Case by Case

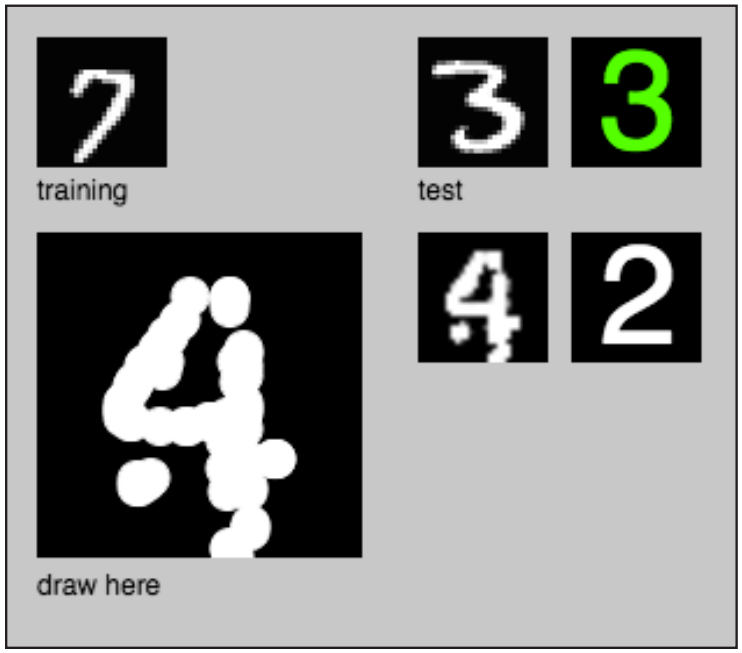
NATURE OF CODE:
Intelligence & Learning
Final Project / Michelle Gallero
Spring 2017

Final Project:

Case by Case, my Nature of Code final project came from the idea to distinguish lowercase letters from uppercase letters for little kids to use. This was inspired by a parent-teacher meeting for my 3-year old. The teacher told me that my child was really good at identifying uppercase letters, but not lower case letters. When we read, we are deciphering many strings of lowercase letters, so I wanted to figure out a fun exercise to help him learn in preparation to learning how to read.

Main Goal:

To explore and understand the initial steps of letter and number recognition in a machine learning system using Shiffman's *Neural Network with p5* example of handwritten numbers and applying letters to his sketch.



Shiffman's 'Neural Network built with p5'
using the MNIST database

Image & Art Recognition:

And as a graphic designer, I also find hand drawn and illustrated type as something that I pay close attention when looking for illustrators and design inspiration (example: typography project, *36 Days of Type*)

36 DAYS OF TYPE

Eventually, I would like to apply a machine learning model to identify abstract looking letters and numbers in graphic illustrations, photos and different typefaces.

1st Step:

Learning how to convert the picture files of letters and adding it to the p5 sketch example

