

RQ2: Operator Performance Metrics (Rates % and Deltas)

Operator	Exec	NE	EHR	IR	cEHR	Δμ	Δσ
ConceptAdditionOperator	E01	62.99	1.57	35.43	2.44	-0.08	0.12
ConceptAdditionOperator	E02	51.54	4.62	41.54	7.89	-0.06	0.14
ConceptAdditionOperator	E03	48.87	9.02	41.35	15.38	-0.03	0.10
ConceptAdditionOperator	E04	52.45	3.50	42.66	6.10	-0.05	0.13
ConceptAdditionOperator	E05	53.23	9.68	35.48	15.00	-0.03	0.11
ConceptAdditionOperator	E06	62.50	1.56	35.16	2.41	-0.05	0.13
ConceptAdditionOperator	E07	58.41	1.77	38.05	2.86	-0.07	0.15
ConceptAdditionOperator	E08	51.69	5.08	40.68	8.57	-0.05	0.12
ConceptAdditionOperator	E09	54.76	1.59	40.48	2.67	-0.12	0.20
ConceptAdditionOperator	E10	54.33	2.36	42.52	4.11	-0.05	0.12
ConceptAdditionOperator	Mean	55.08*	4.08	39.33*	6.74	-0.06*	0.13
InformedEvolutionOperator	E01	54.33	6.30	39.37	10.39	-0.20	0.10
InformedEvolutionOperator	E02	54.62	13.08	30.00	18.89	-0.21	0.12
InformedEvolutionOperator	E03	49.62	16.54	31.58	24.72	-0.17	0.12
InformedEvolutionOperator	E04	58.04	3.50	36.36	5.62	-0.19	0.10
InformedEvolutionOperator	E05	38.71	14.52	46.77	27.27	-0.13	0.11
InformedEvolutionOperator	E06	57.81	7.03	34.38	10.71	-0.16	0.09
InformedEvolutionOperator	E07	30.97	7.08	61.95	18.60	-0.13	0.11
InformedEvolutionOperator	E08	36.44	8.47	55.08	18.87	-0.17	0.14
InformedEvolutionOperator	E09	41.27	1.59	48.41	3.33	-0.26	0.14
InformedEvolutionOperator	E10	37.80	4.72	55.91	11.11	-0.15	0.10
InformedEvolutionOperator	Mean	45.96*	8.28	43.98*	14.95	-0.18*	0.11
LLMBackTranslation_HI	E01	62.99	4.72	31.50	6.90	-0.08	0.13
LLMBackTranslation_HI	E02	70.00	4.62	23.08	6.00	-0.07	0.14
LLMBackTranslation_HI	E03	72.18	9.02	15.79	10.81	-0.05	0.10
LLMBackTranslation_HI	E04	68.53	2.80	22.38	3.60	-0.08	0.12
LLMBackTranslation_HI	E05	74.19	4.84	17.74	5.88	-0.05	0.10
LLMBackTranslation_HI	E06	75.00	1.56	21.09	1.98	-0.08	0.12
LLMBackTranslation_HI	E07	74.34	5.31	15.93	6.32	-0.08	0.13
LLMBackTranslation_HI	E08	62.71	5.93	27.97	8.43	-0.06	0.14
LLMBackTranslation_HI	E09	67.46	0.00	14.29	0.00	-0.16	0.19
LLMBackTranslation_HI	E10	81.10	4.72	11.02	5.31	-0.08	0.11
LLMBackTranslation_HI	Mean	70.85*	4.35	20.08*	5.52	-0.08*	0.13
LLMBasedParaphrasing	E01	59.06	2.36	37.80	3.80	-0.08	0.12
LLMBasedParaphrasing	E02	62.31	2.31	34.62	3.53	-0.08	0.13
LLMBasedParaphrasing	E03	48.87	6.77	43.61	12.00	-0.03	0.11
LLMBasedParaphrasing	E04	53.85	1.40	43.36	2.47	-0.07	0.11
LLMBasedParaphrasing	E05	46.77	7.26	44.35	13.04	-0.03	0.09
LLMBasedParaphrasing	E06	57.03	0.78	42.19	1.35	-0.06	0.13
LLMBasedParaphrasing	E07	55.75	3.54	40.71	5.97	-0.08	0.13
LLMBasedParaphrasing	E08	68.64	2.54	27.12	3.49	-0.06	0.14
LLMBasedParaphrasing	E09	47.62	0.00	44.44	0.00	-0.17	0.21
