Approximate Graph Coloring via LSTM NN

Model-1 : 3 Layer LSTMS (1024, 1024, 1024)

- Total trainable params = 21,496,933
- Test Data Invalid Nodes % after model prediction = 9.22%
- Baidu Invalid Node % after model prediction = 37%
- Karate Invalid Node % after model prediction = 15%

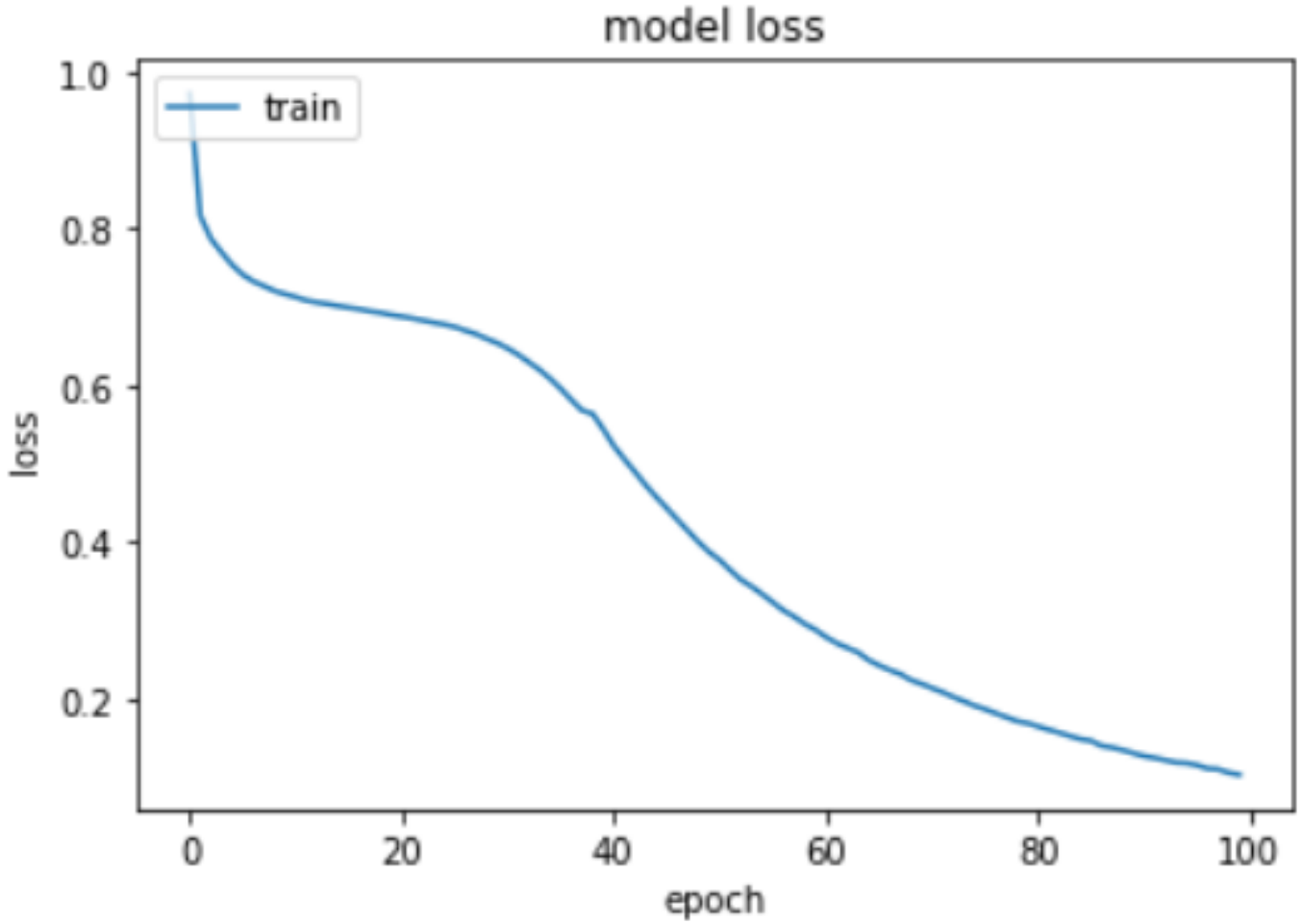
Model-2 : 3 Layer LSTMS (1024, 512, 256)

- Total trainable params = 8,569,189
- Test Data Invalid Nodes % after model prediction = 10%
- Baidu Invalid Node % after model prediction = 31%
- Karate Invalid Node % after model prediction = 22%

Model-3 : 3 Layer Bidirectional LSTMS (512, 256, 128)

- Total trainable params = 5,816,677
- Test Data Invalid Nodes % after model prediction = 9.1%
- Baidu Invalid Node % after model prediction = 31%
- Karate Invalid Node % after model prediction = 15%
- This model gave us the best results.

Model-3 : Training Loss Graph



Model-4 : 3 Layer Bidirectional LSTMS (512, 128, 64)

- Total trainable params = 3,868,901
- Test Data Invalid Nodes % after model prediction = 9.3%
- Baidu Invalid Node % after model prediction = 37%
- Karate Invalid Node % after model prediction = 15%

Model-5 : 3 Layer Bidirectional LSTMS (256, 256, 256)

- Total trainable params = 3,932,773
- Test Data Invalid Nodes % after model prediction = 9.3%
- Baidu Invalid Node % after model prediction = 31%
- Karate Invalid Node % after model prediction = 25%

FINAL RESULTS – Model-3 : 3 Layer Bidirectional LSTMS (512, 256, 128)

Graph	Golden Chromatic Number	Total nodes	Total edges	Chromatic Number prediced by original model	Invalid edges by original model	Invalid edges % by original model	Chromatic Number after color correction on original model	Chromatic Number prediced by new model	Invalid edges by new model	Invalid edges % by new model	Chromatic Number after color correction on new model	Golden Chromatic - Chromatic number after color correction
Baidu	**3**	**60**	**91**	**4**	**35**	**38**	**4**	**3**	**28**	**31**	**3**	0
Karate	**5**	**34**	**79**	**4**	**23**	**29**	**5**	**4**	**12**	**15**	**5**	0
insertions_2	4	37	72	3		34	4	3	23	32	6	2
insertions_3	4	56	110	3		41	4	3	34	31	4	0
insertions_4	4	67	232	5		28	6	4	53	23	5	1
mugg88	4	88	146					3	43	29	4	0
mugg100	4	100	166	3		35	4	3	53	32	4	0
queens8_12	12	96	1368	9		12	17	9	183	13	15	3
queens5x5	5	25	160	6		21	9	6	22	14	7	2
queens6x6	7	36	290	6		16	9	8	29	10	11	4
queens7x7	7	49	476	7		15	11	8	52	11	12	5
queens9	10	81	876					8	110	13	14	4
david	11	87	406					7	71	17	11	0
jean	10	80	254					4	75	30	11	1
myciel5	6	47	236					5	39	17	6	0
myciel4	5	23	71					4	12	17	5	0
myciel6	7	95	689					8	90	13	8	1

FINAL RESULTS – Model-3 : 3 Layer Bidirectional LSTMS (512, 256, 128) on LLVM graphs

Graph	Chromatic Number prediced by new model	Chromatic Number after color correction on new model
LLVM xz	454	687
LLVM leela	476	830
LLVM mcf1	153	234
LLVM namd	133	212
LLVM x264	441	711
LLVM gcc	334	527

THANK YOU !