IMAGE CONVERSION TO TRAINING/TEST DATA

1080 x 1080 pixels
RGB

28 x 28 pixels
Greyscale

```
Image
('test.png')
#.getdata())

, 244, 244, 244, 244, 244, 244, 244, 244, 244, 244, 244, 244, 244, 244, 244, 244, 244, 244, 244, 244, 244,
244, 244, 244, 244, 244, 244, 244, 244, 244, 244, 244, 244, 244, 244, 244, 244, 244, 244, 244, 244, 244, 2
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, 252, 249, 94, 69, 70, 96, 74, 211, 255, 248, 93, 62, 60, 59, 46, 69, 252, 251, 243, 244, 244,
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75, 85, 77, 105, 136, 100, 69, 65, 79, 91, 45, 89, 255, 245, 241, 241, 241, 241, 241, 241, 241,
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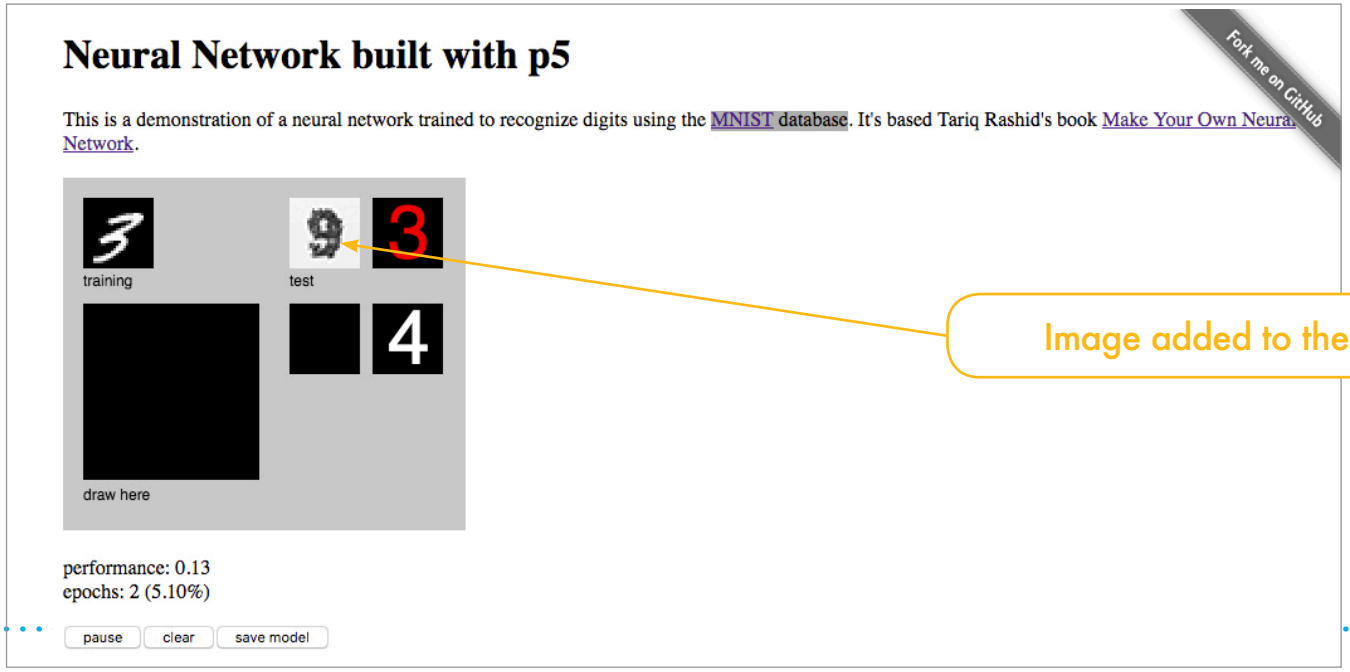
