### Amara & Haziqa Assignment 1

Question 1:

## **Binary Classification**

Feature Extration Method	Classifier	Results				
	SVM	Results of SV	M CLASSIFIER	on BOW		
			precision	recall	f1-score	support
		0	0.84 0.25	0.77 0.33	0.80 0.28	933 212
		1	0.25	0.33	0.20	212
		accuracy			0.69	1145
		macro avg	0.54	0.55	0.54	1145
		weighted avg	0.73	0.69	0.70	1145
		[[716 217] [141 71]]				
	Logistic Regression	Results of Lo	n BOW			
	Regression		precision	recall	f1-score	support
		0	0.92	0.77	0.84	1030
		1	0.17	0.43	0.25	115
		accuracy			0.74	1145
BOW		macro avg	0.55	0.60		1145
		weighted avg	0.85	0.74	0.78	1145
		[[792 238]				
		[ 65 50]]				
	Random Forest	Results of B	Random Forest	t on BOW		
			precision	recall	f1-score	support
		0	1.00	0.75	0.86	1145
		1	0.00	0.00	0.00	0
		accuracy			0.75	1145
		macro avg	0.50	0.37	0.43	1145
		weighted avg	1.00	0.75	0.86	1145
		[[857 288] [ 0 0]]				

	Naive Bayes	Results of Na	ive Baves Cl	assifier	on BOW			
	24,00	Nesarts of Na	_			gunnat		
			precision		f1-score	support		
		0	0.65 0.38	0.76 0.27	0.70 0.31	734 411		
			0.50	0.27				
		accuracy macro avg	0.52	0.51	0.58 0.51	1145 1145		
		weighted avg	0.55	0.58	0.56	1145		
		[[556 178] [301 110]]						
		0 00000						
	Perceptron	Results of Perceptron Classifier on TF-IDF Vectorizer						
			precision	recall	f1-score	support		
		0	0.65	0.78	0.71	709		
		1	0.47	0.31	0.37	436		
		accuracy		0 55	0.60	1145		
		macro avg weighted avg		0.55 0.60	0.54 0.58	1145 1145		
		[[555 154]						
		[302 134]]						
	0)/84							
	SVM	Results of SV	/M CLASSIFIE	R on TF-II	OF Vectorize	er		
			precision	recall	f1-score	support		
		0	0.88	0.77	0.82	985		
		1	0.21	0.38	0.27	160		
		accuracy	0 55	0.50	0.72	1145		
		macro avg weighted avg	0.55 0.79	0.58 0.72	0.55 0.75	1145 1145		
		[[758 227]						
		[ 99 61]]						
TF /IDF	Logistic	Results of Logi	stic Regressic	on Classifie	er on TF-IDF	/ectorizer		
	Regression	p.	recision re	ecall f1-sc	ore support	:		
		0 1			.86 1136 .03			
		accuracy macro avg	0.51		0.75 1145 0.44 1145			
		weighted avg			0.85 1145			
		[[853 283] [ 4 5]]						

	Random Forest	Results of R	andom Fores	t on TF-II	OF Vectori	zer
			precision		f1-score	
		0	1.00	0.75 0.00	0.86 0.00	1145 0
		accuracy			0.75	1145
		macro avg	0.50	0.37	0.43	1145
		weighted avg	1.00	0.75	0.86	1145
		[[857 288] [ 0 0]]				
	Naive Bayes	Results of Na	aive Bayes C	lassifier	on TF-IDF	Vectorizer
			precision	recall	f1-score	support
		0	0.53	0.76	0.63	595
		1	0.51	0.27	0.35	550
		accuracy			0.53	1145
		macro avg weighted avg	0.52 0.52	0.52 0.53	0.49 0.50	1145 1145
		[[455 140] [402 148]]				
	Perceptron	Results of Pe	erceptron Cl	assifier o	on TF-IDF	Vectorizer
			precision	recall	f1-score	support
		0	0.75	0.77		
		1	0.33	0.31	0.32	305
		accuracy			0.65	
		macro avg weighted avg	0.54 0.64	0.54 0.65	0.54 0.64	1145 1145
		[[647 193] [210 95]]	***************************************	0.00	0.00	
	SVM	Results of SV	M CLASSIFIE	R on Bi-gı	cam	
			precision	recall	f1-score	support
		0	0.96	0.76	0.85	1090
		1	0.08	0.40	0.13	55
Bi-Gram		accuracy			0.74	1145
		macro avg weighted avg	0.52 0.92	0.58 0.74	0.49 0.81	1145 1145
		[[828 262] [ 33 22]]	125			

	1					
	Logistic Regression	Results of Lo	ogistic Regre	ssion Cla	ssifier on	Bi-gram
	Regression		precision	recall	f1-score	support
		0	0.99	0.75	0.86	1135
		1	0.01	0.40	0.03	10
		accuracy macro avg	0.50	0.58	0.75 0.44	1145 1145
		weighted avg	0.98	0.75	0.85	1145
		[[855 280] [ 6 4]]				
R	andom Forest	Results of R	andom Forest	on Bi-gr	cam	
			precision	recall	f1-score	support
		0	1.00	0.75	0.86	1145
		1	0.00	0.00	0.00	0
		accuracy			0.75	1145
		macro avg weighted avg	0.50 1.00	0.38 0.75	0.43	1145 1145
		[[861 284] [ 0 0]]				
	Naive Bayes	Results of Na	ive Bayes Cl	assifier	on Bi-gram	
			precision	recall	f1-score	support
		0	0.70	0.75	0.72	797
		1	0.30	0.25	0.27	348
		accuracy macro avg	0.50	0.50	0.60	1145 1145
		weighted avg	0.58	0.60	0.59	1145
		[[599 198] [262 86]]				
	Perceptron	Results of Pe	erceptron Cla	ssifier o	n Bi-gram	
			precision	recall	f1-score	support
		0	0.85	0.76	0.80	959
		1	0.20	0.30	0.24	186
		accuracy	0 50	0.50	0.69	1145
		macro avg weighted avg	0.52 0.74	0.53 0.69	0.52 0.71	1145 1145
		[[731 228] [130 56]]				

