CSE 674 - Project 2

Writer Verification, Explainable AI

Tasks

- Dataset annotation
- Bayesian Inference of Handcrafted Features
- Deep Learning using “AND” images
- Explainable AI – Deep Learning + PGM

Timeline

Dataset Annotation - Handmade features

- Wed, 13 March, 11:59 PM

Sample Verification - PGM

- Mon, 18 March, 11:59 PM

Sample Verification - Deep Learning

- Mon, 25 March, 11:59 PM

Sample Verification - XAI

- Mon, 1 April, 11:59 PM

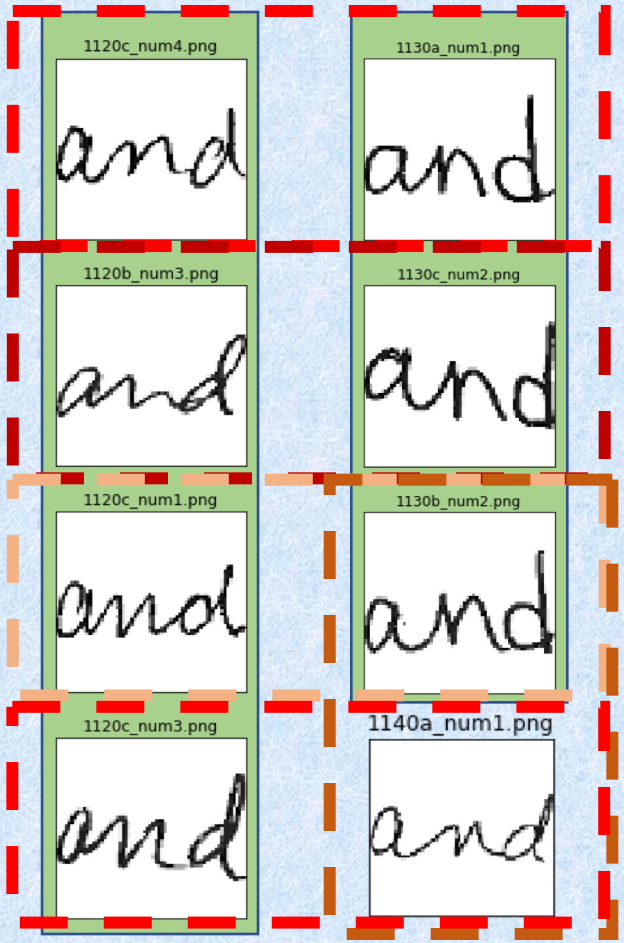
Basic Information

What are handcrafted features

ImageId	f1	f2	f3	f4	f5	f6	f7	f8	f9
0359a	2	1	1	0	2	2	0	2	2
0577a	2	1	1	0	2	2	0	1	2
1120a	2	1	1	3	2	2	0	2	2
1120b	1	1	1	0	2	2	0	2	2
1120c	2	1	1	0	2	2	0	0	2
1121a	2	1	1	3	2	2	0	1	2
1121b	2	1	1	0	2	2	0	3	2
1121c	1	1	1	0	2	2	0	1	2

- Values of f1 to f9 indicate handcrafted features
- These values are assigned by human observers

What are similar and dissimilar writers



- Dashed lines indicate dissimilar writers
- Solid color indicates similar writers

Data Annotation

Requirements

- Annotate the “AND” images to generate handcrafted features

University at Buffalo, CEDAR - Handwriting Truthing Tool

Hello mshaikh2

Click to toggle Add Users Panel

Click to toggle Edit User Panel

View Images Panel

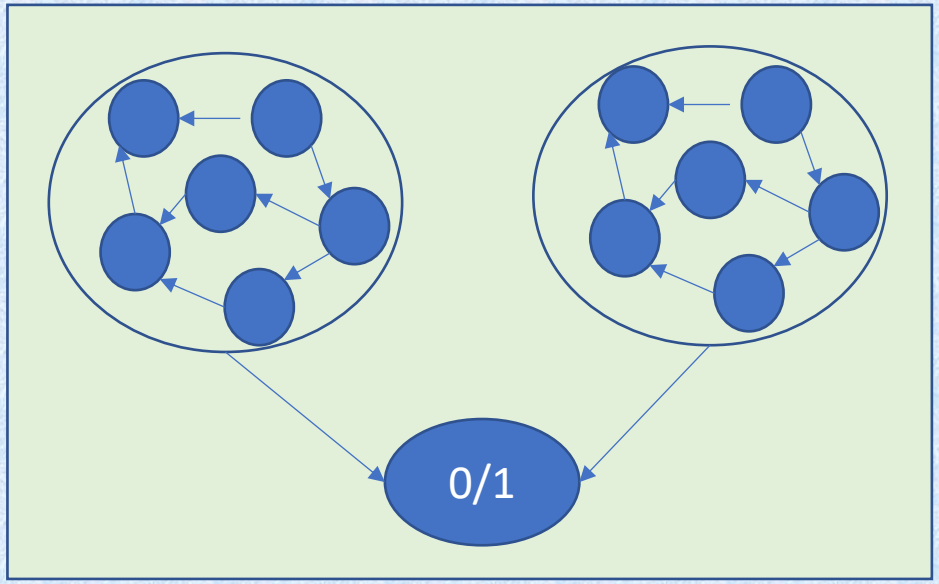
enter UBID | View

Image Id	Image Name	ɔn ɛssure	letter spacing	size	dimension	is lowercase	is continuous	slantness	tilt	entry stroke "a"	staff of "a"	formation "n"	staff of "d"	exit stroke d	word formation	constancy
16			1	1	1	1	1	1	1	1	1	1	1	1	1	1
110			1	1	1	1	1	1	1	1	1	1	1	1	1	1
204			1	1	1	1	1	1	1	1	1	1	1	1	1	1

