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 ± 00.42	20.82 ± 00.67	27.59 ± 00.94	38.03 ± 01.02
conve	48.28 ± 00.12	66.99 ± 00.04	73.27 ± 00.03	79.76 ± 00.07
$\mathbf{distmult}$	16.45 ± 00.16	29.10 ± 00.17	35.54 ± 00.21	45.00 ± 00.25
hole	21.79 ± 00.19	39.69 ± 00.24	48.06 ± 00.30	58.84 ± 00.28
kg2e	0.11 ± 00.04	0.36 ± 00.08	0.56 ± 00.10	1.01 ± 00.14
rotate	41.53 ± 00.06	64.14 ± 00.07	71.23 ± 00.05	78.67 ± 00.08
\mathbf{simple}	0.01 ± 00.00	0.03 ± 00.00	0.04 ± 00.00	0.06 ± 00.01
${f transd}$	21.22 ± 00.03	40.48 ± 00.10	48.57 ± 00.09	58.71 ± 00.14
$_{ m transe}$	15.23 ± 00.16	29.85 ± 00.24	37.18 ± 00.24	47.34 ± 00.18
transh	1.69 ± 00.25	2.95 ± 00.20	3.29 ± 00.22	3.74 ± 00.18
${f transr}$	0.37 ± 00.00	0.63 ± 00.04	0.78 ± 00.06	1.03 ± 00.07
${ m tucker}$	0.01 ± 00.00	0.02 ± 00.00	0.03 ± 00.01	0.15 ± 00.17

1.1.2 fb15k Average Mean Ranks

	MR	MRR	AMR
complex	171.16 ± 16.05	19.13 ± 00.45	2.46 ± 00.28
conve	50.76 ± 00.40	59.56 ± 00.06	0.73 ± 00.01
$\mathbf{distmult}$	134.02 ± 01.98	26.06 ± 00.17	1.86 ± 00.03
hole	193.03 ± 07.61	34.15 ± 00.22	2.71 ± 00.12
kg2e	5779.07 ± 51.02	0.58 ± 00.07	78.40 ± 00.68
rotate	42.28 ± 00.13	55.00 ± 00.06	0.63 ± 00.00
\mathbf{simple}	7395.75 ± 02.02	0.04 ± 00.00	100.02 ± 00.03
${f transd}$	153.37 ± 05.35	33.99 ± 00.03	2.29 ± 00.09
\mathbf{transe}	127.92 ± 00.86	26.01 ± 00.17	1.78 ± 00.01
transh	6320.02 ± 30.37	2.54 ± 00.20	85.63 ± 00.40
${f transr}$	6795.95 ± 16.65	0.65 ± 00.02	91.99 ± 00.22
${ m tucker}$	7327.77 ± 29.22	0.07 ± 00.02	99.11 ± 00.39

1.2 fb15k Best

1.2.1 fb15k Best Hits@K

	hits@1	hits@3	hits@5	hits@10
	moser	11105@0	11105@5	11100010
$\operatorname{complex}$	10.06 ± 00.42	20.82 ± 00.67	27.59 ± 00.94	38.03 ± 01.02
conve	48.28 ± 00.12	66.99 ± 00.04	73.27 ± 00.03	79.76 ± 00.07
${f distmult}$	16.45 ± 00.16	29.10 ± 00.17	35.54 ± 00.21	45.00 ± 00.25
\mathbf{hole}	21.79 ± 00.19	39.69 ± 00.24	48.06 ± 00.30	58.84 ± 00.28
kg2e	0.11 ± 00.04	0.36 ± 00.08	0.56 ± 00.10	1.01 ± 00.14
\mathbf{rotate}	41.53 ± 00.06	64.14 ± 00.07	71.23 ± 00.05	78.67 ± 00.08
\mathbf{simple}	11.58 ± 06.42	24.16 ± 10.95	34.73 ± 13.40	54.28 ± 15.80
${f transd}$	21.22 ± 00.03	40.48 ± 00.10	48.57 ± 00.09	58.71 ± 00.14
\mathbf{transe}	15.23 ± 00.16	29.85 ± 00.24	37.18 ± 00.24	47.34 ± 00.18
${ m transh}$	1.69 ± 00.25	2.95 ± 00.20	3.29 ± 00.22	3.74 ± 00.18
transr	0.37 ± 00.00	0.63 ± 00.04	0.78 ± 00.06	1.03 ± 00.07
tucker	0.01 ± 00.00	0.02 ± 00.00	0.03 ± 00.01	0.15 ± 00.17