		ı				
	SVM	Results of SV	M CLASSIFIEF	on Tri-	gram	
			precision	recall	f1-score	support
		0	1.00	0.75	0.86	1139
		1	0.01	0.50	0.02	6
		accuracy	0.50	0.62	0.75	1145
		macro avg weighted avg	0.50 0.99	0.63 0.75	0.44 0.85	1145 1145
		[[858 281]				
		[ 3 3]]				
	Logistic Regression	Results of Lo	ogistic Regre	ession Cla	assifier on	Tri-gram
	rtogrossion		precision	recall	f1-score	support
		0	1.00	0.75	0.86	1143
		1	0.00	0.00	0.00	2
		accuracy macro avg		0.38	0.75 0.43	1145 1145
		weighted avg		0.75	0.86	1145
		[[859 284]				
		[ 2 0]]				
Tui Cuana						
Tri-Gram	Random Forest	Results of I	Random Forest	on Tri-	gram	
			precision	recall	f1-score	support
		0	1.00	0.75	0.86	1145
		1	0.00	0.00	0.00	0
		accuracy macro avg		0.38	0.75 0.43	1145 1145
		weighted avg	1.00	0.75	0.86	1145
		[[861 284]				
		[ 0 0]]				
	Naive Bayes	Results of Na	ive Bayes Cl	assifier	on Tri-gram	n
	-		precision	recall	f1-score	support
		0	0.35	0.79	0.49	383
		1	0.72	0.27	0.39	762
		accuracy			0.44	1145
		macro avg weighted avg	0.54 0.60	0.53 0.44	0.44	1145 1145
			2121	27	2	
		[[304 79] [557 205]]				

Perceptron	Results of Perceptron Classifier on Tri-gram					
		precision	recall	f1-score	support	
	0	0.92	0.76	0.84	1039	
	1	0.14	0.37	0.20	106	
	accuracy			0.73	1145	
	macro avg	0.53	0.57	0.52	1145	
	weighted avg	0.85	0.73	0.78	1145	
	[[794 245]					
	[ 67 39]]					

## **Multiclass Classification**

Feature Extration Method	Classifier	Results				
	SVM	Results of SVM (	CLASSIFIER	on BOW		
		pı	recision	recall	f1-score	support
		0	0.00	0.00	0.00	0
		1	0.00	0.00	0.00	0
		2	0.00	0.00	0.00	0
		3	0.00	0.00	0.00	0
		4	0.00	0.00	0.00	0
		5	1.00	0.66	0.80	217
		accuracy			0.66	217
		macro avg	0.17	0.11	0.13	217
		weighted avg	1.00	0.66	0.80	217
BOW	Logistic Regression	Results of Logistic Regression Classifier on BOW				
	regression	p	precision	recall	f1-score	support
		0	0.00	0.00	0.00	0
		1	0.00	0.00	0.00	0
		2	0.00	0.00	0.00	0
		3	0.00	0.00	0.00	0
		4	0.00	0.00	0.00	0
		5	1.00	0.66	0.80	217
		accuracy			0.66	217
		macro avg	0.17	0.11	0.13	217
		weighted avg	1.00	0.66	0.80	217
		1				

	Random Forest		= .			
	Namuom Forest	Results of R	andom Forest	on BOW		
			precision	recall	f1-score	support
		0	0.00	0.00	0.00	0
		1	0.00	0.00	0.00	0
		2	0.00	0.00	0.00	0
		3	0.00	0.00	0.00	0
		4 5	0.00 1.00	0.00	0.00 0.80	0 217
			1.00	0.00	0.80	217
		accuracy			0.66	217
		macro avg	0.17	0.11	0.13	217
		weighted avg	1.00	0.66	0.80	217
	Naive Bayes	Results of Na	ive Bayes Cla	assifier	on BOW	
			precision	recall	f1-score	support
		0	0.07	0.25	0.12	12
		1	0.00	0.00	0.00	1
		2	1.00	0.01	0.02	158
		3	0.00	0.00	0.00	2
		4	0.00	0.00	0.00	3
		5	0.17	0.61	0.27	41
		accuracy			0.14	217
		macro avg	0.21	0.15	0.07	217
		weighted avg	0.77	0.14	0.08	217
	Perceptron	Results of Per	rceptron Clas	ssifier o	n BOW	
			precision	recall	f1-score	support
		0	0.07	0.38	0.12	8
		1	0.00	0.00	0.00	2
		2	0.00	0.00	0.00	0
		3	0.00	0.00	0.00	2
		4 5	0.00	0.00	0.00	3 202
		1	0.92	0.66	0.77	202
		accuracy			0.63	217
		macro avg	0.17	0.17	0.15	217
		weighted avg	0.86	0.63	0.72	217
	SVM	Results of SV	M CLASSIFIER	on TF-ID	F Vectorize	er
			precision	recall	f1-score	support
		0	0.05	0.22	0.08	9
		1	0.00	0.00	0.00	0
		2	0.00	0.00	0.00	0
TF/IDF		3	0.00	0.00	0.00	0
ן ור/וטר		4 5	0.07	0.50	0.12	206
		5	0.96	0.67	0.79	206
		accuracy			0.65	217
		macro avg	0.18	0.23	0.17	217
1	l	weighted avg	0.91	0.65	0.75	217
i .		weighted avg	0.71	0.05	0.75	217

