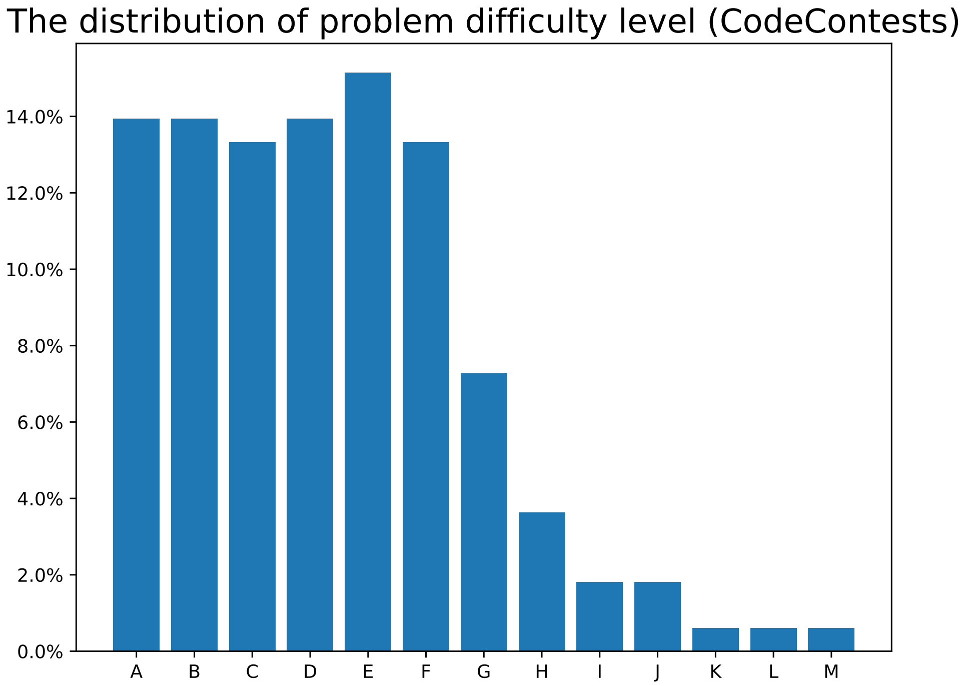


Fig. 1. The distribution of problem difficulty level (CodeContests)

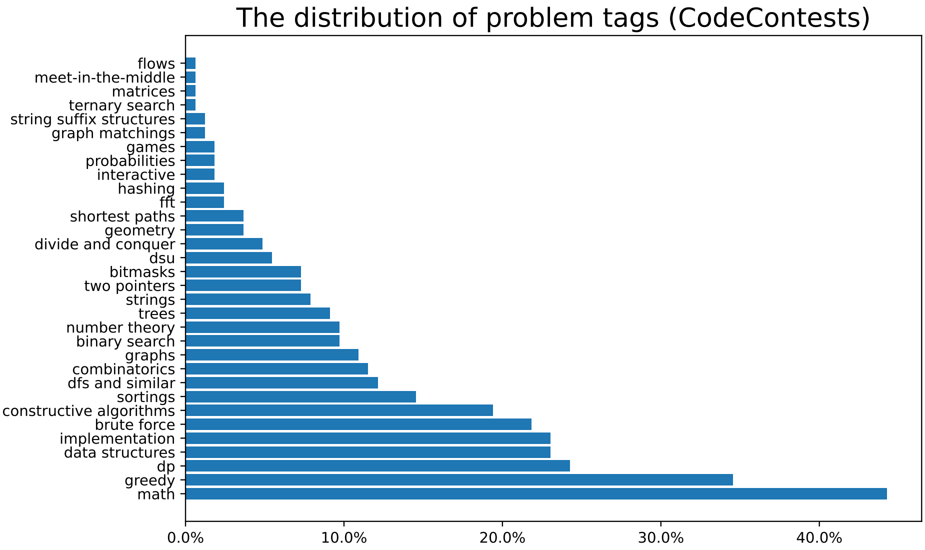


Fig. 2. The distribution of problem tags (CodeContests)

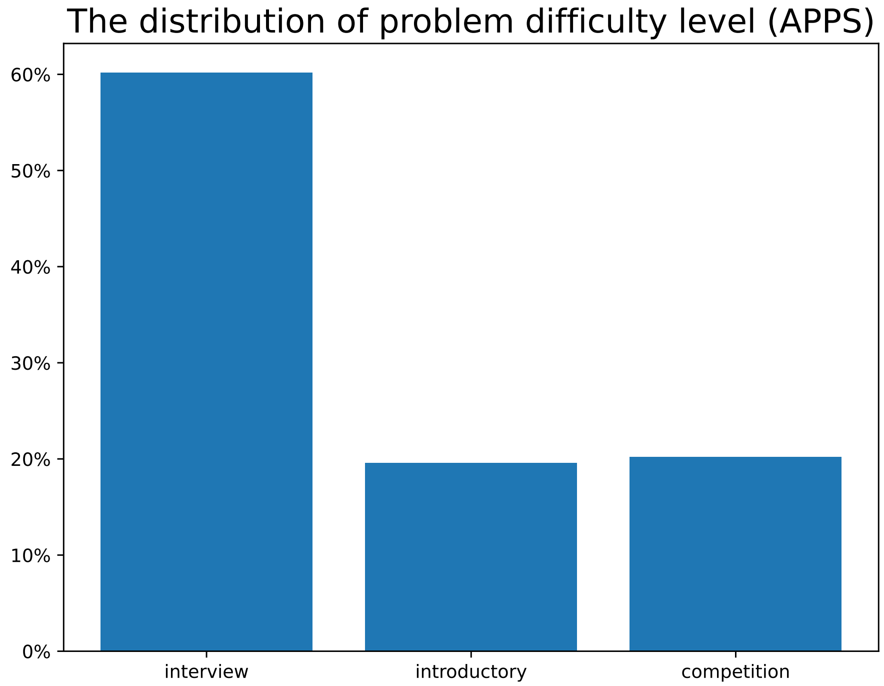


Fig. 3. The distribution of problem difficulty level (APPS)