1.2.2 fb15k Best Mean Ranks

	MR	MRR
complex	171.16 ± 16.05	19.13 ± 00.45
conve	50.76 ± 00.40	59.56 ± 00.06
$\mathbf{distmult}$	134.02 ± 01.98	26.06 ± 00.17
hole	193.03 ± 07.61	34.15 ± 00.22
kg2e	5779.07 ± 51.02	0.58 ± 00.07
rotate	42.28 ± 00.13	55.00 ± 00.06
\mathbf{simple}	139.34 ± 49.45	23.90 ± 08.79
${f transd}$	153.37 ± 05.35	33.99 ± 00.03
$_{ m transe}$	127.92 ± 00.86	26.01 ± 00.17
transh	6320.00 ± 30.37	2.54 ± 00.20
${f transr}$	6795.94 ± 16.65	0.65 ± 00.02
tucker	7327.77 ± 29.22	0.07 ± 00.02

1.3 fb15k Worst

1.3.1 fb15k Worst Hits@K

	1.4 @1	1:4 @0	1:4 @5	1:4 @10
	hits@1	hits@3	hits@5	hits@10
complex	10.06 ± 00.42	20.82 ± 00.67	27.59 ± 00.94	38.03 ± 01.02
conve	48.28 ± 00.12	66.99 ± 00.04	73.27 ± 00.03	79.76 ± 00.07
${f distmult}$	16.45 ± 00.16	29.10 ± 00.17	35.54 ± 00.21	45.00 ± 00.25
hole	21.79 ± 00.19	39.69 ± 00.24	48.06 ± 00.30	58.84 ± 00.28
kg2e	0.11 ± 00.04	0.36 ± 00.08	0.56 ± 00.10	1.01 ± 00.14
\mathbf{rotate}	41.53 ± 00.06	64.14 ± 00.07	71.23 ± 00.05	78.67 ± 00.08
\mathbf{simple}	0.01 ± 00.00	0.03 ± 00.00	0.04 ± 00.00	0.06 ± 00.01
${f transd}$	21.22 ± 00.03	40.48 ± 00.10	48.57 ± 00.09	58.71 ± 00.14
${f transe}$	15.23 ± 00.16	29.85 ± 00.24	37.18 ± 00.24	47.34 ± 00.18
${f transh}$	1.69 ± 00.25	2.95 ± 00.20	3.29 ± 00.22	3.74 ± 00.18
${f transr}$	0.37 ± 00.00	0.63 ± 00.04	0.78 ± 00.06	1.03 ± 00.07
${f tucker}$	0.01 ± 00.00	0.02 ± 00.00	0.03 ± 00.01	0.15 ± 00.17

1.3.2 fb15k Worst Mean Ranks

	MR	MRR
complex	171.16 ± 16.05	19.13 ± 00.45
conve	50.76 ± 00.40	59.56 ± 00.06
${f dist mult}$	134.02 ± 01.98	26.06 ± 00.17
hole	193.03 ± 07.61	34.15 ± 00.22
kg2e	5779.07 ± 51.02	0.58 ± 00.07
\mathbf{rotate}	42.28 ± 00.13	55.00 ± 00.06
\mathbf{simple}	14652.16 ± 45.71	0.03 ± 00.00
${f transd}$	153.37 ± 05.35	33.99 ± 00.03
$_{ m transe}$	127.92 ± 00.86	26.01 ± 00.17
${f transh}$	6320.05 ± 30.37	2.54 ± 00.20
${f transr}$	6795.95 ± 16.65	0.65 ± 00.02
tucker	7327.77 ± 29.22	0.07 ± 00.02

2 fb15k237 Evaluation

2.1 fb15k237 Average

$2.1.1 \quad fb15k237 \ Average \ Hits@K$

	hits@1	hits@3	hits@5	hits@10
conve	18.22 ± 00.11	29.51 ± 00.24	35.98 ± 00.16	44.95 ± 00.17
convkb	3.31 ± 00.23	4.04 ± 00.19	4.57 ± 00.22	7.76 ± 00.88
rotate	17.57 ± 00.06	28.97 ± 00.05	35.29 ± 00.09	44.55 ± 00.06