Logistic Regression	Results of Logis				
Regression	pı	recision	recall f1-	score supp	port
	0	0.00	0.00	0.00	0
	1	0.00	0.00	0.00	0
	2	0.00	0.00	0.00	0
	3	0.00	0.00	0.00	0
	4 5	1.00	0.66	0.00	217
		1.00	0.00	0.00	21,
	accuracy			0.66	217
	macro avg	0.17	0.11	0.13	217
	weighted avg	1.00	0.66	0.80	217
Random Forest	Results of Ra	andom Fores	t on TF-II	DF Vectoriz	zer
		precision	recall	f1-score	support
	0	0.00	0.00	0.00	0
	1	0.00	0.00	0.00	0
	2	0.00	0.00	0.00	0
	3	0.00	0.00	0.00	0
	4	0.00	0.00	0.00	0
	5	1.00	0.66	0.80	217
	accuracy			0.66	217
	macro avg	0.17	0.11	0.13	217
	weighted avg	1.00	0.66	0.80	217
	werdinger and	1.00	0.00	0.00	
Naive Bayes	Results of Nai	ve Bayes C	lassifier	on TF-IDF \	/ectorizer
Naive Bayes		ve Bayes C		on TF-IDF \	Vectorizer
Naive Bayes					
Naive Bayes		precision	recall	f1-score	support
Naive Bayes	0	precision 0.12	recall	f1-score	support
Naive Bayes	0	0.12 0.00	recall 0.23 0.00	f1-score 0.16 0.00	support  22 1
Naive Bayes	0 1 2 3 4	0.12 0.00 0.00 0.00 0.21	recall 0.23 0.00 0.00 0.00 0.00	f1-score 0.16 0.00 0.00 0.00 0.23	22 1 1 2 12
Naive Bayes	0 1 2 3	0.12 0.00 0.00 0.00	recall 0.23 0.00 0.00 0.00	0.16 0.00 0.00 0.00	22 1 1 2
Naive Bayes	0 1 2 3 4 5	0.12 0.00 0.00 0.00 0.21 0.84	recall 0.23 0.00 0.00 0.00 0.25 0.68	f1-score 0.16 0.00 0.00 0.00 0.23 0.75 0.59	22 1 1 2 12 179
Naive Bayes	0 1 2 3 4 5 accuracy macro avg	0.12 0.00 0.00 0.00 0.21 0.84	recall 0.23 0.00 0.00 0.00 0.05 0.68	f1-score  0.16 0.00 0.00 0.00 0.23 0.75  0.59 0.19	22 1 1 2 12 179 217 217
Naive Bayes	0 1 2 3 4 5	0.12 0.00 0.00 0.00 0.21 0.84	recall 0.23 0.00 0.00 0.00 0.25 0.68	f1-score 0.16 0.00 0.00 0.00 0.23 0.75 0.59	22 1 1 2 12 179
Naive Bayes  Perceptron	0 1 2 3 4 5 accuracy macro avg	0.12 0.00 0.00 0.00 0.21 0.84	recall 0.23 0.00 0.00 0.00 0.25 0.68	f1-score  0.16 0.00 0.00 0.00 0.23 0.75 0.59 0.19 0.65	22 1 1 2 12 179 217 217 217
	0 1 2 3 4 5 accuracy macro avg weighted avg  Results of Per	0.12 0.00 0.00 0.00 0.21 0.84	recall  0.23 0.00 0.00 0.00 0.25 0.68  0.19 0.59	f1-score  0.16 0.00 0.00 0.00 0.23 0.75 0.59 0.19 0.65	22 1 1 2 12 179 217 217 217
	0 1 2 3 4 5 accuracy macro avg weighted avg  Results of Per	0.12 0.00 0.00 0.00 0.21 0.84 0.20 0.72 ceptron Cla	recall  0.23 0.00 0.00 0.00 0.25 0.68  0.19 0.59  assifier o	f1-score  0.16 0.00 0.00 0.00 0.23 0.75 0.59 0.19 0.65  on TF-IDF Vo	support  22 1 1 2 17 217 217 217 ectorizer support 25
	0 1 2 3 4 5 accuracy macro avg weighted avg  Results of Per 0 1	0.12 0.00 0.00 0.00 0.21 0.84 0.20 0.72 ceptron Claprecision 0.15 0.00	recall  0.23 0.00 0.00 0.00 0.25 0.68  0.19 0.59  assifier o recall  0.24 0.00	f1-score  0.16 0.00 0.00 0.00 0.23 0.75 0.59 0.19 0.65  on TF-IDF Vo	22 1 1 2 12 179 217 217 217 217 217 217
	0 1 2 3 4 5 accuracy macro avg weighted avg  Results of Per 0 1 2	0.12 0.00 0.00 0.00 0.21 0.84 0.20 0.72 ceptron Claprecision 0.15 0.00 0.00	recall  0.23 0.00 0.00 0.00 0.25 0.68  0.19 0.59  assifier o  recall  0.24 0.00 0.00	f1-score  0.16 0.00 0.00 0.00 0.23 0.75 0.59 0.19 0.65  on TF-IDF Vo	22 1 1 2 17 217 217 217 217 217 217 227 22
	0 1 2 3 4 5 accuracy macro avg weighted avg  Results of Per 0 1 2 3	0.12 0.00 0.00 0.00 0.21 0.84 0.20 0.72 ceptron Claprecision 0.15 0.00 0.00	recall  0.23 0.00 0.00 0.00 0.25 0.68  0.19 0.59  assifier o  recall  0.24 0.00 0.00 0.00	f1-score  0.16 0.00 0.00 0.00 0.23 0.75 0.59 0.19 0.65  on TF-IDF Vol f1-score  0.18 0.00 0.00 0.00	support  22 1 1 2 12 179 217 217 217 ectorizer support  25 7 2 2
	0 1 2 3 4 5 accuracy macro avg weighted avg  Results of Per 0 1 2 3 4	0.12 0.00 0.00 0.00 0.21 0.84 0.20 0.72 ceptron Claprecision 0.15 0.00 0.00 0.00 0.36	recall  0.23 0.00 0.00 0.00 0.25 0.68  0.19 0.59  assifier o  recall  0.24 0.00 0.00 0.00 0.00 0.22	f1-score  0.16 0.00 0.00 0.00 0.23 0.75 0.59 0.19 0.65  on TF-IDF Volume  11-score  0.18 0.00 0.00 0.00 0.27	support  22 1 1 2 12 179 217 217 217 ectorizer support  25 7 2 2 2 2 3
	0 1 2 3 4 5 accuracy macro avg weighted avg  Results of Per 0 1 2 3	0.12 0.00 0.00 0.00 0.21 0.84 0.20 0.72 ceptron Claprecision 0.15 0.00 0.00	recall  0.23 0.00 0.00 0.00 0.25 0.68  0.19 0.59  assifier o  recall  0.24 0.00 0.00 0.00	f1-score  0.16 0.00 0.00 0.00 0.23 0.75 0.59 0.19 0.65  on TF-IDF Vol f1-score  0.18 0.00 0.00 0.00	support  22 1 1 2 12 179 217 217 217 ectorizer support  25 7 2 2
	0 1 2 3 4 5 accuracy macro avg weighted avg  Results of Per  0 1 2 3 4 5	0.12 0.00 0.00 0.00 0.21 0.84 0.20 0.72 ceptron Claprecision 0.15 0.00 0.00 0.00 0.36	recall  0.23 0.00 0.00 0.00 0.25 0.68  0.19 0.59  assifier o  recall  0.24 0.00 0.00 0.00 0.00 0.22	f1-score  0.16 0.00 0.00 0.00 0.23 0.75  0.59 0.19 0.65  on TF-IDF Volume  f1-score  0.18 0.00 0.00 0.00 0.00 0.27 0.73	support  22 1 1 2 17 217 217 217 ectorizer support  25 7 2 2 23 158
	0 1 2 3 4 5 accuracy macro avg weighted avg  Results of Per  0 1 2 3 4 5 accuracy	0.12 0.00 0.00 0.00 0.21 0.84 0.20 0.72 ceptron Claprecision 0.15 0.00 0.00 0.00 0.36 0.76	recall  0.23 0.00 0.00 0.00 0.25 0.68  0.19 0.59  assifier o  recall  0.24 0.00 0.00 0.00 0.22 0.70	f1-score  0.16 0.00 0.00 0.00 0.23 0.75  0.59 0.19 0.65  0.TF-IDF Vo. f1-score  0.18 0.00 0.00 0.00 0.27 0.73 0.56	support  22 1 1 2 17 217 217 217 217 217 217 21
	0 1 2 3 4 5 accuracy macro avg weighted avg  Results of Per  0 1 2 3 4 5	0.12 0.00 0.00 0.00 0.21 0.84 0.20 0.72 ceptron Claprecision 0.15 0.00 0.00 0.00 0.36	recall  0.23 0.00 0.00 0.00 0.25 0.68  0.19 0.59  assifier o  recall  0.24 0.00 0.00 0.00 0.00 0.22	f1-score  0.16 0.00 0.00 0.00 0.23 0.75  0.59 0.19 0.65  on TF-IDF Volume  f1-score  0.18 0.00 0.00 0.00 0.00 0.27 0.73	support  22 1 1 2 17 217 217 217 ectorizer support  25 7 2 2 23 158