LLMBasedParaphrasing	E10	51.18	3.15	44.09	5.63	-0.08	0.11
LLMBasedParaphrasing	Mean	55.11*	3.01	40.23*	5.13	-0.07*	0.13
PDSAwareSynonymReplacement	E01	78.74	3.15	10.24	3.81	-0.07	0.11
PDSAwareSynonymReplacement	E02	70.00	10.00	16.15	11.93	-0.06	0.12
PDSAwareSynonymReplacement	E03	70.68	8.27	18.05	10.28	-0.03	0.08
PDSAwareSynonymReplacement	E04	79.72	4.20	10.49	4.84	-0.06	0.11
PDSAwareSynonymReplacement	E05	72.58	8.06	16.13	9.71	-0.06	0.10
PDSAwareSynonymReplacement	E06	84.38	3.12	8.59	3.51	-0.06	0.13
PDSAwareSynonymReplacement	E07	75.22	10.62	12.39	12.24	-0.04	0.13
PDSAwareSynonymReplacement	E08	79.66	5.93	9.32	6.73	-0.05	0.12
PDSAwareSynonymReplacement	E09	75.40	1.59	11.90	1.82	-0.12	0.18
PDSAwareSynonymReplacement	E10	79.53	3.94	12.60	4.63	-0.05	0.12
PDSAwareSynonymReplacement	Mean	76.59*	5.89	12.59*	6.95	-0.06*	0.12
MLM	E01	61.42	4.72	23.62	7.06	-0.05	0.10
MLM	E02	60.00	6.15	25.38	9.09	-0.06	0.15
MLM	E03	58.65	10.53	26.32	15.22	-0.03	0.09
MLM	E04	62.24	5.59	25.17	8.00	-0.05	0.11
MLM	E05	57.26	7.26	27.42	10.98	-0.06	0.11
MLM	E06	71.88	3.12	20.31	4.12	-0.07	0.12
MLM	E07	53.10	3.54	37.17	6.15	-0.04	0.13
MLM	E08	55.08	5.08	36.44	8.33	-0.05	0.16
MLM	E09	57.94	4.76	24.60	6.82	-0.12	0.17
MLM	E10	57.48	4.72	33.07	7.59	-0.04	0.10
MLM	Mean	59.50*	5.55*	27.95*	8.34	-0.06*	0.12
NegationOperator	E01	76.38	1.57	13.39	1.98	-0.10	0.12
NegationOperator	E02	69.23	6.92	20.77	8.91	-0.06	0.14
NegationOperator	E03	58.65	9.02	26.32	12.37	-0.03	0.10
NegationOperator	E04	67.13	3.50	24.48	4.72	-0.08	0.13
NegationOperator	E05	75.81	2.42	18.55	3.00	-0.04	0.09
NegationOperator	E06	86.72	3.12	7.81	3.45	-0.08	0.13
NegationOperator	E07	66.37	7.96	20.35	10.34	-0.06	0.12
NegationOperator	E08	75.42	7.63	11.02	8.91	-0.06	0.12
NegationOperator	E09	57.94	0.79	22.22	1.04	-0.14	0.19
NegationOperator	E10	78.74	1.57	18.90	1.94	-0.07	0.11
NegationOperator	Mean	71.24*	4.45	18.38*	5.67	-0.07*	0.12
PSAwareAntonymReplacement	E01	84.25	5.51	3.94	6.09	-0.06	0.12
PSAwareAntonymReplacement	E02	83.08	10.77	3.08	11.29	-0.06	0.14
PSAwareAntonymReplacement	E03	82.71	11.28	4.51	11.90	-0.04	0.11
PSAwareAntonymReplacement	E04	85.31	4.20	4.90	4.62	-0.07	0.12
PSAwareAntonymReplacement	E05	84.68	8.87	4.84	9.40	-0.05	0.10
PSAwareAntonymReplacement	E06	83.59	3.91	10.16	4.42	-0.05	0.11
PSAwareAntonymReplacement	E07	84.07	6.19	3.54	6.80	-0.06	0.12
PSAwareAntonymReplacement	E08	87.29	5.08	4.24	5.45	-0.05	0.12
PSAwareAntonymReplacement	E09	74.60	3.17	4.76	3.42	-0.12	0.20
PSAwareAntonymReplacement	E10	88.19	3.94	3.94	4.17	-0.06	0.10
PSAwareAntonymReplacement	Mean	83.78*	6.29	4.79*	6.76	-0.06*	0.12
SemanticFusionCrossover	E01	34.62	1.92	59.62	4.88	-0.08	0.09
SemanticFusionCrossover	E02	45.45	2.73	49.09	5.36	-0.06	0.11
