

1 FB15k Evaluation

1.1 FB15k Average

1.1.1 FB15k Average Hits@K

	Hits@1 (%)	Hits@3 (%)	Hits@5 (%)	Hits@10 (%)
ComplEx	10.06 ± 0.42	20.82 ± 0.67	27.59 ± 0.94	38.03 ± 1.02
ConvE	48.28 ± 0.12	66.99 ± 0.04	73.27 ± 0.03	79.76 ± 0.07
DistMult	16.45 ± 0.16	29.10 ± 0.17	35.54 ± 0.21	45.00 ± 0.25
HolE	21.79 ± 0.19	39.69 ± 0.24	48.06 ± 0.30	58.84 ± 0.28
KG2E	0.11 ± 0.04	0.36 ± 0.08	0.56 ± 0.10	1.01 ± 0.14
RotatE	41.53 ± 0.06	64.14 ± 0.07	71.23 ± 0.05	78.67 ± 0.08
SimpleE	0.01 ± 0.00	0.03 ± 0.00	0.04 ± 0.00	0.06 ± 0.01
TransD	21.22 ± 0.03	40.48 ± 0.10	48.57 ± 0.09	58.71 ± 0.14
TransE	15.23 ± 0.16	29.85 ± 0.24	37.18 ± 0.24	47.34 ± 0.18
TransH	1.69 ± 0.25	2.95 ± 0.20	3.29 ± 0.22	3.74 ± 0.18
TransR	0.37 ± 0.00	0.63 ± 0.04	0.78 ± 0.06	1.03 ± 0.07
TuckER	0.01 ± 0.00	0.02 ± 0.00	0.03 ± 0.01	0.15 ± 0.17

1.1.2 FB15k Average Mean Ranks

	MR	MRR (%)	AMR (%)
ComplEx	171.16 ± 16.05	19.13 ± 0.45	2.46 ± 0.28
ConvE	50.76 ± 0.40	59.56 ± 0.06	0.73 ± 0.01
DistMult	134.02 ± 1.98	26.06 ± 0.17	1.86 ± 0.03
HolE	193.03 ± 7.61	34.15 ± 0.22	2.71 ± 0.12
KG2E	5779.07 ± 51.02	0.58 ± 0.07	78.40 ± 0.68
RotatE	42.28 ± 0.13	55.00 ± 0.06	0.63 ± 0.00
SimpleE	7395.75 ± 2.02	0.04 ± 0.00	100.02 ± 0.03
TransD	153.37 ± 5.35	33.99 ± 0.03	2.29 ± 0.09
TransE	127.92 ± 0.86	26.01 ± 0.17	1.78 ± 0.01
TransH	6320.02 ± 30.37	2.54 ± 0.20	85.63 ± 0.40
TransR	6795.95 ± 16.65	0.65 ± 0.02	91.99 ± 0.22
TuckER	7327.77 ± 29.22	0.07 ± 0.02	99.11 ± 0.39

1.2 FB15k Best

1.2.1 FB15k Best Hits@K

	Hits@1 (%)	Hits@3 (%)	Hits@5 (%)	Hits@10 (%)
ComplEx	10.06 \pm 0.42	20.82 \pm 0.67	27.59 \pm 0.94	38.03 \pm 1.02
ConvE	48.28 \pm 0.12	66.99 \pm 0.04	73.27 \pm 0.03	79.76 \pm 0.07
DistMult	16.45 \pm 0.16	29.10 \pm 0.17	35.54 \pm 0.21	45.00 \pm 0.25
HolE	21.79 \pm 0.19	39.69 \pm 0.24	48.06 \pm 0.30	58.84 \pm 0.28
KG2E	0.11 \pm 0.04	0.36 \pm 0.08	0.56 \pm 0.10	1.01 \pm 0.14
RotatE	41.53 \pm 0.06	64.14 \pm 0.07	71.23 \pm 0.05	78.67 \pm 0.08
SimpleE	11.58 \pm 6.42	24.16 \pm 10.95	34.73 \pm 13.40	54.28 \pm 15.80
TransD	21.22 \pm 0.03	40.48 \pm 0.10	48.57 \pm 0.09	58.71 \pm 0.14
TransE	15.23 \pm 0.16	29.85 \pm 0.24	37.18 \pm 0.24	47.34 \pm 0.18
TransH	1.69 \pm 0.25	2.95 \pm 0.20	3.29 \pm 0.22	3.74 \pm 0.18
TransR	0.37 \pm 0.00	0.63 \pm 0.04	0.78 \pm 0.06	1.03 \pm 0.07
TuckER	0.01 \pm 0.00	0.02 \pm 0.00	0.03 \pm 0.01	0.15 \pm 0.17