	SVM	Results of SV	M CLASSIFIER	on Bi-gr	am		
			precision		f1-score	support	
			precipion	rccurr	II boole	Bupporc	
		0	0.03	0.33	0.05	3	
		1	0.00	0.00	0.00	0	
		2 3	0.00	0.00	0.00	0	
		4	0.00	0.00	0.00	1	
		5	0.99	0.67	0.80	213	
		accuracy			0.66	217	
		macro avg weighted avg	0.17 0.98	0.17 0.66	0.14 0.79	217 217	
		weighted avg	0.90	0.00	0.75	217	
	Logistic Regression	Results of Logistic Regression Classifier on Bi-gram					
	rtogrootion.		precision	recall	f1-score	support	
		0		0.00		0	
		1		0.00		0	
		2 3		0.00		0	
		4		0.00		1	
		5		0.67		216	
		1					
		accuracy			0.66	217	
		macro avg		0.11		217	
		weighted avg	1.00	0.66	0.80	217	
Bi-Gram	Random Forest	Results of I	Random Fores	t on Bi-g	ram		
			precision	recall	f1-score	support	
		0	0.00	0.00	0.00	0	
		1	0.00	0.00	0.00	0	
		2	0.00	0.00		0	
		3	0.00	0.00		0	
		4	0.00	0.00		0	
		5	1.00	0.66	0.80	217	
		accuracy			0.66	217	
		macro avg	0.17	0.11		217	
		weighted avg	1.00	0.66	0.80	217	
	Naive Bayes	Results of Na	aive Bayes Cl	assifier	on Bi-gram		
			precision	recall	f1-score	support	
		0	0.15	0.17	0.16	36	
		1	0.00	0.00	0.00	5	
		2	0.00	0.00	0.00	24	
		3	0.00	0.00	0.00	4	
		4 5	0.00 0.62	0.00 0.67	0.00 0.65	14 134	
		]	0.02	3.07	3.03	131	
		accuracy			0.44	217	
		macro avg	0.13	0.14	0.13	217	
		weighted avg	0.41	0.44	0.43	217	

	Perceptron	Results of Pe	erceptron Cl	assifier	on Bi-gram	i.
			precision	recall	f1-score	support
		0	0.15	0.30	0.20	20
		1	0.14	0.14	0.14	7
		2	0.00	0.00		
		3 4	0.00	0.00		
		5	0.74	0.68		
		accuracy			0.53	217
		macro avg	0.17	0.19	0.18	217
		weighted avg	0.56	0.53	0.54	217
	SVM	Results of SVN	M CLASSIFIER	on Tri-gr	am	
			precision	recall	f1-score	support
		0	0.00	0.00	0.00	0
		1	0.00	0.00	0.00	0
		2 3	0.00	0.00	0.00	0
		4	0.00	0.00	0.00	0 0
		5	1.00	0.66	0.80	217
		accuracy			0.66	217
		macro avg	0.17	0.11	0.13	217
		weighted avg	1.00	0.66	0.80	217
	Logistic	Results of Log	gistic Regre	ession Cla	assifier on	n Tri-gram
	Regression		precision	recall	f1-score	support
		0	0.00	0.00	0.00	0
		1	0.00	0.00	0.00	0
		2 3	0.00	0.00	0.00	0
Tri-Gram		4	0.00	0.00	0.00	Ö
•		5	1.00	0.66	0.80	217
		accuracy			0.66	217
		macro avq	0.17	0.11	0.13	217
		weighted avg	1.00	0.66	0.80	217
	Random Forest	Results of R	andom Fores	t on Tri-g	ram	
			precision	recall	f1-score	support
		0	0.00	0.00	0.00	0
		1 2	0.00	0.00	0.00	0 0
		3	0.00	0.00	0.00	0
		4	0.00	0.00	0.00	0
		5	1.00	0.66	0.80	217
		accuracy			0.66	217
		macro avg	0.17	0.11	0.13	217
		weighted avg	1.00	0.66	0.80	217