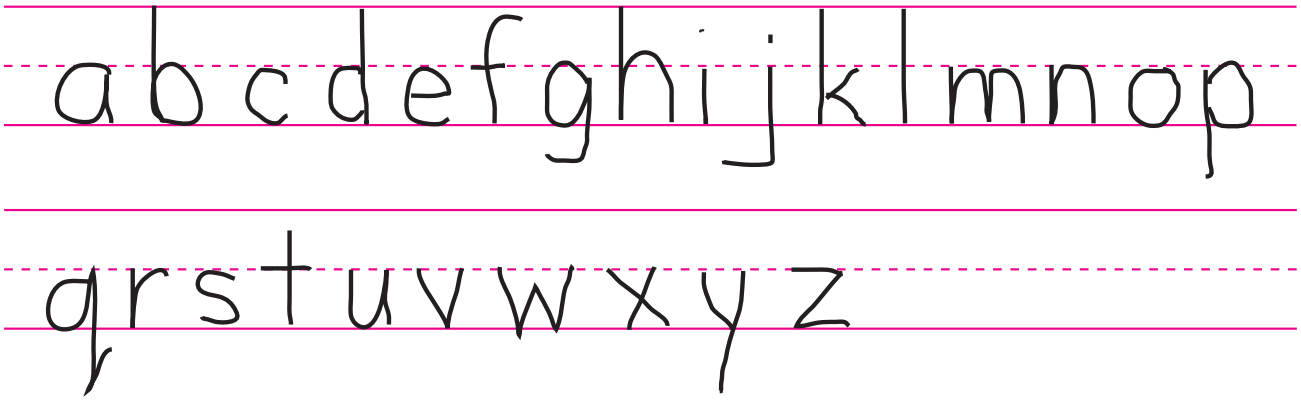
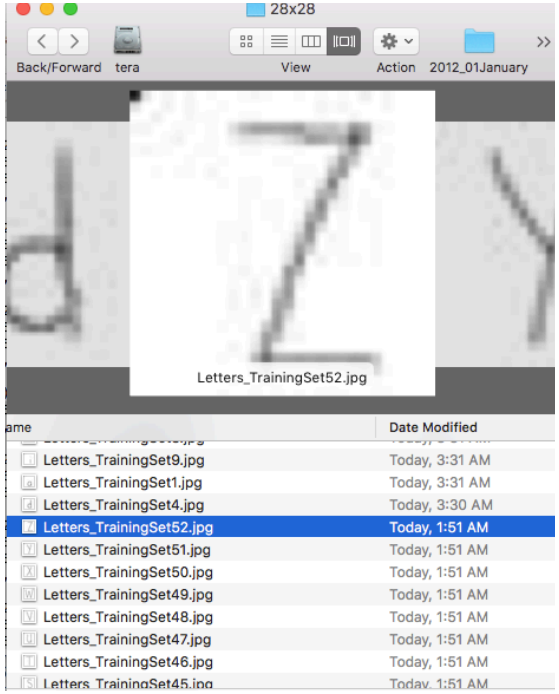
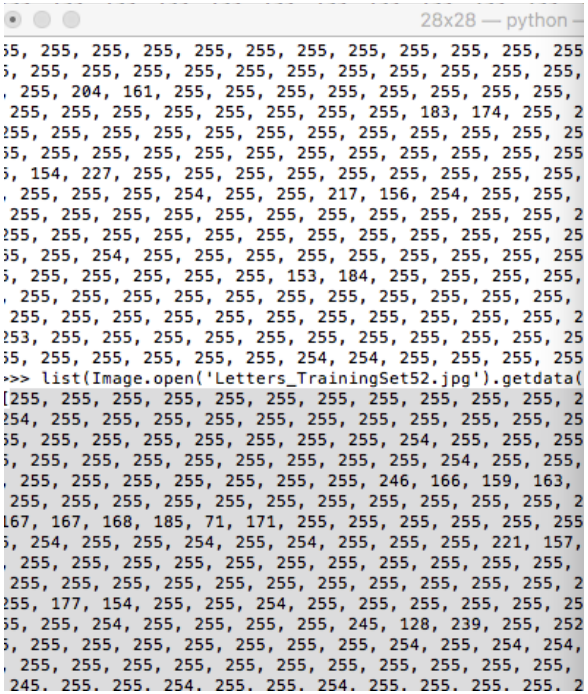
Conversion from JPEG using Python to extract the pixel values from the photo illustration.

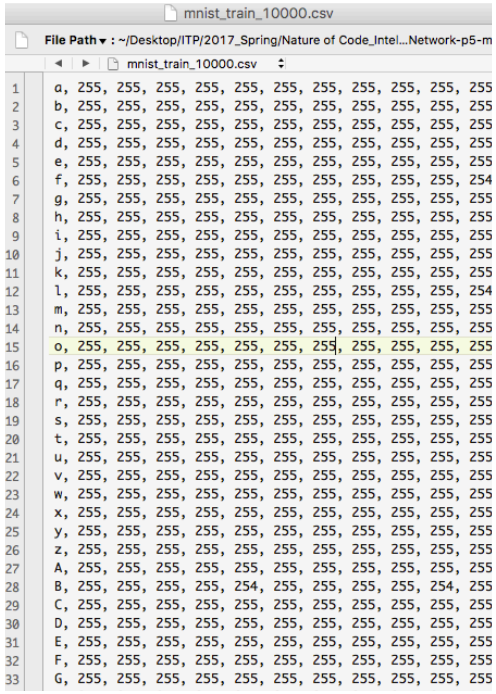


ADDING THE UPPER & LOWERCASE TRAINING SETS









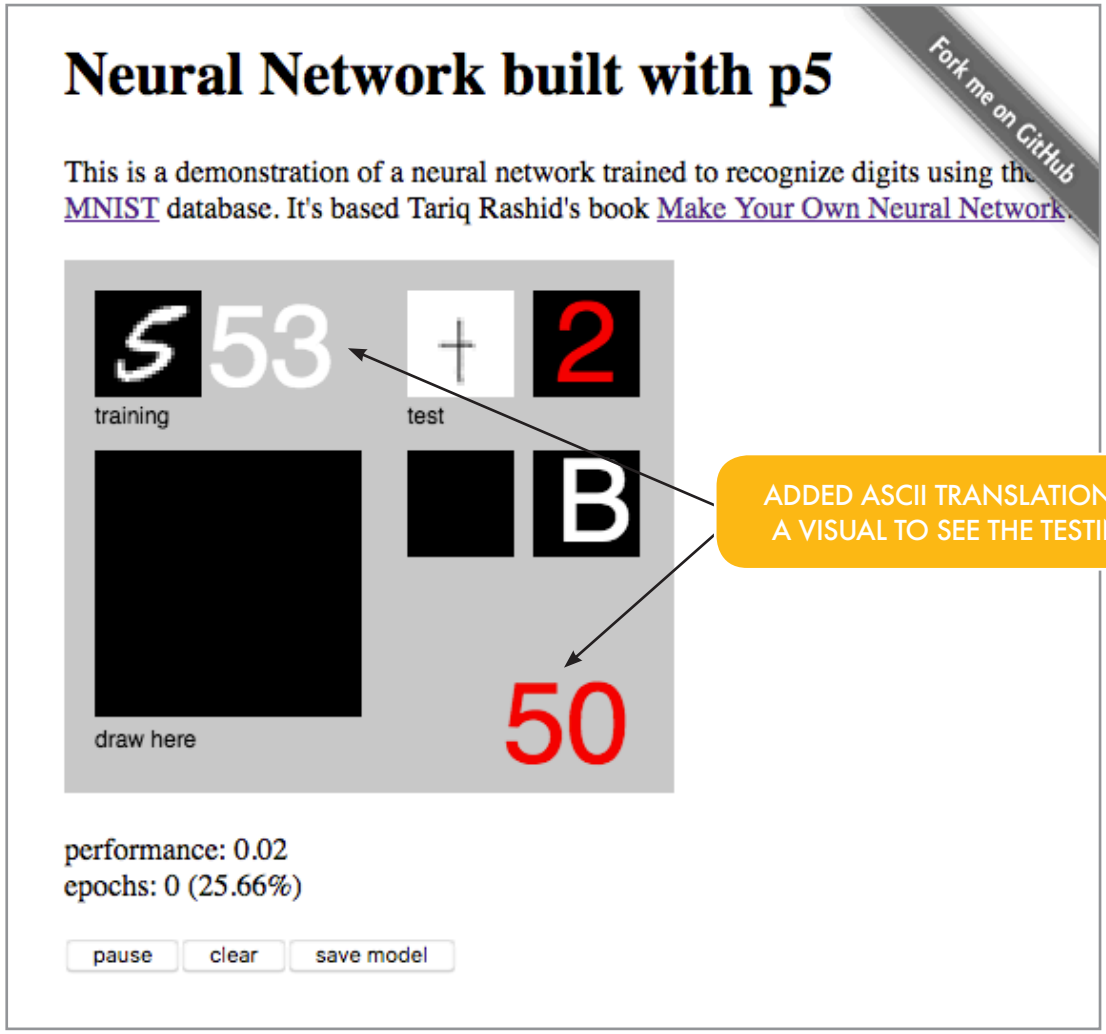
JPEGS → Pixel values converted in Python → Then added to training and test dataset

SHIFFMAN'S NEURAL NETWORK WITH p5

Dec	Hx	Oct	Html	Chr	Dec	Hx	Oct	Html	Chr
32	20	040	&#32;	Space	64	40	100	&#64;	@
33	21	041	&#33;	!	65	41	101	&#65;	A
34	22	042	&#34;	"	66	42	102	&#66;	B
35	23	043	&#35;	#	67	43	103	&#67;	C
36	24	044	&#36;	$	68	44	104	&#68;	D
37	25	045	&#37;	%	69	45	105	&#69;	E