1.2.2 FB15k Best Mean Ranks

	MR	MRR (%)
ComplEx	171.16 \pm 16.05	19.13 \pm 0.45
ConvE	50.76 \pm 0.40	59.56 \pm 0.06
DistMult	134.02 \pm 1.98	26.06 \pm 0.17
HolE	193.03 \pm 7.61	34.15 \pm 0.22
KG2E	5779.07 \pm 51.02	0.58 \pm 0.07
RotatE	42.28 \pm 0.13	55.00 \pm 0.06
SimpleE	139.34 \pm 49.45	23.90 \pm 8.79
TransD	153.37 \pm 5.35	33.99 \pm 0.03
TransE	127.92 \pm 0.86	26.01 \pm 0.17
TransH	6320.00 \pm 30.37	2.54 \pm 0.20
TransR	6795.94 \pm 16.65	0.65 \pm 0.02
TuckER	7327.77 \pm 29.22	0.07 \pm 0.02

1.3 FB15k Worst

1.3.1 FB15k Worst Hits@K

	Hits@1 (%)	Hits@3 (%)	Hits@5 (%)	Hits@10 (%)
ComplEx	10.06 \pm 0.42	20.82 \pm 0.67	27.59 \pm 0.94	38.03 \pm 1.02
ConvE	48.28 \pm 0.12	66.99 \pm 0.04	73.27 \pm 0.03	79.76 \pm 0.07
DistMult	16.45 \pm 0.16	29.10 \pm 0.17	35.54 \pm 0.21	45.00 \pm 0.25
HolE	21.79 \pm 0.19	39.69 \pm 0.24	48.06 \pm 0.30	58.84 \pm 0.28
KG2E	0.11 \pm 0.04	0.36 \pm 0.08	0.56 \pm 0.10	1.01 \pm 0.14
RotatE	41.53 \pm 0.06	64.14 \pm 0.07	71.23 \pm 0.05	78.67 \pm 0.08
SimpleE	0.01 \pm 0.00	0.03 \pm 0.00	0.04 \pm 0.00	0.06 \pm 0.01
TransD	21.22 \pm 0.03	40.48 \pm 0.10	48.57 \pm 0.09	58.71 \pm 0.14
TransE	15.23 \pm 0.16	29.85 \pm 0.24	37.18 \pm 0.24	47.34 \pm 0.18
TransH	1.69 \pm 0.25	2.95 \pm 0.20	3.29 \pm 0.22	3.74 \pm 0.18
TransR	0.37 \pm 0.00	0.63 \pm 0.04	0.78 \pm 0.06	1.03 \pm 0.07
TuckER	0.01 \pm 0.00	0.02 \pm 0.00	0.03 \pm 0.01	0.15 \pm 0.17

1.3.2 FB15k Worst Mean Ranks

	MR	MRR (%)
ComplEx	171.16 \pm 16.05	19.13 \pm 0.45
ConvE	50.76 \pm 0.40	59.56 \pm 0.06
DistMult	134.02 \pm 1.98	26.06 \pm 0.17
HolE	193.03 \pm 7.61	34.15 \pm 0.22
KG2E	5779.07 \pm 51.02	0.58 \pm 0.07
RotatE	42.28 \pm 0.13	55.00 \pm 0.06
SimpleE	14652.16 \pm 45.71	0.03 \pm 0.00
TransD	153.37 \pm 5.35	33.99 \pm 0.03
TransE	127.92 \pm 0.86	26.01 \pm 0.17
TransH	6320.05 \pm 30.37	2.54 \pm 0.20
TransR	6795.95 \pm 16.65	0.65 \pm 0.02
TuckER	7327.77 \pm 29.22	0.07 \pm 0.02

2 FB15k237 Evaluation

2.1 FB15k237 Average

2.1.1 FB15k237 Average Hits@K

	Hits@1 (%)	Hits@3 (%)	Hits@5 (%)	Hits@10 (%)
ConvE	18.22 \pm 0.11	29.51 \pm 0.24	35.98 \pm 0.16	44.95 \pm 0.17
ConvKB	3.31 \pm 0.23	4.04 \pm 0.19	4.57 \pm 0.22	7.76 \pm 0.88
RotatE	17.57 \pm 0.06	28.97 \pm 0.05	35.29 \pm 0.09	44.55 \pm 0.06