Naive Bayes	Results of N	aive Bayes C	lassifier	Results of Naive Bayes Classifier on Tri-gram						
		precision	recall	f1-score	support					
	0		0.25		12					
	1		0.00		1					
	2		0.01		158					
	3		0.00		2					
	4		0.00		3					
	5	0.17	0.61	0.27	41					
	20017201			0.14	217					
	accuracy macro avg		0.15		217					
	weighted avg		0.13		217					
	weighted avg	0.77	0.14	0.00	217					
Perceptron	Results of Pe	rceptron Cla	ssifier or	Tri-gram						
		precision	recall	f1-score	support					
	0	0.07	0.38	0.12	8					
	1	0.00	0.00	0.00	2					
	2	0.00	0.00	0.00	0					
	3	0.00	0.00	0.00	2					
	4	0.00	0.00	0.00	3					
	5	0.92	0.66	0.77	202					
	accuracy			0.63	217					
	macro avg	0.17	0.17	0.15	217					
	weighted avg	0.86	0.63	0.72	217					

#### Question 2:

# **Binary Classification**

Model	Layer	Dropout	Results			
RNN	1	0.2		precision	recall	f1-score
			0	0.80	0.76	0.78
			1	0.25	0.30	0.27
			accuracy macro avg	0.53	0.53	0.66 0.53
DAIN						
RNN	2	0.2		precision	recall	f1-score
			0	0.76	0.75	0.76
			1	0.27	0.27	0.27
			accuracy			0.63
			macro avg		0.51	0.51

NNN   1   0.4	RNN	3	0.2				
RNN   3   0.4	IXININ		0.2		precision	recall	f1-score
RNN   1				6	0.73	0.76	0.74
RNN				1	0.34	0.29	0.31
RNN				accuracy	/		0.63
RNN   2   0.4				macro avg	g 0.53	0.53	0.53
RNN   2   0.4   precision   recall   f1-score   0.63   0.51   0	RNN	1	0.4		precision	recall	f1-score
RNN   2   0.4				0	0.77	0.75	0.76
RNN 2 0.4 precision recall f1-score  0 0.73 0.77 0.75 1 0.34 0.30 0.32  accuracy macro avg 0.53 0.53 0.53  RNN 3 0.4 precision recall f1-score  0 0.84 0.75 0.79 1 0.18 0.27 0.22  accuracy macro avg 0.51 0.51 0.51  RNN 1 0.6 precision recall f1-score  0 0.84 0.75 0.79 1 0.18 0.27 0.22  accuracy macro avg 0.51 0.51 0.51  RNN 1 0.6 precision recall f1-score  0 0.76 0.75 0.76 1 0.25 0.26 0.26  accuracy 0.63				1	0.26	0.27	0.26
RNN 2 0.4 precision recall f1-score  0 0.73 0.77 0.75 1 0.34 0.30 0.32  accuracy macro avg 0.53 0.53 0.53  RNN 3 0.4 precision recall f1-score  0 0.84 0.75 0.79 1 0.18 0.27 0.22  accuracy macro avg 0.51 0.51 0.51  RNN 1 0.6 precision recall f1-score  0 0.84 0.75 0.79 1 0.18 0.27 0.22  accuracy macro avg 0.51 0.51 0.51  RNN 1 0.6 precision recall f1-score  0 0.76 0.75 0.76 1 0.25 0.26 0.26  accuracy 0.63				accuracy			0.64
RNN 3 0.4 precision recall f1-score  0 0.73 0.77 0.75 1 0.34 0.30 0.32  accuracy macro avg 0.53 0.53 0.53  RNN 3 0.4 precision recall f1-score  0 0.84 0.75 0.79 1 0.18 0.27 0.22  accuracy macro avg 0.51 0.51  RNN 1 0.6 precision recall f1-score  0 0.76 0.75 0.76 1 0.25 0.26 0.26  accuracy 0.63					0.51	0.51	
RNN 3 0.4 precision recall f1-score  0 0.73 0.77 0.75 1 0.34 0.30 0.32  accuracy macro avg 0.53 0.53 0.53  RNN 3 0.4 precision recall f1-score  0 0.84 0.75 0.79 1 0.18 0.27 0.22  accuracy macro avg 0.51 0.51  RNN 1 0.6 precision recall f1-score  0 0.76 0.75 0.76 1 0.25 0.26 0.26  accuracy 0.63							
1   0.34   0.30   0.32	RNN	2	0.4		precision	recall	f1-score
RNN 3 0.4 precision recall f1-score 0 0.84 0.75 0.79 1 0.18 0.27 0.22 accuracy macro avg 0.51 0.51 0.51  RNN 1 0.6 precision recall f1-score 0 0.84 0.75 0.79 1 0.18 0.27 0.22 accuracy macro avg 0.51 0.51 0.51  RNN 2 1 0.6 precision recall f1-score 0 0.76 0.75 0.76 1 0.25 0.26 0.26 accuracy 0.63				0	0.73	0.77	0.75
RNN 3 0.4 precision recall f1-score  0 0.84 0.75 0.79 1 0.18 0.27 0.22 accuracy macro avg 0.51 0.51 0.51  RNN 1 0.6 precision recall f1-score  0 0.76 0.75 0.76 1 0.25 0.26 0.26 accuracy 0.63				1	0.34	0.30	0.32
RNN 3 0.4 precision recall f1-score  0 0.84 0.75 0.79 1 0.18 0.27 0.22  accuracy macro avg 0.51 0.51 0.51  RNN 1 0.6 precision recall f1-score  0 0.76 0.75 0.76 1 0.25 0.26 0.26  accuracy 0.63				accuracy			0.63
Precision recall f1-score   0 0.84 0.75 0.79   1 0.18 0.27 0.22					0.53	0.53	0.53
RNN 1 0.6 precision recall f1-score  0 0.84 0.75 0.79 1 0.18 0.27 0.22  accuracy macro avg 0.51 0.51  precision recall f1-score 0 0.76 0.75 0.76 1 0.25 0.26 0.26  accuracy 0.63	RNN	3	0.4		precision	recall	f1-score
RNN 1 0.6 precision recall f1-score  0 0.76 0.75 0.76 1 0.25 0.26 0.26  accuracy macro avg 0.51 0.51 0.51							
RNN 1 0.6 precision recall f1-score  0 0.76 0.75 0.76 1 0.25 0.26 0.26  accuracy 0 0.51 0.51 0.67							
RNN 1 0.6 precision recall f1-score  0 0.76 0.75 0.76 1 0.25 0.26 0.26  accuracy 0.63				1	0.18	0.27	0.22
RNN 1 0.6 precision recall f1-score  0 0.76 0.75 0.76 1 0.25 0.26 0.26  accuracy 0.63				accuracy			0.67
0 0.76 0.75 0.76 1 0.25 0.26 0.26 accuracy 0.63				macro avg	0.51	0.51	0.51
1 0.25 0.26 0.26 accuracy 0.63	RNN	1	0.6		precision	recall	f1-score
1 0.25 0.26 0.26 accuracy 0.63							
accuracy 0.63							
					0.23	0.20	0.20
macro avg 0.51 0.51 0.51							
				macro avg	0.51	0.51	0.51