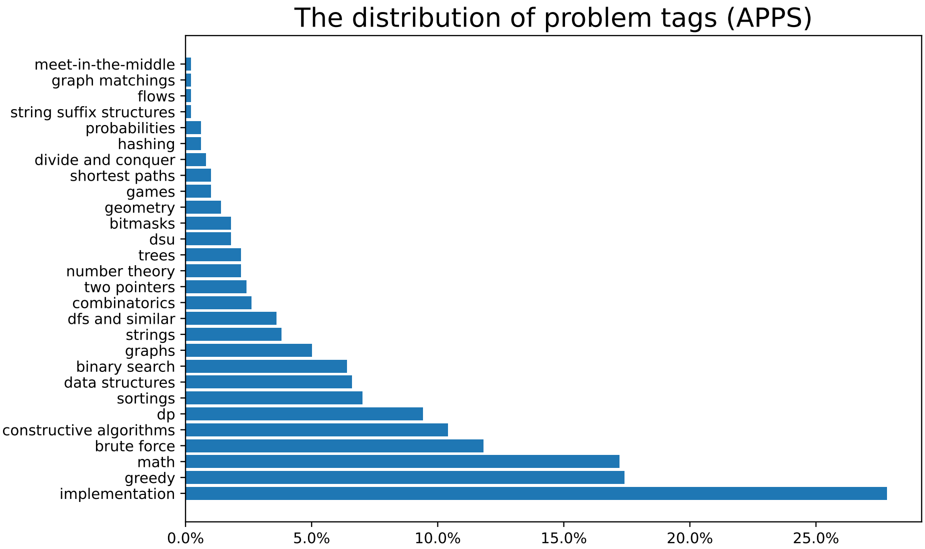


Fig. 4. The distribution of problem tags (APPS)

Given the code problem ‘HumanEval/151’ as an example:

Listing 1. Code problem example

```
def double_the_difference(lst):
    '''
    Given a list of numbers, return the sum of squares of the numbers
    that are odd. Ignore numbers that are negative or not integers.

    double_the_difference([1, 3, 2, 0]) == 1 + 9 + 0 + 0 = 10
    double_the_difference([-1, -2, 0]) == 0
    double_the_difference([9, -2]) == 81
    double_the_difference([0]) == 0

    If the input list is empty, return 0.
    '''
```

and its test cases:

Listing 2. Test cases

```
print(double_the_difference([]) == 0)#1
print(double_the_difference([5, 4]) == 25)#2
print(double_the_difference([0.1, 0.2, 0.3]) == 0)#3
print(double_the_difference([-10, -20, -30]) == 0)#4
print(double_the_difference([-1, -2, -8]) == 0)#5
print(double_the_difference([0.2, 3, 5]) == 34)#6
print(double_the_difference([-99, -97, -95, -93, -91, -89, -87, -85, -83,
     -81, -79, -77, -75, -73, -71, -69, -67, -65, -63, -61, -59, -57,
    -55, -53, -51, -49, -47, -45, -43, -41, -39, -37, -35, -33, -31, -29,
     -27, -25, -23, -21, -19, -17, -15, -13, -11, -9, -7, -5, -3, -1, 1,
    3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29, 31, 33, 35, 37,
    39, 41, 43, 45, 47, 49, 51, 53, 55, 57, 59, 61, 63, 65, 67, 69, 71,
    73, 75, 77, 79, 81, 83, 85, 87, 89, 91, 93, 95, 97, 99]) == 166650)#7
```

There are three code problems generated by ChatGPT under temperature=0, which have different test pass rates, namely 42.9% (3/7), 57.1% (4/7), and 71.4% (5/7), where there are a total of 7 test cases. The first solution passes the least test cases, i.e., test No. 1, 4, and 5. We can see that the code does follow the requirement ‘Ignore numbers that are negative’, but ignore ‘ignore the not integers’, which leads to its failure to pass the test cases whose inputs include float digits. Although solution 1 passes certain tests, its code logic has mistakes, where the `total * 2` in the *return* statement should be `total`. The second solution follows the requirement ‘ Ignore numbers that are negative or not integers’, which can be shown in its *if* statement including `isinstance(num, int)`. Such a difference helps solution 2 pass one more test case (test No. 3). But the mistake in return still remains. Solution 3 has the correct logic to solve the problem. But because it fails to consider the ‘ignore the not integers’ requirement, the solution is still not perfect, though it has the highest test pass rate among all the solutions. The passed tests for solution 3 are test No. 1, 2, 4, 5, and 7.

Listing 3. Solution 1

```
def double_the_difference(lst):
    total = 0
    for num in lst:
        if num > 0 and num % 2 != 0:
            total += num ** 2
    return total * 2 if total > 0 else 0
```

Listing 4. Solution 2

```
def double_the_difference(lst):
    total = 0
    for num in lst:
        if isinstance(num, int) and num > 0 and num % 2 != 0:
            total += num ** 2
    return total * 2 if total > 0 else 0
```

Listing 5. Solution 3

```
def double_the_difference(lst):
    return sum(x**2 for x in lst if x > 0 and x % 2 != 0)
```

Table 1. RQ2: Influence of temperature (CodeContests).

Temperature	Test Pass Rate					
	Mean value	Mean variance	Mean max diff	Max diff	Ratio of worst cases	
0	0.15	0.01	0.11	1.00	1.82%	
0.5	0.16	0.02	0.15	1.00	2.42%	
1	0.16	0.03	0.24	1.00	3.64%	
Temperature	OER			OER (no ex.)		
	Mean value	Ratio of worst cases	Pair mean value	Mean value	Ratio of worst cases	Pair mean value
0	0.37	43.64%	0.59	0.27	54.55%	0.46
0.5	0.18	62.42%	0.37	0.13	68.48%	0.28
1	0.09	75.76%	0.27	0.06	81.21%	0.19
Temperature	LCS			LED		
	Mean value	Mean worst value	Pair mean value	Mean value	Mean worst value	Pair mean value
0	0.61	0.44	0.62	23.45	35.87	22.31
0.5	0.33	0.23	0.34	44.48	62.02	44.89
1	0.22	0.16	0.23	58.80	77.46	58.86
Temperature	United_Diff			Tree_Diff		
	Mean value	Mean worst value	Pair mean value	Mean value	Mean worst value	Pair mean value
0	0.41	0.39	0.67	0.50	0.46	0.74
0.5	0.61	0.49	0.63	0.69	0.58	0.71
1	0.33	0.27	0.46	0.41	0.33	0.56

Table 2. RQ2: Influence of temperature (APPS).

Temperature	Test Pass Rate				
	Mean value	Mean variance	Mean max diff	Max diff	Ratio of worst cases
0	0.43	0.01	0.14	1.00	1.80%
0.5	0.42	0.03	0.27	1.00	6.20%
1	0.42	0.04	0.35	1.00	10.40%

Temperature	OER			OER (no ex.)		
	Mean value	Ratio of worst cases	Pair mean value	Mean value	Ratio of worst cases	Pair mean value
0	0.56	27.4%	0.73	0.50	32.8%	0.65
0.5	0.36	42.20%	0.56	0.33	46.20%	0.50
1	0.27	51.0%	0.47	0.25	53.4%	0.42

Temperature	LCS			LED		
	Mean value	Mean worst value	Pair mean value	Mean value	Mean worst value	Pair mean value
0	0.65	0.50	0.66	18.18	28.41	17.40
0.5	0.37	0.26	0.37	35.00	48.37	34.86
1	0.23	0.16	0.24	47.37	61.55	46.94

Temperature	United_Diff			Tree_Diff		
	Mean value	Mean worst value	Pair mean value	Mean value	Mean worst value	Pair mean value
0	0.49	0.46	0.70	0.60	0.57	0.77
0.5	0.67	0.55	0.69	0.75	0.65	0.77
1	0.43	0.35	0.52	0.54	0.47	0.63

Table 3. RQ2: Influence of temperature (HumanEval).