2.1.2 FB15k237 Average Mean Ranks

		MR	MRR (%)	AMR (%)
ConvE	255.46 \pm 6.16	26.93 \pm 0.11	3.73 \pm 0.13	
ConvKB	4345.27 \pm 46.99	4.71 \pm 0.23	61.36 \pm 0.65	
RotatE	191.92 \pm 0.31	26.42 \pm 0.04	2.84 \pm 0.00	

2.2 FB15k237 Best

2.2.1 FB15k237 Best Hits@K

	Hits@1 (%)	Hits@3 (%)	Hits@5 (%)	Hits@10 (%)
ConvE	18.22 \pm 0.11	29.51 \pm 0.24	35.98 \pm 0.16	44.95 \pm 0.17
ConvKB	3.31 \pm 0.23	4.04 \pm 0.19	4.57 \pm 0.22	7.76 \pm 0.88
RotatE	17.57 \pm 0.06	28.97 \pm 0.05	35.29 \pm 0.09	44.55 \pm 0.06

2.2.2 FB15k237 Best Mean Ranks

		MR	MRR (%)
ConvE	255.46 \pm 6.16	26.93 \pm 0.11	
ConvKB	4345.27 \pm 46.99	4.71 \pm 0.23	
RotatE	191.92 \pm 0.31	26.42 \pm 0.04	

2.3 FB15k237 Worst

2.3.1 FB15k237 Worst Hits@K

	Hits@1 (%)	Hits@3 (%)	Hits@5 (%)	Hits@10 (%)
ConvE	18.22 \pm 0.11	29.51 \pm 0.24	35.98 \pm 0.16	44.95 \pm 0.17
ConvKB	3.31 \pm 0.23	4.04 \pm 0.19	4.57 \pm 0.22	7.76 \pm 0.88
RotatE	17.57 \pm 0.06	28.97 \pm 0.05	35.29 \pm 0.09	44.55 \pm 0.06

2.3.2 FB15k237 Worst Mean Ranks

		MR	MRR (%)
ConvE	255.46 \pm 6.16	26.93 \pm 0.11	
ConvKB	4345.27 \pm 46.99	4.71 \pm 0.23	
RotatE	191.92 \pm 0.31	26.42 \pm 0.04	

3 WN18 Evaluation

3.1 WN18 Average

3.1.1 WN18 Average Hits@K

	Hits@1 (%)	Hits@3 (%)	Hits@5 (%)	Hits@10 (%)
ComplEx	12.36 ± 1.96	20.66 ± 2.75	25.24 ± 3.33	32.92 ± 4.40
ConvE	85.14 ± 0.10	91.76 ± 0.11	93.29 ± 0.04	94.85 ± 0.06
DistMult	67.45 ± 0.34	85.94 ± 0.21	89.52 ± 0.25	92.72 ± 0.18
HolE	59.29 ± 0.53	79.29 ± 0.47	84.12 ± 0.36	88.61 ± 0.42
KG2E	1.35 ± 0.22	3.21 ± 0.31	4.57 ± 0.34	7.02 ± 0.43
RotatE	82.17 ± 0.20	91.53 ± 0.12	93.44 ± 0.07	95.28 ± 0.08
Simple	0.01 ± 0.01	0.03 ± 0.00	0.04 ± 0.01	0.07 ± 0.03
TransD	3.94 ± 0.27	65.63 ± 0.55	79.64 ± 0.43	87.27 ± 0.41
TransE	9.99 ± 1.82	64.74 ± 0.91	75.44 ± 0.48	84.25 ± 0.33
TransH	0.04 ± 0.02	0.19 ± 0.10	0.29 ± 0.14	0.39 ± 0.11
TransR	0.00 ± 0.00	0.04 ± 0.02	0.05 ± 0.03	0.11 ± 0.06
TuckER	0.00 ± 0.00	0.02 ± 0.01	0.03 ± 0.03	0.04 ± 0.03