2.1.2 fb15k237 Average Mean Ranks

	MR	MRR	AMR
conve	255.46 ± 06.16	26.93 ± 00.11	3.73 ± 00.13
convkb	4345.27 ± 46.99	4.71 ± 00.23	61.36 ± 00.65
\mathbf{rotate}	191.92 ± 00.31	26.42 ± 00.04	2.84 ± 00.00

2.2 fb15k237 Best

$2.2.1 \quad fb15k237 \ Best \ Hits@K$

	hits@1	hits@3	hits@5	hits@10
conve	18.22 ± 00.11 3.31 ± 00.23	29.51 ± 00.24 4.04 ± 00.19	35.98 ± 00.16 4.57 ± 00.22	44.95 ± 00.17 7.76 ± 00.88
rotate	0.01 ± 00. 2 0	28.97 ± 00.05	1.0. = 00.==	44.55 ± 00.06

2.2.2 fb15k237 Best Mean Ranks

	MR	MRR
conve convkb rotate	$255.46 \pm 06.16 4345.27 \pm 46.99 191.92 \pm 00.31$	$26.93 \pm 00.11 4.71 \pm 00.23 26.42 \pm 00.04$

2.3 fb15k237 Worst

2.3.1 fb15k237 Worst Hits@K

	hits@1	hits@3	hits@5	hits@10
conve convkb rotate	18.22 ± 00.11 3.31 ± 00.23 17.57 ± 00.06	$29.51 \pm 00.24 4.04 \pm 00.19 28.97 \pm 00.05$	35.98 ± 00.16 4.57 ± 00.22 35.29 ± 00.09	44.95 ± 00.17 7.76 ± 00.88 44.55 ± 00.06

2.3.2 fb15k237 Worst Mean Ranks

	MR	MRR
conve	255.46 ± 06.16	26.93 ± 00.11
convkb	4345.27 ± 46.99	4.71 ± 00.23
rotate	191.92 ± 00.31	26.42 ± 00.04

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 ± 01.96	20.66 ± 02.75	25.24 ± 03.33	32.92 ± 04.40
conve	85.14 ± 00.10	91.76 ± 00.11	93.29 ± 00.04	94.85 ± 00.06
${f dist mult}$	67.45 ± 00.34	85.94 ± 00.21	89.52 ± 00.25	92.72 ± 00.18
hole	59.29 ± 00.53	79.29 ± 00.47	84.12 ± 00.36	88.61 ± 00.42
kg2e	1.35 ± 00.22	3.21 ± 00.31	4.57 ± 00.34	7.02 ± 00.43
\mathbf{rotate}	82.17 ± 00.20	91.53 ± 00.12	93.44 ± 00.07	95.28 ± 00.08
\mathbf{simple}	0.01 ± 00.01	0.03 ± 00.00	0.04 ± 00.01	0.07 ± 00.03
${f transd}$	3.94 ± 00.27	65.63 ± 00.55	79.64 ± 00.43	87.27 ± 00.41
${f transe}$	9.99 ± 01.82	64.74 ± 00.91	75.44 ± 00.48	84.25 ± 00.33
${ m transh}$	0.04 ± 00.02	0.19 ± 00.10	0.29 ± 00.14	0.39 ± 00.11
${f transr}$	0.00 ± 00.00	0.04 ± 00.02	0.05 ± 00.03	0.11 ± 00.06
\mathbf{tucker}	0.00 ± 00.00	0.02 ± 00.01	0.03 ± 00.03	0.04 ± 00.03