SemanticFusionCrossover	E03	36.21	1.72	61.21	4.55	-0.03	0.08
SemanticFusionCrossover	E04	37.50	3.68	57.35	8.62	-0.04	0.10
SemanticFusionCrossover	E05	42.86	6.12	50.00	12.24	-0.02	0.09
SemanticFusionCrossover	E06	43.40	0.94	55.66	2.13	-0.06	0.09
SemanticFusionCrossover	E07	38.16	1.32	59.21	3.23	-0.09	0.08
SemanticFusionCrossover	E08	38.37	1.16	56.98	2.70	-0.04	0.10
SemanticFusionCrossover	E09	44.12	0.00	50.00	0.00	-0.12	0.12
SemanticFusionCrossover	E10	41.35	0.96	57.69	2.27	-0.07	0.08
SemanticFusionCrossover	Mean	40.20*	2.06	55.68*	4.60	-0.06*	0.09
SemanticSimilarityCrossover	E01	35.58	3.85	0.00	9.76	-0.07	0.09
SemanticSimilarityCrossover	E02	23.64	4.55	0.00	16.13	-0.06	0.11
SemanticSimilarityCrossover	E03	15.52	3.45	0.00	18.18	-0.05	0.10
SemanticSimilarityCrossover	E04	25.00	0.00	0.00	0.00	-0.08	0.09
SemanticSimilarityCrossover	E05	10.20	3.06	0.00	23.08	-0.02	0.10
SemanticSimilarityCrossover	E06	33.96	0.94	0.00	2.70	-0.07	0.08
SemanticSimilarityCrossover	E07	9.21	0.00	0.00	0.00	-0.00	0.09
SemanticSimilarityCrossover	E08	18.60	1.16	0.00	5.56	-0.05	0.15
SemanticSimilarityCrossover	E09	14.71	0.00	0.00	0.00	-0.16	0.10
SemanticSimilarityCrossover	E10	22.12	2.88	0.00	11.54	-0.04	0.08
SemanticSimilarityCrossover	Mean	20.85*	1.99*	0.00*	8.69	-0.06*	0.10
StylisticMutator	E01	62.20	0.79	35.43	1.23	-0.10	0.13
StylisticMutator	E02	51.54	2.31	44.62	4.17	-0.08	0.13
StylisticMutator	E03	54.89	4.51	39.10	7.41	-0.04	0.11
StylisticMutator	E04	55.24	1.40	41.96	2.41	-0.06	0.11
StylisticMutator	E05	62.90	3.23	33.87	4.88	-0.05	0.11
StylisticMutator	E06	51.56	3.12	44.53	5.63	-0.06	0.12
StylisticMutator	E07	58.41	4.42	36.28	6.94	-0.07	0.11
StylisticMutator	E08	57.63	2.54	38.14	4.11	-0.06	0.12
StylisticMutator	E09	51.59	0.79	40.48	1.33	-0.13	0.22
StylisticMutator	E10	47.24	1.57	51.18	3.23	-0.04	0.10
StylisticMutator	Mean	55.32*	2.47	40.56*	4.13	-0.07*	0.13
TypographicalErrorsOperator	E01	47.24	4.72	45.67	8.70	-0.06	0.12
TypographicalErrorsOperator	E02	41.54	3.08	53.85	6.67	-0.08	0.12
TypographicalErrorsOperator	E03	42.11	3.76	53.38	8.06	-0.07	0.11
TypographicalErrorsOperator	E04	39.16	3.50	55.24	7.94	-0.05	0.10
TypographicalErrorsOperator	E05	38.71	5.65	54.03	12.28	-0.05	0.12
TypographicalErrorsOperator	E06	41.41	3.91	53.12	8.33	-0.05	0.11
TypographicalErrorsOperator	E07	41.59	0.00	57.52	0.00	-0.08	0.13
TypographicalErrorsOperator	E08	43.22	0.85	55.08	1.89	-0.06	0.13
TypographicalErrorsOperator	E09	39.68	1.59	56.35	3.64	-0.13	0.20
TypographicalErrorsOperator	E10	44.09	3.15	51.97	6.56	-0.05	0.08
TypographicalErrorsOperator	Mean	41.88*	3.02	53.62*	6.41	-0.07*	0.12

(\*) In ≥1 significant pairwise difference for that metric (Mann-Whitney U, Bonferroni).