RNN	2	0.6		precision	recall	f1-score
			0	a 9a	0.76	0.78
			1		0.30	
			266110261			0.66
			accuracy macro avg	0.53	0.53	
RNN	3	0.6		precision	recall	f1-score
			0	0.83	0.75	0.79
			1		0.27	
			accuracy			0.67
			macro avg	0.51	0.51	
LSTM	1	0.2	pr	ecision r	ecall f1-s	core
			0	0.65 0.32		0.70
			1	0.32		0.26
			accuracy		-	0.58
LSTM	2	0.2		precision	recall f1-	score
				0.64		
			1	0.34	0.22	0.27
			accuracy			0.57
LSTM	3	0.2		precision	recall	f1-score
			0		0.77	
			1	0.32	0.22	0.26
			accuracy			0.59
LSTM	1	0.4	0	0.65	0.77	0.70
			0 1	0.65 0.35	0.77 0.23	0.70 0.28
			accuracy			0.58

LSTM	2	0.4		precision	recall	f1-score
			0	0.65	0.77	0.71
			1	0.35		0.28
			accuracy			0.59
LSTM	3	0.4		precision	recall	f1-score
			0	0.63	0.76	0.69
			1	0.33	0.21	0.26
			accuracy			0.56
LSTM	1	0.6		precision	recall	f1-score
			0	0.81		
			1	0.20	0.26	0.23
			accuracy			0.66
			macro avg	0.51	0.51	0.50
LSTM	2	0.6		precision	recall	f1-score
			0	0.81	0.75	0.78
			1	0.20	0.26	0.23
			accuracy			0.66
			macro avg	0.51	0.51	0.50
LSTM	3	0.6		precision	recall	f1-score
			0	0.81	0.75	0.78
			1	0.20	0.26	0.23
			accuracy			0.66
			macro avg	0.51	0.51	0.50

Model	Layer	Dropout	Results				
BILSTM	1	0.2		pre	cision	recall	f1-score
			0		0.65	0.76	0.70
			1		0.32	0.21	0.26
			accuracy				0.58
BILSTM	2	0.2		pr	recision	recall	f1-score
			0	)	0.64		
			1	L	0.34	0.22	0.27
			accuracy	,			0.57
BILSTM	3	0.2		рі	recision	recall	f1-score
			0		0.65	0.76	
			1		0.32	0.21	0.25
			accuracy	,			0.57
BILSTM	1	0.4			precision	recall	f1-score
				0	1.00	0.75	0.86
				1	0.00	0.00	0.00
			accura				0.75
			macro a	vg	0.50	0.37	0.43
BILSTM	2	0.4		р	recision	recall	f1-score
			(	9	1.00	0.75	0.85
			1	1	0.00	0.00	0.00
			accuracy	y			0.75
			macro avg	g	0.50	0.37	0.43

		1	1			
BILSTM	3	0.4		precision	recall	f1-score
			0	1.00	0.75	0.86
			0			
			1	0.00	0.00	0.00
			accuracy			0.75
			macro avg	0 50	0.38	
			macro avg	0.50	0.50	0.43
BILSTM	1	0.6		precision	recall	f1-score
			0	1.00	0.75	0.86
			1	0.00	0.00	0.00
			_			
			accuracy			0.75
			macro avg	0.50	0.38	0.43
BILSTM	2	0.6		precision	recall	f1-score
			0	1.00	0.75	0.86
			1	0.00	0.00	
			accuracy			0.75
			macro avg	0.50	0.38	0.43
BILSTM	3	0.6		precision	recall	f1-score s
			0	1.00	0.75	0.86
			1		0.00	0.00
			accuracy			0.75
			macro avg	0.50	0.38	0.43
GRU	1	0.2		precision	recall	f1-score
				F		
			0	1.00	0.75	0.86
			1	0.00	0.00	0.00
						0.75
			accuracy		0.30	0.75
			macro avg	0.50	0.38	0.43
L						

GRU	2	0.2		precision	recall	f1-score
			0 1	1.00	0.75 0.00	0.86 0.00
			1	0.00	0.00	0.00
			accuracy macro avg	0.50	0.38	0.75 0.43
GRU	3	0.2		precision	recall	f1-score
			0		0.75	0.86
			1	0.00	0.00	0.00
			accuracy			0.75
			macro avg	0.50	0.38	0.43
GRU	1	0.4		precision	recall	f1-score
			0	1.00	0.75	
			1	0.00	0.00	0.00
			accuracy			0.75
			macro avg	0.50	0.38	0.43
GRU	2	0.4		precision	recall	f1-score
			0	1.00	0.75	
			1	0.00	0.00	0.00
			accuracy			0.75
			macro avg	0.50	0.38	0.43
GRU	3	0.4	ı	precision	recall	f1-score
			Ø	1.00	0.75	0.86
			1	0.00	0.00	0.00
			accuracy			0.75
			macro avg	0.50	0.38	0.43 a 96
GRU	1	0.6		precision		f1-score
			0	1.00	0.75	0.86
			1	0.00	0.00	0.00
			accuracy			0.75
			macro avg	0.50	0.38	0.43