3.1.2 wn18 Average Mean Ranks

	MR	MRR	AMR
complex	452.67 ± 63.05	19.49 ± 02.55	2.21 ± 00.31
conve	444.40 ± 14.82	88.81 ± 00.09	2.17 ± 00.07
${f dist mult}$	458.64 ± 23.96	77.44 ± 00.22	2.24 ± 00.12
hole	812.64 ± 28.33	70.44 ± 00.45	3.97 ± 00.14
kg2e	2708.89 ± 44.57	3.61 ± 00.26	13.25 ± 00.22
\mathbf{rotate}	123.68 ± 01.71	87.29 ± 00.12	0.61 ± 00.01
\mathbf{simple}	20376.43 ± 42.30	0.04 ± 00.01	99.57 ± 00.21
${f transd}$	444.39 ± 25.61	36.22 ± 00.12	2.17 ± 00.13
\mathbf{transe}	468.24 ± 13.64	39.19 ± 01.21	2.29 ± 00.07
${f transh}$	19678.04 ± 18.92	0.18 ± 00.04	96.16 ± 00.09
\mathbf{transr}	19686.49 ± 100.97	0.06 ± 00.02	96.20 ± 00.49
tucker	20622.46 ± 153.52	0.03 ± 00.01	100.78 ± 00.75

3.2 wn18 Best

3.2.1 wn18 Best Hits@K

${\rm hits@1}$	hits@3	${\rm hits}@5$	hits@10
12.36 ± 01.96	20.66 ± 02.75	25.24 ± 03.33	32.92 ± 04.40
85.14 ± 00.10	91.76 ± 00.11	93.29 ± 00.04	94.85 ± 00.06
67.45 ± 00.34	85.94 ± 00.21	89.52 ± 00.25	92.72 ± 00.18
59.29 ± 00.53	79.29 ± 00.47	84.12 ± 00.36	88.61 ± 00.42
1.35 ± 00.22	3.21 ± 00.31	4.57 ± 00.34	7.02 ± 00.43
82.17 ± 00.20	91.53 ± 00.12	93.44 ± 00.07	95.28 ± 00.08
33.93 ± 04.32	39.59 ± 04.67	42.76 ± 03.73	47.01 ± 02.66
3.94 ± 00.27	65.63 ± 00.55	79.64 ± 00.43	87.27 ± 00.41
9.99 ± 01.82	64.74 ± 00.91	75.44 ± 00.48	84.25 ± 00.33
0.04 ± 00.02	0.19 ± 00.10	0.29 ± 00.14	0.39 ± 00.11
0.00 ± 00.00	0.04 ± 00.02	0.05 ± 00.03	0.11 ± 00.06
0.00 ± 00.00	0.02 ± 00.01	0.03 ± 00.03	0.04 ± 00.03
	12.36 ± 01.96 85.14 ± 00.10 67.45 ± 00.34 59.29 ± 00.53 1.35 ± 00.22 82.17 ± 00.20 33.93 ± 04.32 3.94 ± 00.27 9.99 ± 01.82 0.04 ± 00.02 0.00 ± 00.00	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	$\begin{array}{cccccccccccccccccccccccccccccccccccc$

3.2.2 wn18 Best Mean Ranks

	MR	MRR
complex	452.67 ± 63.05	19.49 ± 02.55
conve	444.40 ± 14.82	88.81 ± 00.09
${f dist mult}$	458.64 ± 23.96	77.44 ± 00.22
hole	812.63 ± 28.33	70.44 ± 00.45
kg2e	2708.88 ± 44.57	3.61 ± 00.26
\mathbf{rotate}	123.68 ± 01.71	87.29 ± 00.12
\mathbf{simple}	384.53 ± 66.45	38.48 ± 04.00
${f transd}$	444.39 ± 25.61	36.22 ± 00.12
${f transe}$	468.24 ± 13.64	39.19 ± 01.21
${ m transh}$	19678.02 ± 18.92	0.18 ± 00.04
${f transr}$	19686.49 ± 100.97	0.06 ± 00.02
tucker	20622.46 ± 153.52	0.03 ± 00.01