Temperature	Test Pass Rate				
	Mean value	Mean variance	Mean max diff	Max diff	Ratio of worst cases
0	0.65	0.03	0.17	1.00	14.02%
0.5	0.62	0.05	0.30	1.00	20.73%
1	0.63	0.09	0.53	1.00	39.63%

Temperature	OER			OER (no ex.)		
	Mean value	Ratio of worst cases	Pair mean value	Mean value	Ratio of worst cases	Pair mean value
0	0.77	18.29%	0.89	0.72	23.17%	0.82
0.5	0.62	26.83%	0.80	0.58	30.49%	0.74
1	0.39	47.56%	0.67	0.35	51.22%	0.61

Temperature	LCS			LED		
	Mean value	Mean worst value	Pair mean value	Mean value	Mean worst value	Pair mean value
0	0.80	0.68	0.81	7.80	14.73	7.67
0.5	0.59	0.42	0.57	17.57	29.75	18.11
1	0.42	0.25	0.41	26.56	43.91	27.10

Temperature	United_Diff			Tree_Diff		
	Mean value	Mean worst value	Pair mean value	Mean value	Mean worst value	Pair mean value
0	0.67	0.63	0.81	0.70	0.65	0.83
0.5	0.82	0.71	0.81	0.86	0.75	0.84
1	0.60	0.47	0.67	0.62	0.48	0.70

Table 4. RQ3: Similarity for different request ways (CodeContests), where t represents the temperature setting.

Request Way	Test Pass Rate					
	Mean value	Mean variance	Mean max diff	Max diff	Ratio of worst cases	
R1 (t=1)	0.17	0.03	0.28	1.00	8.70%	
R2 (t=1)	0.16	0.03	0.24	1.00	3.64%	
R1 (t=0)	0.18	0.00	0.00	0.00	1.20%	
R2 (t=0)	0.15	0.01	0.11	1.00	1.82%	
Request	OER			OER (no ex.)		
	Mean value	Ratio of worst cases	Pair mean value	Mean value	Ratio of worst cases	Pair mean value
R1 (t=1)	0.09	76.09%	0.27	0.04	83.7%	0.18
R2 (t=1)	0.09	75.76%	0.27	0.06	81.21%	0.19
R1 (t=0)	1.00	1.20%	1.00	0.81	12.05%	0.81
R2 (t=0)	0.37	43.64%	0.59	0.27	54.55%	0.46
Request Way	LCS			LED		
	Mean value	Mean worst value	Pair mean value	Mean value	Mean worst value	Pair mean value
R1 (t=1)	0.21	0.15	0.20	61.30	82.73	63.09
R2 (t=1)	0.22	0.16	0.23	58.80	77.46	58.86
R1 (t=0)	1.00	1.00	1.00	0.00	0.00	0.00
R2 (t=0)	0.61	0.44	0.62	23.45	35.87	22.31
Request Way	United_Diff			Tree_Diff		
	Mean value	Mean worst value	Pair mean value	Mean value	Mean worst value	Pair mean value
R1 (t=1)	0.98	0.98	0.98	0.98	0.98	0.98
R2 (t=1)	0.33	0.27	0.46	0.41	0.33	0.56
R1 (t=0)	1.00	1.00	1.00	1.00	1.00	1.00
R2 (t=0)	0.41	0.39	0.67	0.50	0.46	0.74

Table 5. RQ3: Similarity for different request ways (APPS), where t represents the temperature setting.

Request Way	Test Pass Rate					
	Mean value	Mean variance	Mean max diff	Max diff	Ratio of worst cases	
R1 (t=1)	0.41	0.04	0.35	1.00	10.40%	
R2 (t=1)	0.42	0.04	0.35	1.00	10.40%	
R1 (t=0)	0.42	0.00	0.00	0.00	100.00%	
R2 (t=0)	0.43	0.01	0.14	1.00	1.80%	
Request Way	OER			OER (no ex.)		
	Mean value	Ratio of worst cases	Pair mean value	Mean value	Ratio of worst cases	Pair mean value
R1 (t=1)	0.26	55.0%	0.46	0.24	57.0%	0.41
R2 (t=1)	0.27	51.0%	0.47	0.25	53.4%	0.42
R1 (t=0)	1.00	0.2%	1.00	0.90	6.8%	0.90
R2 (t=0)	0.56	27.4%	0.73	0.50	32.8%	0.65
Request Way	LCS			LED		
	Mean value	Mean worst value	Pair mean value	Mean value	Mean worst value	Pair mean value
R1 (t=1)	0.24	0.16	0.24	47.50	62.84	47.58
R2 (t=1)	0.23	0.16	0.24	47.37	61.55	46.94
R1 (t=0)	1.00	1.00	1.00	0.00	0.00	0.00
R2 (t=0)	0.65	0.50	0.66	18.18	28.41	17.40
Request Way	United_Diff			Tree_Diff		
	Mean value	Mean worst value	Pair mean value	Mean value	Mean worst value	Pair mean value
R1 (t=1)	0.98	0.98	0.98	0.98	0.98	0.98
R2 (t=1)	0.43	0.35	0.52	0.54	0.47	0.63
R1 (t=0)	0.99	0.99	0.99	0.99	0.99	0.99
R2 (t=0)	0.49	0.46	0.70	0.60	0.57	0.77

Table 6. RQ3: Similarity for different request ways (HumanEval), where t represents the temperature setting.

