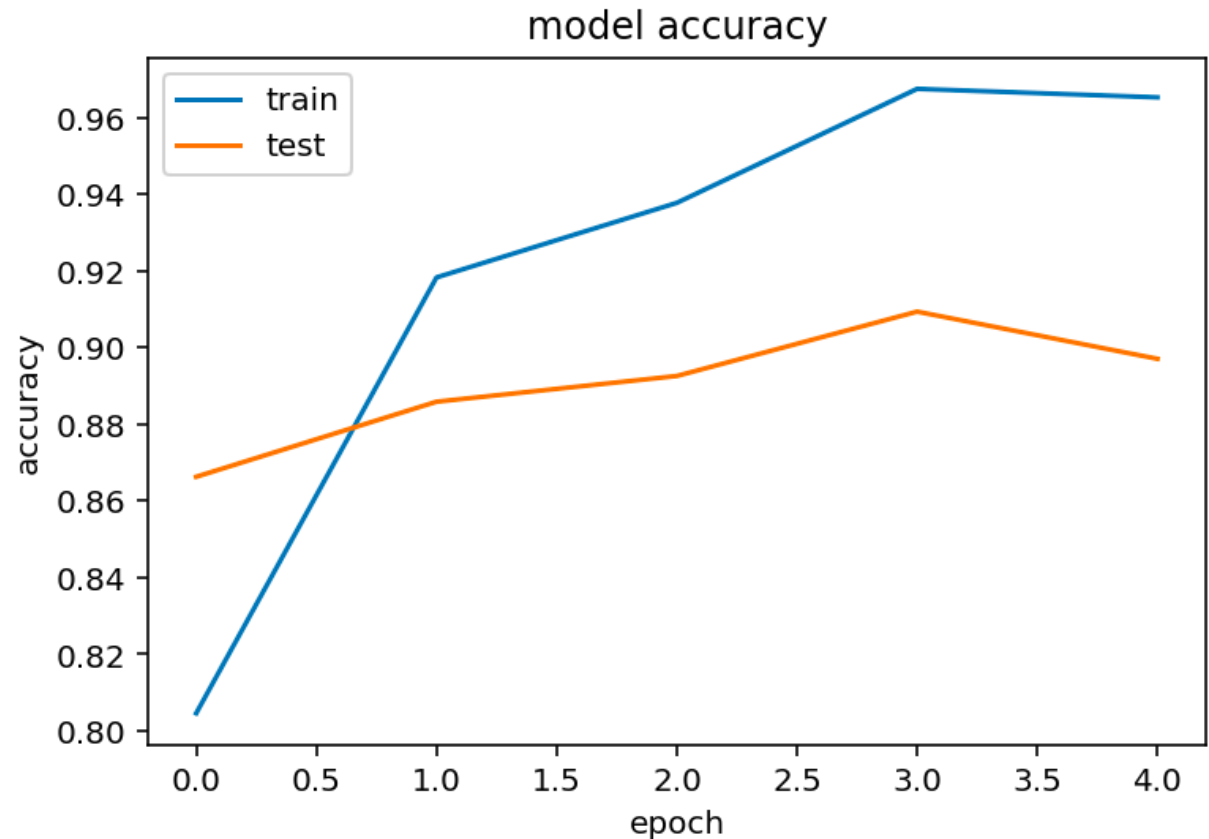
**Convolutional
Neural Network**

The 10 classes included both punctuation and short words:

“ , . and in a of the to was

Resulting CNN model had an accuracy of = 0.86 on unseen data

Model & Parameters:
MobileNetV2
Imagenet weights
Alpha = 0.35
3 Dense layers (100, 80, 10)
Relu
SoftMax
Categorical cross entropy loss
Adam optimizer
5 epochs



Recommendations

- Add additional classes
- Ensure model is tested on unseen writer's print
- Transition to testing on whole documents/forms