Bayesian Inference

Requirements

- Build multiple Bayesian models for task of verification
- Compare the following metrics for each model and report the best one in tabular format
  - Accuracy
  - Number of Edges
  - Time to train
  - Time to infer

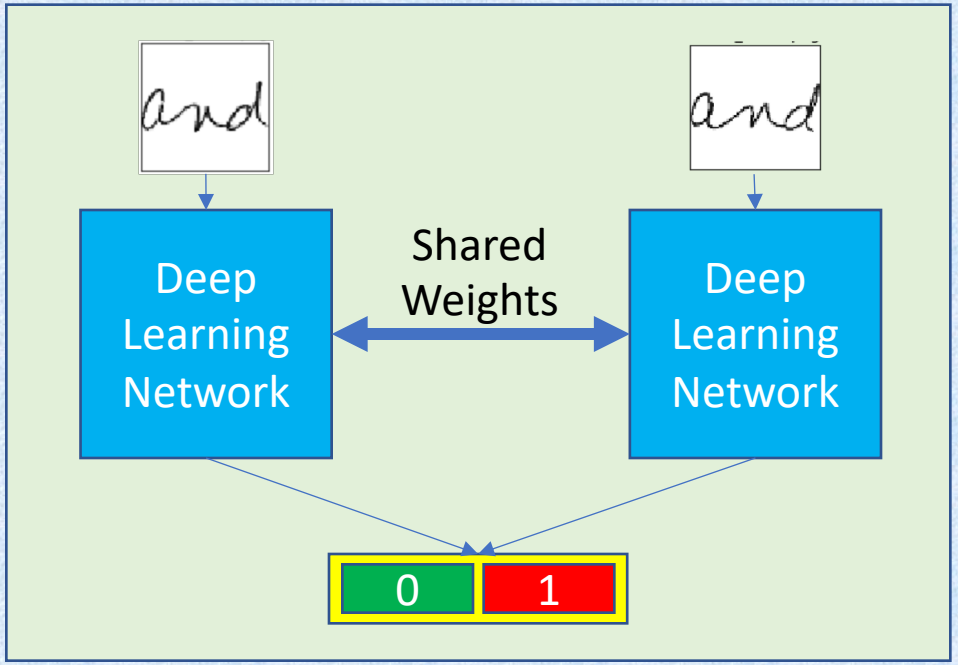


Sample PGM for Verification

Deep Learning Inference

Requirements

- Build a “Siamese network” **OR** a “classification network” for the task of verification
- Generate the following metrics and report in tabular format
  - Training Accuracy
  - Training Loss
  - Validation Accuracy
  - Validation Loss
- Generate graphs for Training and Validation curves

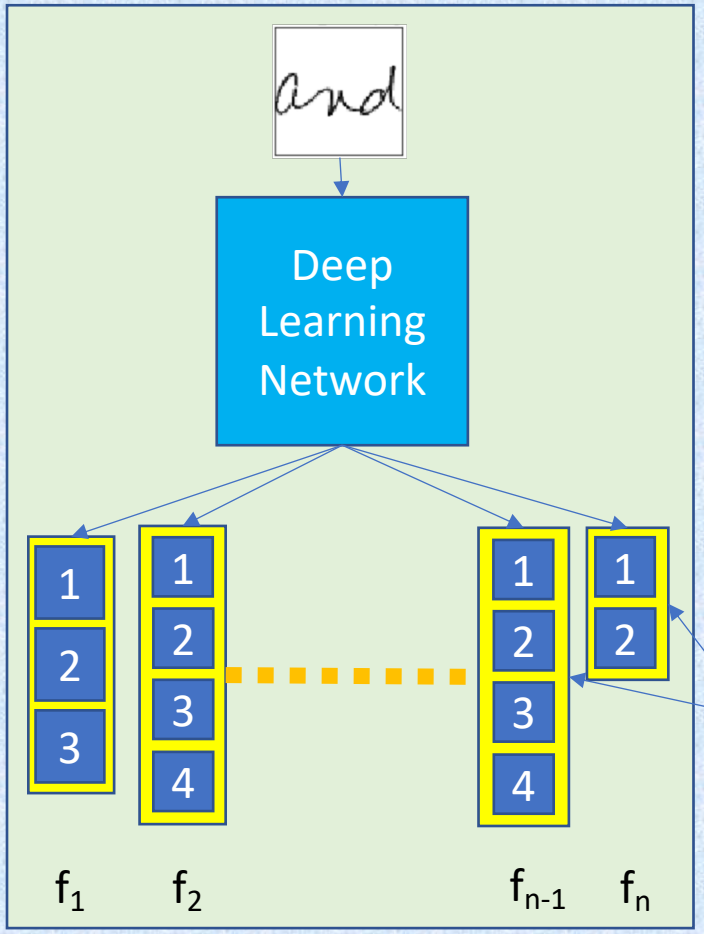


Sample Siamese Net for Verification

Explainable AI

Requirements

- Build a Multitask Learning (MTL) model to learn the mapping between “AND” images and handcrafted features
- Generate the following metrics and report in tabular format
  - Training Accuracy
  - Training Loss
  - Validation Accuracy
  - Validation Loss
- Generate graphs for Training and Validation curves
- Supply the argmax of MTL generated class probabilities for pairs of images into the PGM and report the accuracy on validation data



Sample MTL model

- Task is to classify the image to identify a feature (f_n) value

Network learns to identify classes in each task