Request	Test Pass Rate					
Way	Mean value	Mean variance	Mean max diff	Max diff	Ratio of worst cases	
R1 (t=1)	0.65	0.07	0.44	1.00	32.32%	
R2 (t=1)	0.63	0.09	0.53	1.00	39.63%	
R1 (t=0)	0.63	0.00	0.00	0.00	100.00%	
R2 (t=0)	0.65	0.03	0.17	1.00	14.02%	
Request	OER			OER (no ex.)		
Way	Mean value	Ratio of worst cases	Pair mean value	Mean value	Ratio of worst cases	Pair mean value
R1 (t=1)	0.48	40.24%	0.71	0.45	43.9%	0.65
R2 (t=1)	0.39	47.56%	0.67	0.35	51.22%	0.61
R1 (t=0)	0.99	0.61%	0.99	0.92	7.32%	0.92
R2 (t=0)	0.77	18.29%	0.89	0.72	23.17%	0.82
Request	LCS			LED		
Way	Mean value	Mean worst value	Pair mean value	Mean value	Mean worst value	Pair mean value
R1 (t=1)	0.43	0.26	0.41	27.73	43.86	27.74
R2 (t=1)	0.42	0.25	0.41	26.56	43.91	27.10
R1 (t=0)	0.98	0.98	0.98	0.00	0.00	0.00
R2 (t=0)	0.80	0.68	0.81	7.80	14.73	7.67
Request	United_Diff			Tree_Diff		
Way	Mean value	Mean worst value	Pair mean value	Mean value	Mean worst value	Pair mean value
R1 (t=1)	0.93	0.93	0.93	0.93	0.93	0.93
R2 (t=1)	0.60	0.47	0.67	0.62	0.48	0.70
R1 (t=0)	0.97	0.97	0.97	0.97	0.97	0.97
R2 (t=0)	0.67	0.63	0.81	0.70	0.65	0.83

Table 7. RQ5: Non-determinism of GPT-4 v.s. GPT-3.5 (CodeContests).

Model	Test Pass Rate					
	Mean value	Mean variance	Mean max diff	Max diff	Ratio of worst cases	
GPT-4 (t=1)	0.14	0.01	0.09	1.00	1.21%	
GPT-3.5 (t=1)	0.16	0.03	0.24	1.00	3.64%	
GPT-4 (t=0)	0.14	0.01	0.08	1.00	1.21%	
GPT-3.5 (t=0)	0.15	0.01	0.11	1.00	1.82%	
Model	OER			OER (no ex.)		
	Mean value	Ratio of worst cases	Pair mean value	Mean value	Ratio of worst cases	Pair mean value
GPT-4 (t=1)	0.35	46.06%	0.58	0.25	55.76%	0.46
GPT-3.5 (t=1)	0.09	75.76%	0.27	0.06	81.21%	0.19
GPT-4 (t=0)	0.37	41.21%	0.59	0.27	52.73%	0.46
GPT-3.5 (t=0)	0.37	43.64%	0.59	0.27	54.55%	0.46
Model	LCS			LED		
	Mean value	Mean worst value	Pair mean value	Mean value	Mean worst value	Pair mean value
GPT-4 (t=1)	0.61	0.45	0.62	24.54	39.74	24.81
GPT-3.5 (t=1)	0.22	0.16	0.23	58.80	77.46	58.86
GPT-4 (t=0)	0.61	0.44	0.61	24.45	40.14	24.12
GPT-3.5 (t=0)	0.61	0.44	0.62	23.45	35.87	22.31
Model	United_Diff			Tree_Diff		
	Mean value	Mean worst value	Pair mean value	Mean value	Mean worst value	Pair mean value
GPT-4 (t=1)	0.78	0.68	0.79	0.82	0.74	0.84
GPT-3.5 (t=1)	0.33	0.27	0.46	0.41	0.33	0.56
GPT-4 (t=0)	0.78	0.68	0.79	0.83	0.75	0.84
GPT-3.5 (t=0)	0.41	0.39	0.67	0.50	0.46	0.74

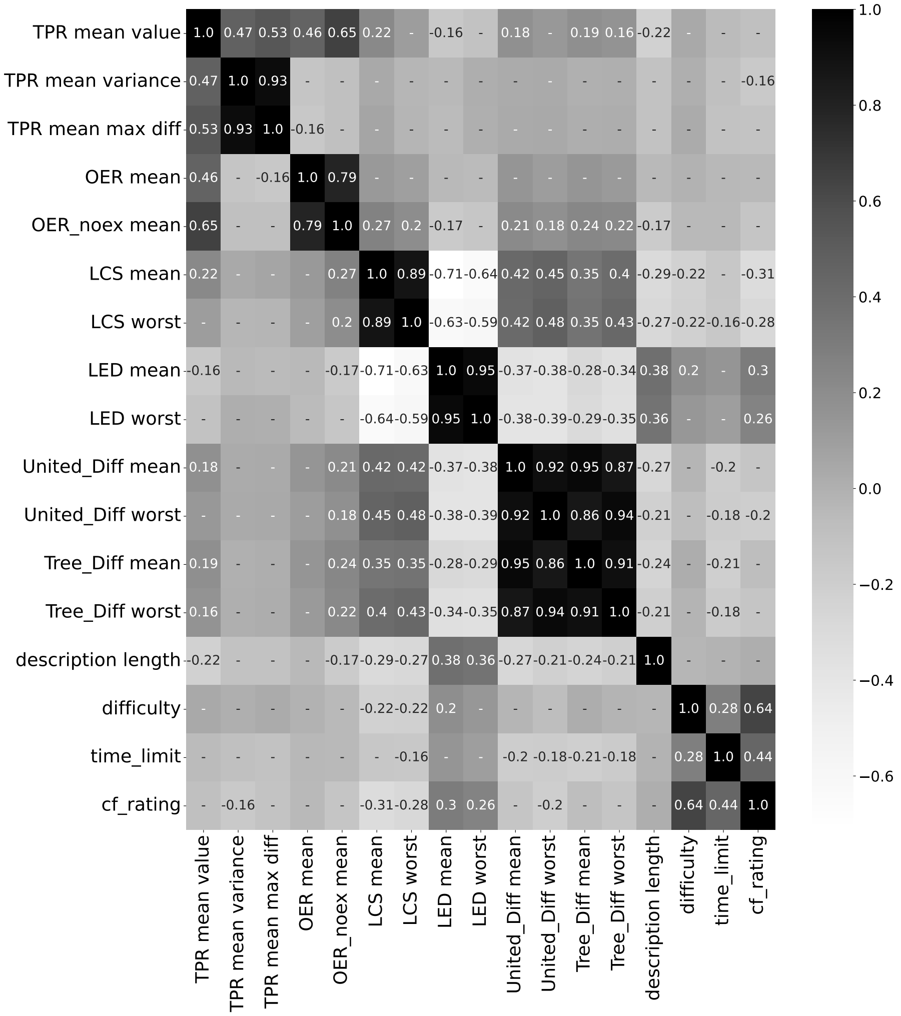


Fig. 5. RQ4: Correlations between coding tasks and non-determinism (CodeContests, temperature=1). Only significant correlations will be displayed on the heatmap, while the insignificant correlations (i.e. p-value > 0.05) are masked by '-'.