3.3 wn18 Worst

3.3.1 wn18 Worst Hits@K

	hits@1	hits@3	hits@5	hits@10
complex	12.36 ± 01.96	20.66 ± 02.75	25.24 ± 03.33	32.92 ± 04.40
conve	85.14 ± 00.10	91.76 ± 00.11	93.29 ± 00.04	94.85 ± 00.06
${f dist mult}$	67.45 ± 00.34	85.94 ± 00.21	89.52 ± 00.25	92.72 ± 00.18
hole	59.29 ± 00.53	79.29 ± 00.47	84.12 ± 00.36	88.61 ± 00.42
kg2e	1.35 ± 00.22	3.21 ± 00.31	4.57 ± 00.34	7.02 ± 00.43
rotate	82.17 ± 00.20	91.53 ± 00.12	93.44 ± 00.07	95.28 ± 00.08
\mathbf{simple}	0.01 ± 00.01	0.03 ± 00.00	0.04 ± 00.01	0.07 ± 00.03
${f transd}$	3.94 ± 00.27	65.63 ± 00.55	79.64 ± 00.43	87.27 ± 00.41
\mathbf{transe}	9.99 ± 01.82	64.74 ± 00.91	75.44 ± 00.48	84.25 ± 00.33
${f transh}$	0.04 ± 00.02	0.19 ± 00.10	0.29 ± 00.14	0.39 ± 00.11
\mathbf{transr}	0.00 ± 00.00	0.04 ± 00.02	0.05 ± 00.03	0.11 ± 00.06
${ m tucker}$	0.00 ± 00.00	0.02 ± 00.01	0.03 ± 00.03	0.04 ± 00.03

3.3.2 wn18 Worst Mean Ranks

	MR	MRR
complex	452.67 ± 63.05	19.49 ± 02.55
conve	444.40 ± 14.82	88.81 ± 00.09
$\operatorname{distmult}$	458.64 ± 23.96	77.44 ± 00.22
hole	812.64 ± 28.34	70.44 ± 00.45
kg2e	2708.89 ± 44.57	3.61 ± 00.26
\mathbf{rotate}	123.68 ± 01.71	87.29 ± 00.12
\mathbf{simple}	40368.33 ± 114.95	0.03 ± 00.01
${f transd}$	444.39 ± 25.61	36.22 ± 00.12
\mathbf{transe}	468.24 ± 13.64	39.19 ± 01.21
${f transh}$	19678.06 ± 18.92	0.18 ± 00.04
transr	19686.50 ± 100.97	0.06 ± 00.02
${f tucker}$	20622.46 ± 153.52	0.03 ± 00.01

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 ± 00.22	46.49 ± 00.14	48.92 ± 00.23	51.76 ± 00.13
convkb	0.09 ± 00.03	0.21 ± 00.07	0.32 ± 00.10	0.57 ± 00.16
rotate	44.02 ± 00.15	50.55 ± 00.12	52.98 ± 00.11	56.51 ± 00.26

4.1.2 wn18rr Average Mean Ranks

	MR	MRR	AMR
conve	5369.49 ± 50.92	44.69 ± 00.21	67.27 ± 03.52
convkb	13634.66 ± 714.24	0.30 ± 00.07	
rotate	4263.32 ± 90.33	48.40 ± 00.09	

4.2 wn18rr Best

4.2.1 wn18rr Best Hits@K

	hits@1	hits@3	hits@5	hits@10
conve convkb rotate	0.09 ± 00.03	46.49 ± 00.14 0.21 ± 00.07 50.55 ± 00.12	48.92 ± 00.23 0.32 ± 00.10 52.98 ± 00.11	51.76 ± 00.13 0.57 ± 00.16 56.51 ± 00.26

4.2.2 wn18rr Best Mean Ranks

	MR	MRR
conve convkb rotate	5369.49 ± 50.92 13634.65 ± 714.24 4263.32 ± 90.33	$44.69 \pm 00.21 0.30 \pm 00.07 48.40 \pm 00.09$

4.3 wn18rr Worst

4.3.1 wn18rr Worst Hits@K

	hits@1	hits@3	hits@5	hits@10
conve	40.98 ± 00.22 0.09 ± 00.03	46.49 ± 00.14 0.21 ± 00.07	48.92 ± 00.23 0.32 ± 00.10	51.76 ± 00.13 0.57 ± 00.16
rotate	44.02 ± 00.15	50.55 ± 00.12	52.98 ± 00.10	56.51 ± 00.16

4.3.2 wn18rr Worst Mean Ranks

	MR	MRR
conve convkb rotate	5369.49 ± 50.92 13634.66 ± 714.24 4263.32 ± 90.33	44.69 ± 00.21 0.30 ± 00.07 48.40 ± 00.09