GRU	2	0.6		precision	recall	f1-score
			0 1	1.00	0.75 0.00	0.86 0.00
			accuracy macro avg	0.50	0.38	0.75 0.43
GRU	3	0.6		precision	recall	f1-score
			0 1	1.00	0.75 0.00	0.86 0.00
			accuracy macro avg	0.50	0.38	0.75 0.43

#### **Multiclass classification**

Analysis: The dataset is very imbalanced / skewed. Most of the tweets had NaN values or not fall in any of the 5 categories so the results particularly accuracy is severely effected by it.

Model	Layer	Dropout	Results			
RNN	1	0.2		precision	recall	f1-score
			0	0.14	0.15	0.15
			1	0.00	0.00	0.00
			2	0.00	0.00	0.00
			3	0.00	0.00	0.00
			4	0.14	0.06	0.08
			micro avg	0.14	0.09	0.11
			macro avg	0.06	0.04	0.05

			1			
RNN	2	0.2		precision	recall	f1-score
			0	0.23	0.30	0.26
			1	0.00	0.00	0.00
			2	0.00	0.00	0.00
			3	0.00	0.00	0.00
			4	0.11	0.12	0.12
				0.11	0.12	0.12
			micro avg	0.19	0.19	0.19
			macro avg	0.07	0.08	0.08
			Ü			
RNN	3	0.2		precision	recall	f1-score
			0	0.17	0.25	0.20
			1	0.00	0.00	0.00
			2		0.00	0.00
			3		0.00	
			4	0.17	0.22	0.19
			micro avg	0.16	0.19	0.17
			macro avg		0.09	0.08
				0.44	0.05	0.16
	,					
RNN	1	0.4		precision	recall	f1-score
			0	0.17	0.18	0.17
			1	0.00	0.00	0.00
			2	0.00	0.00	0.00
			3	0.00	0.00	0.00
			4	0.05	0.03	0.04
			micro avg	0.13	0.11	0.12
			macro avg	0.04	0.04	0.04
RNN	2	0.4	r	precision	recall	f1-score
	-	0.1				
			0	0.24	0.31	0.27
			1	0.00	0.00	0.00
			2	0.00	0.00	0.00
			3	0.04	0.07	0.05
			4	0.05	0.03	0.04
			micro avg	0.15	0.18	0.17
			macro avg	0.07	0.08	0.07
			l .			

RNN	3	0.4		precision	recall	f1-score
			0	0.40	0.03	0.06
			1	0.00	0.00	0.00
			2	0.00	0.00	0.00
			3	0.00	0.00	0.00
			4	0.14	0.16	0.14
			micro avg	0.16	0.06	0.09
			macro avg	0.11	0.04	0.04
RNN	1	0.6		precision	recall	f1-score
			0	0.40	0.03	0.06
			1	0.00	0.00	0.00
			2	0.00	0.00	0.00
			3	0.00	0.00	0.00
			4	0.14	0.16	0.14
			micro avg	0.16	0.06	0.09
			macro avg	0.11	0.04	0.04
RNN	2	0.6		precision	recall	f1-score
RNN	2	0.6	0	precision 0.13	recall 0.11	f1-score
RNN	2	0.6	Ø 1			
RNN	2	0.6		0.13	0.11	0.12
RNN	2	0.6	1	0.13 0.00	0.11 0.00	0.12 0.00
RNN	2	0.6	1 2	0.13 0.00 0.00	0.11 0.00 0.00	0.12 0.00 0.00
RNN	2	0.6	1 2 3 4	0.13 0.00 0.00 0.00 0.00	0.11 0.00 0.00 0.00	0.12 0.00 0.00 0.00 0.00
RNN	2	0.6	1 2 3	0.13 0.00 0.00 0.00	0.11 0.00 0.00 0.00 0.00	0.12 0.00 0.00 0.00
RNN	3	0.6	1 2 3 4 micro avg	0.13 0.00 0.00 0.00 0.00	0.11 0.00 0.00 0.00 0.00 0.00	0.12 0.00 0.00 0.00 0.00
			1 2 3 4 micro avg macro avg	0.13 0.00 0.00 0.00 0.00 0.13 0.03	0.11 0.00 0.00 0.00 0.00 0.06 0.02	0.12 0.00 0.00 0.00 0.00 0.08 0.02
			1 2 3 4 micro avg macro avg	0.13 0.00 0.00 0.00 0.00 0.13 0.03 precision	0.11 0.00 0.00 0.00 0.00 0.06 0.02 recall	0.12 0.00 0.00 0.00 0.00 0.08 0.02 f1-score
			1 2 3 4 micro avg macro avg	0.13 0.00 0.00 0.00 0.00 0.13 0.03 precision 0.31 0.00	0.11 0.00 0.00 0.00 0.00 0.06 0.02 recall 0.08 0.00	0.12 0.00 0.00 0.00 0.00 0.08 0.02 f1-score 0.13 0.00
			1 2 3 4 micro avg macro avg	0.13 0.00 0.00 0.00 0.00 0.13 0.03 precision 0.31 0.00 0.00	0.11 0.00 0.00 0.00 0.00 0.06 0.02 recall 0.08 0.00 0.00	0.12 0.00 0.00 0.00 0.00 0.02 f1-score 0.13 0.00 0.00
			1 2 3 4 micro avg macro avg	0.13 0.00 0.00 0.00 0.00 0.13 0.03 precision 0.31 0.00	0.11 0.00 0.00 0.00 0.00 0.06 0.02 recall 0.08 0.00	0.12 0.00 0.00 0.00 0.00 0.08 0.02 f1-score 0.13 0.00
			1 2 3 4 micro avg macro avg 1 2 3 4	0.13 0.00 0.00 0.00 0.00 0.13 0.03 precision 0.31 0.00 0.00 0.00	0.11 0.00 0.00 0.00 0.00 0.02 recall 0.08 0.00 0.00 0.00	0.12 0.00 0.00 0.00 0.00 0.02 f1-score 0.13 0.00 0.00 0.00 0.17
			1 2 3 4 micro avg macro avg	0.13 0.00 0.00 0.00 0.00 0.13 0.03 precision 0.31 0.00 0.00	0.11 0.00 0.00 0.00 0.00 0.06 0.02 recall 0.08 0.00 0.00	0.12 0.00 0.00 0.00 0.00 0.08 0.02 f1-score 0.13 0.00 0.00