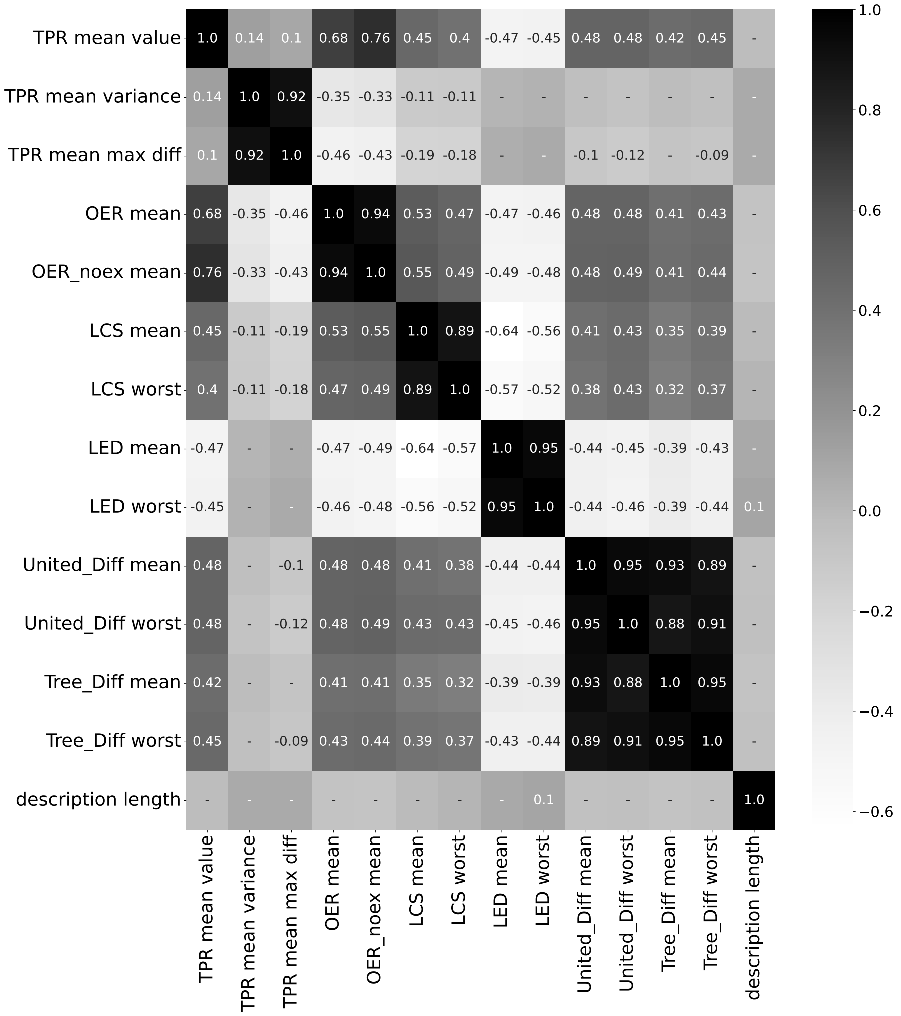
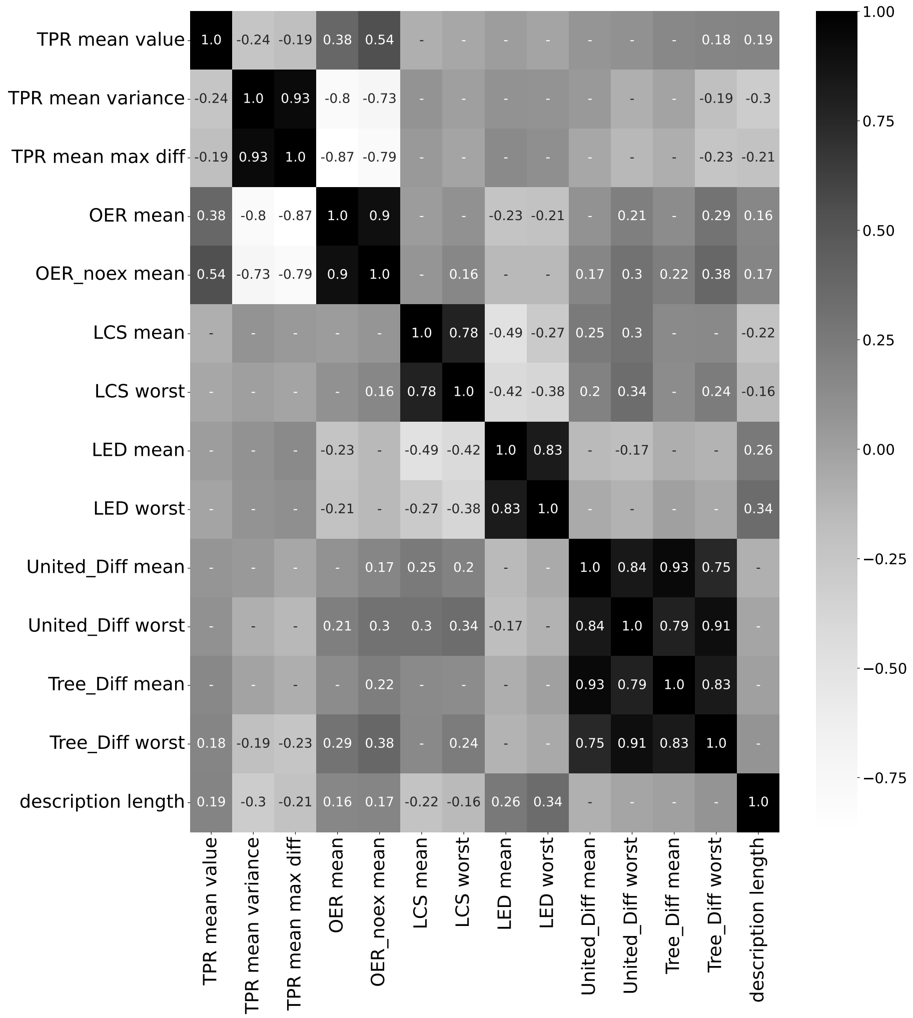


Fig. 6. RQ4: Correlations between coding tasks and non-determinism (APPS, temperature=1). Only significant correlations will be displayed on the heatmap, while the insignificant correlations (i.e. p-value > 0.05) are masked by '-'.