3.1.2 WN18 Average Mean Ranks

	MR	MRR (%)	AMR (%)
ComplEx	452.67 ± 63.05	19.49 ± 2.55	2.21 ± 0.31
ConvE	444.40 ± 14.82	88.81 ± 0.09	2.17 ± 0.07
DistMult	458.64 ± 23.96	77.44 ± 0.22	2.24 ± 0.12
HolE	812.64 ± 28.33	70.44 ± 0.45	3.97 ± 0.14
KG2E	2708.89 ± 44.57	3.61 ± 0.26	13.25 ± 0.22
RotatE	123.68 ± 1.71	87.29 ± 0.12	0.61 ± 0.01
Simple	20376.43 ± 42.30	0.04 ± 0.01	99.57 ± 0.21
TransD	444.39 ± 25.61	36.22 ± 0.12	2.17 ± 0.13
TransE	468.24 ± 13.64	39.19 ± 1.21	2.29 ± 0.07
TransH	19678.04 ± 18.92	0.18 ± 0.04	96.16 ± 0.09
TransR	19686.49 ± 100.97	0.06 ± 0.02	96.20 ± 0.49
TuckER	20622.46 ± 153.52	0.03 ± 0.01	100.78 ± 0.75

3.2 WN18 Best

3.2.1 WN18 Best Hits@K

	Hits@1 (%)	Hits@3 (%)	Hits@5 (%)	Hits@10 (%)
ComplEx	12.36 \pm 1.96	20.66 \pm 2.75	25.24 \pm 3.33	32.92 \pm 4.40
ConvE	85.14 \pm 0.10	91.76 \pm 0.11	93.29 \pm 0.04	94.85 \pm 0.06
DistMult	67.45 \pm 0.34	85.94 \pm 0.21	89.52 \pm 0.25	92.72 \pm 0.18
HolE	59.29 \pm 0.53	79.29 \pm 0.47	84.12 \pm 0.36	88.61 \pm 0.42
KG2E	1.35 \pm 0.22	3.21 \pm 0.31	4.57 \pm 0.34	7.02 \pm 0.43
RotatE	82.17 \pm 0.20	91.53 \pm 0.12	93.44 \pm 0.07	95.28 \pm 0.08
SimplE	33.93 \pm 4.32	39.59 \pm 4.67	42.76 \pm 3.73	47.01 \pm 2.66
TransD	3.94 \pm 0.27	65.63 \pm 0.55	79.64 \pm 0.43	87.27 \pm 0.41
TransE	9.99 \pm 1.82	64.74 \pm 0.91	75.44 \pm 0.48	84.25 \pm 0.33
TransH	0.04 \pm 0.02	0.19 \pm 0.10	0.29 \pm 0.14	0.39 \pm 0.11
TransR	0.00 \pm 0.00	0.04 \pm 0.02	0.05 \pm 0.03	0.11 \pm 0.06
TuckER	0.00 \pm 0.00	0.02 \pm 0.01	0.03 \pm 0.03	0.04 \pm 0.03

3.2.2 WN18 Best Mean Ranks

	MR		MRR (%)
ComplEx	452.67 \pm	63.05	19.49 \pm 2.55
ConvE	444.40 \pm	14.82	88.81 \pm 0.09
DistMult	458.64 \pm	23.96	77.44 \pm 0.22
HolE	812.63 \pm	28.33	70.44 \pm 0.45
KG2E	2708.88 \pm	44.57	3.61 \pm 0.26
RotatE	123.68 \pm	1.71	87.29 \pm 0.12
SimplE	384.53 \pm	66.45	38.48 \pm 4.00
TransD	444.39 \pm	25.61	36.22 \pm 0.12
TransE	468.24 \pm	13.64	39.19 \pm 1.21
TransH	19678.02 \pm	18.92	0.18 \pm 0.04
TransR	19686.49 \pm	100.97	0.06 \pm 0.02
TuckER	20622.46 \pm	153.52	0.03 \pm 0.01

3.3 WN18 Worst

3.3.1 WN18 Worst Hits@K

	Hits@1 (%)	Hits@3 (%)	Hits@5 (%)	Hits@10 (%)
ComplEx	12.36 ± 1.96	20.66 ± 2.75	25.24 ± 3.33	32.92 ± 4.40
ConvE	85.14 ± 0.10	91.76 ± 0.11	93.29 ± 0.04	94.85 ± 0.06
DistMult	67.45 ± 0.34	85.94 ± 0.21	89.52 ± 0.25	92.72 ± 0.18
HolE	59.29 ± 0.53	79.29 ± 0.47	84.12 ± 0.36	88.61 ± 0.42
KG2E	1.35 ± 0.22	3.21 ± 0.31	4.57 ± 0.34	7.02 ± 0.43
RotatE	82.17 ± 0.20	91.53 ± 0.12	93.44 ± 0.07	95.28 ± 0.08
SimplE	0.01 ± 0.01	0.03 ± 0.00	0.04 ± 0.01	0.07 ± 0.03
TransD	3.94 ± 0.27	65.63 ± 0.55	79.64 ± 0.43	87.27 ± 0.41
TransE	9.99 ± 1.82	64.74 ± 0.91	75.44 ± 0.48	84.25 ± 0.33
TransH	0.04 ± 0.02	0.19 ± 0.10	0.29 ± 0.14	0.39 ± 0.11
TransR	0.00 ± 0.00	0.04 ± 0.02	0.05 ± 0.03	0.11 ± 0.06
TuckER	0.00 ± 0.00	0.02 ± 0.01	0.03 ± 0.03	0.04 ± 0.03