LSTM	1	0.2		precision	recall	f1-score
		0.2				
			0	0.12	0.08	0.10
			1	0.00	0.00	0.00
			2	0.00	0.00	0.00
			3	0.00	0.00	0.00
			4	0.18	0.13	0.15
			micro avg	0.14	0.08	0.10
			macro avg		0.04	0.05
LSTM	2	0.2		precision	recall	f1-score
				•		
			0		0.52	0.29
			1		0.00	0.00
			2		0.00	0.00
			3		0.00	0.00
			4	0.13	0.07	0.09
			micro avg	0.19	0.28	0.23
			macro avg		0.12	0.08
LSTM	3	0.2		precision	recall	f1-score
			0	0.21	0.42	0.28
			1	0.00	0.00	0.00
			2	0.00	0.00	0.00
			3	0.00	0.00	0.00
			4	0.20	0.03	0.06
			micro avg	0.19	0.21	0.20
			macro avg	0.08	0.09	0.07
LSTM	1	0.4		precision	recall	f1-score
			0	0.17	0.10	0.13
			1	0.00	0.00	0.00
			2	0.00	0.00	0.00
			3	0.00	0.00	0.00
			4	0.06	0.03	0.04
			micro avg	0.13	0.06	0.08
			macro avg	0.15	0.03	0.03
			avg	0.03	0.05	0.05

			l			
LSTM	2	0.4		precision	recall	t1-score
			0	0.22	0.33	0.27
			1	0.00	0.00	0.00
			2		0.00	0.00
			3		0.00	0.00
			4		0.07	0.09
				0.11	0.07	0.03
			micro avg	0.21	0.18	0.20
			macro avg		0.08	0.07
			_			
LSTM	3	0.4		precision	recall	†1-score
			0	0.21	0.15	0.17
			1		0.00	0.00
			2		0.00	0.00
			3		0.00	0.00
			4		0.13	0.11
				0.03	0.13	0.11
			micro avg	0.14	0.11	0.12
			macro avg	0.06	0.06	0.06
LSTM	1	0.6		precision	recall	f1-score
			0	0.12	0.10	0.11
			1	0.00	0.00	0.00
			2	0.00	0.00	0.00
			3	0.00	0.00	0.00
			4	0.07	0.03	0.04
			micro avg		0.06	0.08
			macro avg	0.04	0.03	0.03
LSTM	2	0.6		precision	recall	f1-score
			0	0.19	0.31	0.24
			1	0.00	0.00	0.00
			2	0.00	0.00	0.00
			3	0.00	0.00	0.00
			4	0.10	0.07	0.08
			4	0.10	0.07	0.00
			micro avg	0.17	0.17	0.17
			macro avg	0.06	0.08	0.06
			Š			

LSTM	3	0.6		precision	recall	f1-score
			0	0.22	0.35	0.27
			1	0.00	0.00	0.00
			2	0.00	0.00	0.00
			3	0.00	0.00	0.00
			4	0.10	0.04	0.05
			micro avg macro avg	0.21 0.06	0.22 0.08	0.21 0.06
					,,,,,	- 100

# (The results for GRU and BILSTM are similar because the dataset is fairly skewed)

Model	Layer	Dropout	Results			
GRU	1,2,3	0.2		precision	recall	†1-score
				0.00	0.00	0.00
			0	0.00	0.00	0.00
			1	0.00	0.00	0.00
			2	0.00	0.00	0.00
			3	0.00	0.00	0.00
			4	0.00	0.00	0.00
			5	0.64	1.00	0.78
			accuracy			0.64
			macro avg	0.11	0.17	0.13
GRU	1,2,3	0.4		precision	recarr	TI-score
			0	0.00	0.00	0.00
			1	0.00	0.00	0.00
			2	0.00	0.00	0.00
			3	0.00	0.00	0.00
			4	0.00	0.00	0.00
			5	0.64	1.00	0.78
			accuracy			0.64
			macro avg	0.11	0.17	0.13

GRU	1,2,3	0.6		precision	recall	f1-score
			0	0.00	0.00	0.00
			1	0.00	0.00	0.00
			2		0.00	0.00
			3	0.00	0.00	0.00
			4		0.00	0.00
			5	0.64	1.00	0.78
						0.64
			accuracy macro avg	0.11	0.17	0.64 0.13
			macro avg	0.11	0.17	0.13
BILSTM	1,2,3	0.2		precision	recall	f1-score
			0	0.00	0.00	0.00
			1	0.00	0.00	0.00
			2	0.00	0.00	0.00
			3	0.00	0.00	0.00
			4	0.00	0.00	0.00
			5	0.64	1.00	0.78
			accuracy			0.64
			macro avg	0.11	0.17	0.13
BILSTM	1,2,3	0.4		precision	recall	f1-score
			0	0.00	0.00	0.00
			1	0.00	0.00	0.00
			2	0.00	0.00	0.00
			3	0.00	0.00	0.00
			4	0.00	0.00	0.00
			5	0.64	1.00	0.78
			accuracy			0.64
			macro avg	0.11	0.17	0.13
BILSTM	1,2,3	0.6		precision	recall	f1-score
				0.00	0 00	0.00
			0	0.00 0.00	0.00 0.00	0.00
			2			
			3	0.00	0.00	0.00
			4	0.00 0.00	0.00 0.00	0.00
			5	0.64	1.00	0.00 0.78
			]	0.04	1.00	0.70
			accuracy			0.64
			macro avg	0.11	0.17	0.13