	TPR mean value	TPR mean variance	TPR mean max diff	OER mean	OER_noex mean	LCS mean	LCS worst	LED mean	LED worst	United_Diff mean	United_Diff worst	Tree_Diff mean	Tree_Diff worst	description length
TPR mean value	1.0	-0.24	-0.19	0.38	0.54	-	-	-	-	-	-	-	0.18	0.19
TPR mean variance	-0.24	1.0	0.93	-0.8	-0.73	-	-	-	-	-	-	-	-0.19	-0.3
TPR mean max diff	-0.19	0.93	1.0	-0.87	-0.79	-	-	-	-	-	-	-	-0.23	-0.21
OER mean	0.38	-0.8	-0.87	1.0	0.9	-	-	-0.23	-0.21	-	0.21	-	0.29	0.16
OER_noex mean	0.54	-0.73	-0.79	0.9	1.0	-	0.16	-	-	0.17	0.3	0.22	0.38	0.17
LCS mean	-	-	-	-	-	1.0	0.78	-0.49	-0.27	0.25	0.3	-	-	-0.22
LCS worst	-	-	-	-	0.16	0.78	1.0	-0.42	-0.38	0.2	0.34	-	0.24	-0.16
LED mean	-	-	-	-0.23	-	-0.49	-0.42	1.0	0.83	-	-0.17	-	-	0.26
LED worst	-	-	-	-0.21	-	-0.27	-0.38	0.83	1.0	-	-	-	-	0.34
United_Diff mean	-	-	-	-	0.17	0.25	0.2	-	-	1.0	0.84	0.93	0.75	-
United_Diff worst	-	-	-	0.21	0.3	0.3	0.34	-0.17	-	0.84	1.0	0.79	0.91	-
Tree_Diff mean	-	-	-	-	0.22	-	-	-	-	0.93	0.79	1.0	0.83	-
Tree_Diff worst	0.18	-0.19	-0.23	0.29	0.38	-	0.24	-	-	0.75	0.91	0.83	1.0	-
description length	0.19	-0.3	-0.21	0.16	0.17	-0.22	-0.16	0.26	0.34	-	-	-	-	1.0

Fig. 7. RQ4: Correlations between coding tasks and non-determinism (HumanEval, temperature=1). Only significant correlations will be displayed on the heatmap, while the insignificant correlations (i.e. p-value > 0.05) are masked by '-'.

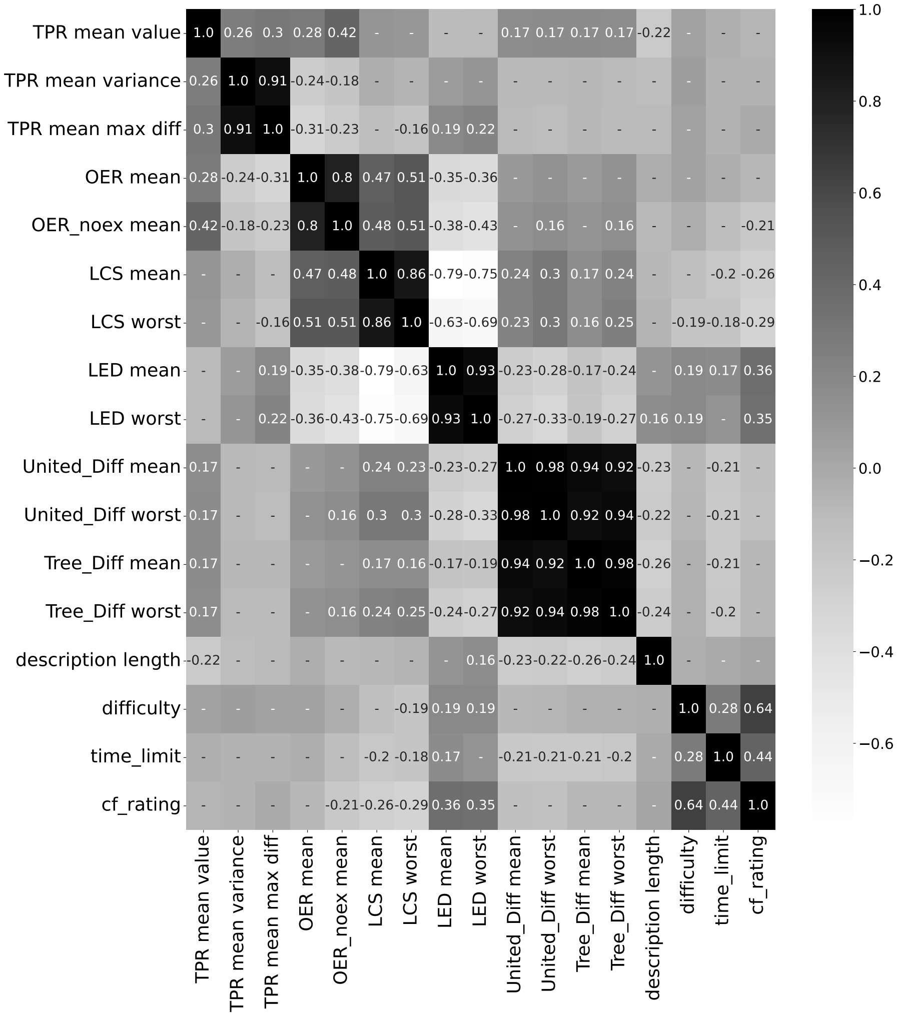


Fig. 8. RQ4: Correlations between coding tasks and non-determinism (CodeContests, temperature=0). Only significant correlations will be displayed on the heatmap, while the insignificant correlations (i.e. p-value > 0.05) are masked by '-'.