38	26	046	&#38;	&	70	46	106	&#70;	F
39	27	047	&#39;	'	71	47	107	&#71;	G
40	28	050	&#40;	(	72	48	110	&#72;	H
41	29	051	&#41;	)	73	49	111	&#73;	I
42	2A	052	&#42;	*	74	4A	112	&#74;	J
43	2B	053	&#43;	+	75	4B	113	&#75;	K
44	2C	054	&#44;	,	76	4C	114	&#76;	L
45	2D	055	&#45;	-	77	4D	115	&#77;	M
46	2E	056	&#46;	.	78	4E	116	&#78;	N
47	2F	057	&#47;	/	79	4F	117	&#79;	O
48	30	060	&#48;	0	80	50	120	&#80;	P
49	31	061	&#49;	1	81	51	121	&#81;	Q
50	32	062	&#50;	2	82	52	122	&#82;	R
51	33	063	&#51;	3	83	53	123	&#83;	S
52	34	064	&#52;	4	84	54	124	&#84;	T
53	35	065	&#53;	5	85	55	125	&#85;	U
54	36	066	&#54;	6	86	56	126	&#86;	V
55	37	067	&#55;	7	87	57	127	&#87;	W
56	38	070	&#56;	8	88	58	130	&#88;	X
57	39	071	&#57;	9	89	59	131	&#89;	Y
58	3A	072	&#58;	:	90	5A	132	&#90;	Z