3.3.2 WN18 Worst Mean Ranks

		MR	MRR (%)
ComplEx	452.67 ± 63.05	19.49 ± 2.55	
ConvE	444.40 ± 14.82	88.81 ± 0.09	
DistMult	458.64 ± 23.96	77.44 ± 0.22	
HolE	812.64 ± 28.34	70.44 ± 0.45	
KG2E	2708.89 ± 44.57	3.61 ± 0.26	
RotatE	123.68 ± 1.71	87.29 ± 0.12	
SimplE	40368.33 ± 114.95	0.03 ± 0.01	
TransD	444.39 ± 25.61	36.22 ± 0.12	
TransE	468.24 ± 13.64	39.19 ± 1.21	
TransH	19678.06 ± 18.92	0.18 ± 0.04	
TransR	19686.50 ± 100.97	0.06 ± 0.02	
TuckER	20622.46 ± 153.52	0.03 ± 0.01	

4 WN18RR Evaluation

4.1 WN18RR Average

4.1.1 WN18RR Average Hits@K

	Hits@1 (%)	Hits@3 (%)	Hits@5 (%)	Hits@10 (%)
ConvE	40.98 ± 0.22	46.49 ± 0.14	48.92 ± 0.23	51.76 ± 0.13
ConvKB	0.09 ± 0.03	0.21 ± 0.07	0.32 ± 0.10	0.57 ± 0.16
RotatE	44.02 ± 0.15	50.55 ± 0.12	52.98 ± 0.11	56.51 ± 0.26

4.1.2 WN18RR Average Mean Ranks

		MR	MRR (%)	AMR (%)
ConvE	5369.49 \pm 50.92	44.69 \pm 0.21	26.49 \pm 0.25	
ConvKB	13634.66 \pm 714.24	0.30 \pm 0.07	67.27 \pm 3.52	
RotatE	4263.32 \pm 90.33	48.40 \pm 0.09	21.03 \pm 0.45	

4.2 WN18RR Best

4.2.1 WN18RR Best Hits@K

	Hits@1 (%)	Hits@3 (%)	Hits@5 (%)	Hits@10 (%)
ConvE	40.98 \pm 0.22	46.49 \pm 0.14	48.92 \pm 0.23	51.76 \pm 0.13
ConvKB	0.09 \pm 0.03	0.21 \pm 0.07	0.32 \pm 0.10	0.57 \pm 0.16
RotatE	44.02 \pm 0.15	50.55 \pm 0.12	52.98 \pm 0.11	56.51 \pm 0.26

4.2.2 WN18RR Best Mean Ranks

		MR	MRR (%)
ConvE	5369.49 \pm 50.92	44.69 \pm 0.21	
ConvKB	13634.65 \pm 714.24	0.30 \pm 0.07	
RotatE	4263.32 \pm 90.33	48.40 \pm 0.09	

4.3 WN18RR Worst

4.3.1 WN18RR Worst Hits@K

	Hits@1 (%)	Hits@3 (%)	Hits@5 (%)	Hits@10 (%)
ConvE	40.98 \pm 0.22	46.49 \pm 0.14	48.92 \pm 0.23	51.76 \pm 0.13
ConvKB	0.09 \pm 0.03	0.21 \pm 0.07	0.32 \pm 0.10	0.57 \pm 0.16
RotatE	44.02 \pm 0.15	50.55 \pm 0.12	52.98 \pm 0.11	56.51 \pm 0.26

4.3.2 WN18RR Worst Mean Ranks

		MR	MRR (%)
ConvE	5369.49 \pm 50.92	44.69 \pm 0.21	
ConvKB	13634.66 \pm 714.24	0.30 \pm 0.07	
RotatE	4263.32 \pm 90.33	48.40 \pm 0.09	