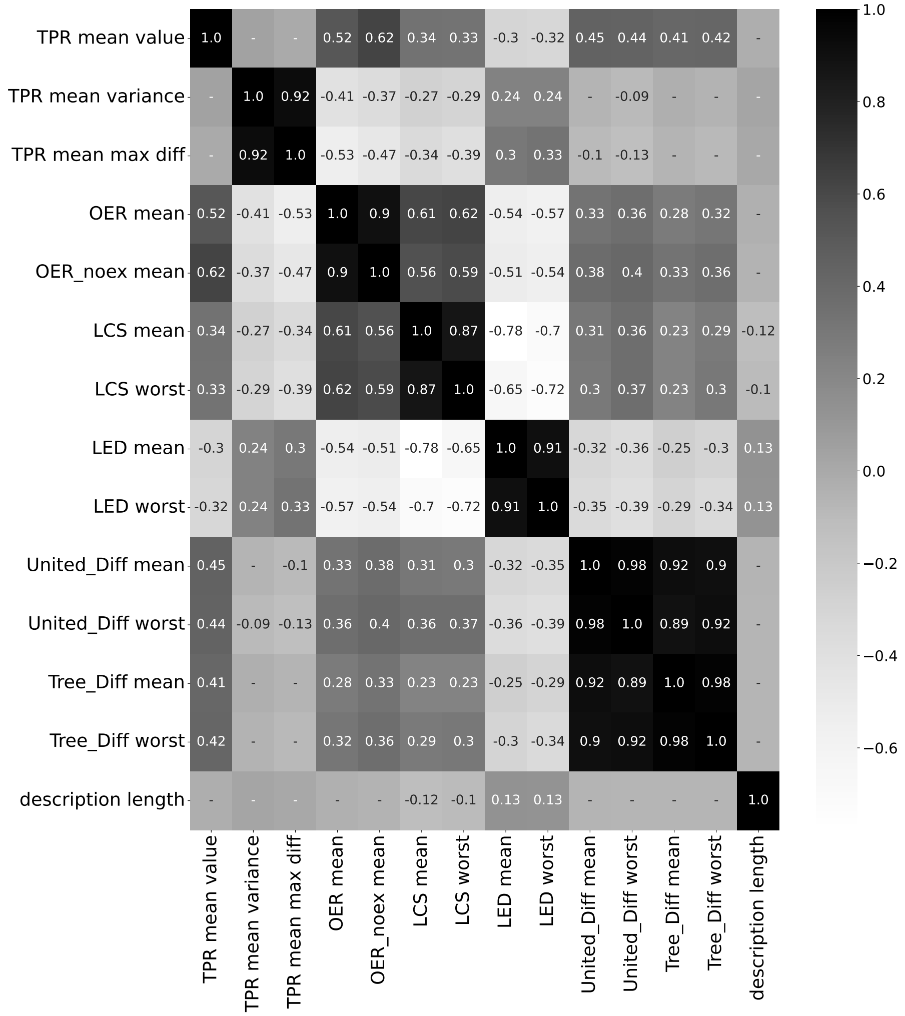
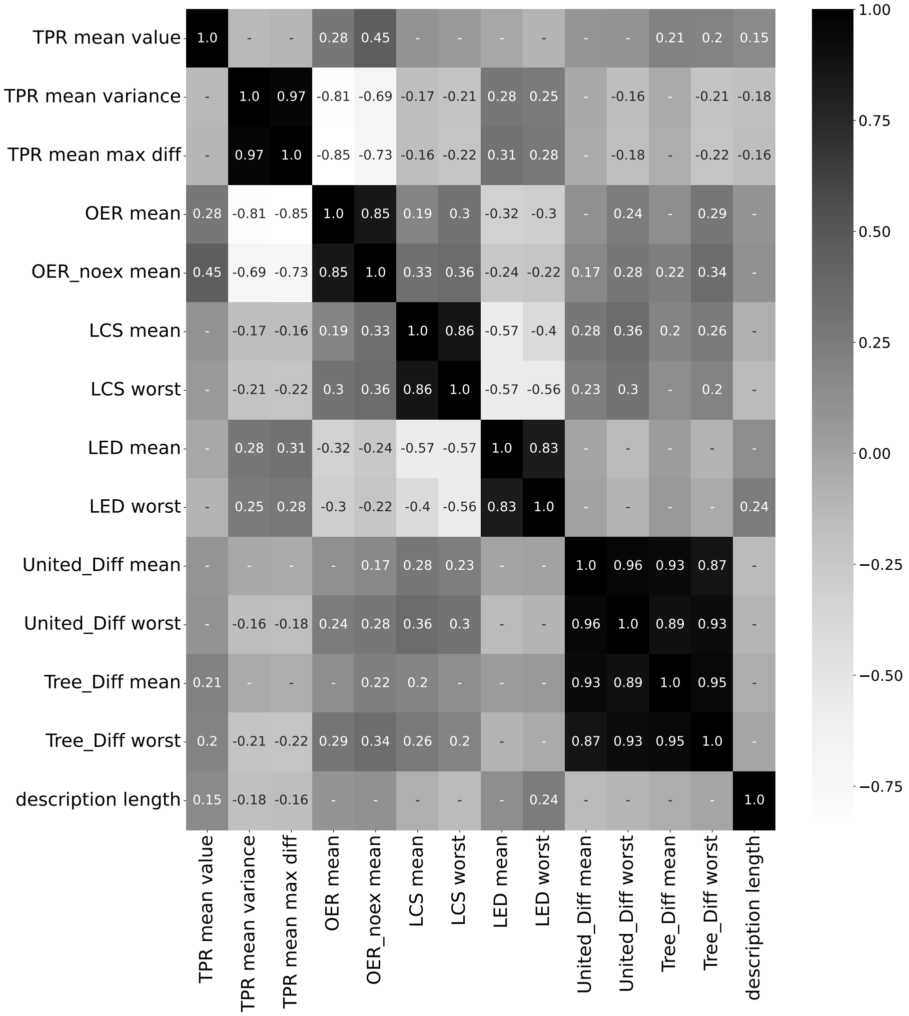


Fig. 9. RQ4: Correlations between coding tasks and non-determinism (APPS, temperature=0). Only significant correlations will be displayed on the heatmap, while the insignificant correlations (i.e. p-value > 0.05) are masked by '-'.



	TPR mean value	TPR mean variance	TPR mean max diff	OER mean	OER_noex mean	LCS mean	LCS worst	LED mean	LED worst	United_Diff mean	United_Diff worst	Tree_Diff mean	Tree_Diff worst	description length
TPR mean value	1.0	-	-	0.28	0.45	-	-	-	-	-	-	0.21	0.2	0.15
TPR mean variance	-	1.0	0.97	-0.81	-0.69	-0.17	-0.21	0.28	0.25	-	-0.16	-	-0.21	-0.18
TPR mean max diff	-	0.97	1.0	-0.85	-0.73	-0.16	-0.22	0.31	0.28	-	-0.18	-	-0.22	-0.16
OER mean	0.28	-0.81	-0.85	1.0	0.85	0.19	0.3	-0.32	-0.3	-	0.24	-	0.29	-
OER_noex mean	0.45	-0.69	-0.73	0.85	1.0	0.33	0.36	-0.24	-0.22	0.17	0.28	0.22	0.34	-
LCS mean	-	-0.17	-0.16	0.19	0.33	1.0	0.86	-0.57	-0.4	0.28	0.36	0.2	0.26	-
LCS worst	-	-0.21	-0.22	0.3	0.36	0.86	1.0	-0.57	-0.56	0.23	0.3	-	0.2	-
LED mean	-	0.28	0.31	-0.32	-0.24	-0.57	-0.57	1.0	0.83	-	-	-	-	-
LED worst	-	0.25	0.28	-0.3	-0.22	-0.4	-0.56	0.83	1.0	-	-	-	-	0.24
United_Diff mean	-	-	-	-	0.17	0.28	0.23	-	-	1.0	0.96	0.93	0.87	-
United_Diff worst	-	-0.16	-0.18	0.24	0.28	0.36	0.3	-	-	0.96	1.0	0.89	0.93	-
Tree_Diff mean	0.21	-	-	-	0.22	0.2	-	-	-	0.93	0.89	1.0	0.95	-
Tree_Diff worst	0.2	-0.21	-0.22	0.29	0.34	0.26	0.2	-	-	0.87	0.93	0.95	1.0	-
description length	0.15	-0.18	-0.16	-	-	-	-	-	0.24	-	-	-	-	1.0

Fig. 10. RQ4: Correlations between coding tasks and non-determinism (HumanEval, temperature=0). Only significant correlations will be displayed on the heatmap, while the insignificant correlations (i.e. p-value > 0.05) are masked by '-'.