59	3B	073	&#59;	;	91	5B	133	&#91;	[
60	3C	074	&#60;	<	92	5C	134	&#92;	\
61	3D	075	&#61;	=	93	5D	135	&#93;	]
62	3E	076	&#62;	>	94	5E	136	&#94;	^
63	3F	077	&#63;	?	95	5F	137	&#95;	_

Source

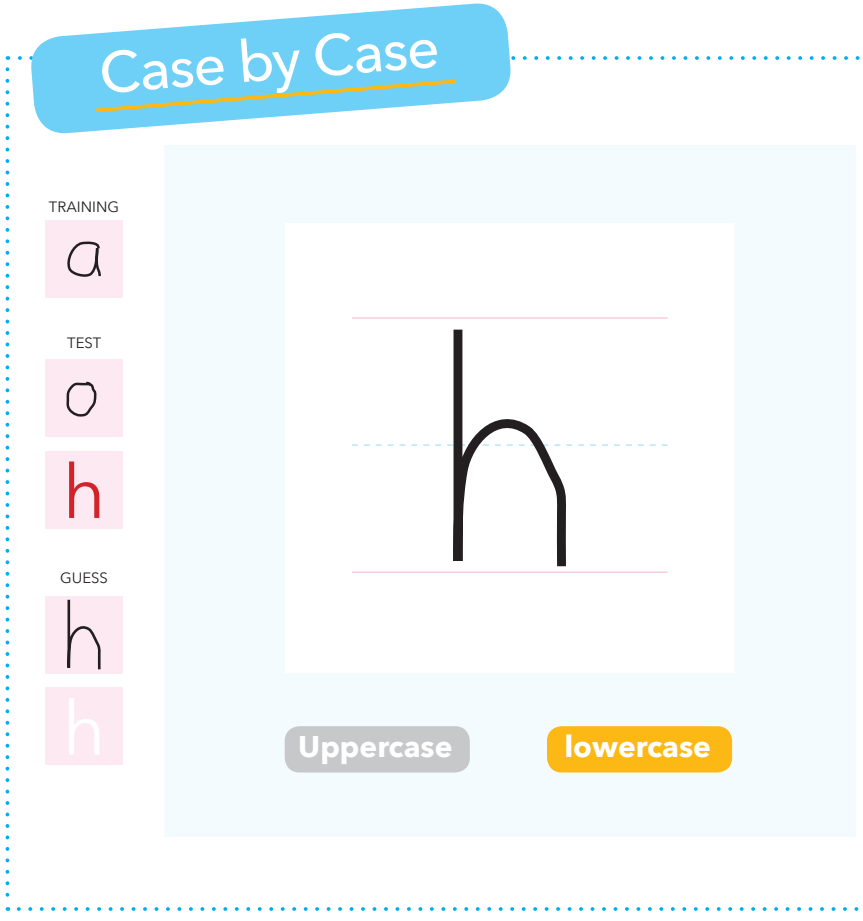
Conversion of the letter to a integer using ASCII Code



Updated dataset with upper and lowercase letters tested in the Neural Network

Next steps:

To keep exploring this method and eventually build this kid's app that could not only create testing data from what the child writes, but could also be a fun way for kid's to practice writing their letters and identifying the letters case by case.



Mockup of a kid's learning app to help learn the difference between uppercase and lowercase letters