Table 8. RQ5: Non-determinism of GPT-4 v.s. GPT-3.5 (APPS).

Model	Test Pass Rate					
	Mean value	Mean variance	Mean max diff	Max diff	Ratio of worst cases	
GPT-4 (t=1)	0.43	0.01	0.14	1.00	2.60%	
GPT-3.5 (t=1)	0.42	0.04	0.35	1.00	10.40%	
GPT-4 (t=0)	0.43	0.02	0.15	1.00	2.20%	
GPT-3.5 (t=0)	0.43	0.01	0.14	1.00	1.80%	
Model	OER			OER (no ex.)		
	Mean value	Ratio of worst cases	Pair mean value	Mean value	Ratio of worst cases	Pair mean value
GPT-4 (t=1)	0.54	27.6%	0.72	0.48	32.4%	0.65
GPT-3.5 (t=1)	0.27	51.0%	0.47	0.25	53.4%	0.42
GPT-4 (t=0)	0.57	25.2%	0.74	0.51	29.6%	0.66
GPT-3.5 (t=0)	0.56	27.4%	0.73	0.50	32.8%	0.65
Model	LCS			LED		
	Mean value	Mean worst value	Pair mean value	Mean value	Mean worst value	Pair mean value
GPT-4 (t=1)	0.65	0.49	0.65	19.54	30.62	18.60
GPT-3.5 (t=1)	0.23	0.16	0.24	47.37	61.55	46.94
GPT-4 (t=0)	0.67	0.51	0.67	17.05	27.95	17.04
GPT-3.5 (t=0)	0.65	0.50	0.66	18.18	28.41	17.40
Model	United_Diff			Tree_Diff		
	Mean value	Mean worst value	Pair mean value	Mean value	Mean worst value	Pair mean value
GPT-4 (t=1)	0.82	0.73	0.83	0.87	0.79	0.88
GPT-3.5 (t=1)	0.43	0.35	0.52	0.54	0.47	0.63
GPT-4 (t=0)	0.83	0.74	0.83	0.87	0.81	0.88
GPT-3.5 (t=0)	0.49	0.46	0.70	0.60	0.57	0.77

Table 9. RQ5: Non-determinism of GPT-4 v.s. GPT-3.5 (HumanEval).

Model	Test Pass Rate					
	Mean value	Mean variance	Mean max diff	Max diff	Ratio of worst cases	
GPT-4 (t=1)	0.66	0.03	0.16	1.00	11.59%	
GPT-3.5 (t=1)	0.63	0.09	0.53	1.00	39.63%	
GPT-4 (t=0)	0.65	0.02	0.13	1.00	9.15%	
GPT-3.5 (t=0)	0.65	0.03	0.17	1.00	14.02%	
Model	OER			OER (no ex.)		
	Mean value	Ratio of worst cases	Pair mean value	Mean value	Ratio of worst cases	Pair mean value
GPT-4 (t=1)	0.78	16.46%	0.89	0.73	21.34%	0.83
GPT-3.5 (t=1)	0.39	47.56%	0.67	0.35	51.22%	0.61
GPT-4 (t=0)	0.81	13.41%	0.90	0.75	18.9%	0.84
GPT-3.5 (t=0)	0.77	18.29%	0.89	0.72	23.17%	0.82
Model	LCS			LED		
	Mean value	Mean worst value	Pair mean value	Mean value	Mean worst value	Pair mean value
GPT-4 (t=1)	0.78	0.65	0.79	8.95	17.85	9.23
GPT-3.5 (t=1)	0.42	0.25	0.41	26.56	43.91	27.10
GPT-4 (t=0)	0.81	0.69	0.82	8.28	14.79	8.30
GPT-3.5 (t=0)	0.80	0.68	0.81	7.80	14.73	7.67
Model	United_Diff			Tree_Diff		
	Mean value	Mean worst value	Pair mean value	Mean value	Mean worst value	Pair mean value
GPT-4 (t=1)	0.89	0.83	0.90	0.91	0.85	0.91
GPT-3.5 (t=1)	0.60	0.47	0.67	0.62	0.48	0.70
GPT-4 (t=0)	0.91	0.86	0.91	0.92	0.87	0.92
GPT-3.5 (t=0)	0.67	0.63	0.81	0.70	0.65	0.83

Table 10. RQ6: Prompt engineering techniques (CodeContests).

Prompt	Test Pass Rate				
	Mean value	Mean variance	Mean max diff	Max diff	Ratio of worst cases
Concise (t=1)	0.15	0.02	0.19	1.00	3.64%
Base (t=1)	0.16	0.03	0.24	1.00	3.64%
CoT (t=1)	0.15	0.02	0.19	1.00	3.64%
Concise (t=0)	0.16	0.01	0.10	1.00	0.61%
Base (t=0)	0.15	0.01	0.11	1.00	1.82%
CoT (t=0)	0.19	0.02	0.15	1.00	1.82%

Prompt	OER			OER (no ex.)		
	Mean value	Ratio of worst cases	Pair mean value	Mean value	Ratio of worst cases	Pair mean value
Concise (t=1)	0.10	76.36%	0.26	0.06	81.82%	0.17
Base (t=1)	0.09	75.76%	0.27	0.06	81.21%	0.19
CoT (t=1)	0.10	73.94%	0.26	0.08	80.0%	0.19
Concise (t=0)	0.39	41.82%	0.63	0.31	49.09%	0.54
Base (t=0)	0.37	43.64%	0.59	0.27	54.55%	0.46
CoT (t=0)	0.28	46.06%	0.50	0.19	54.55%	0.36

Prompt	LCS			LED		
	Mean value	Mean worst value	Pair mean value	Mean value	Mean worst value	Pair mean value
Concise (t=1)	0.22	0.16	0.22	61.53	83.01	62.52
Base (t=1)	0.22	0.16	0.23	58.80	77.46	58.86
CoT (t=1)	0.23	0.15	0.23	59.55	77.68	57.05
Concise (t=0)	0.70	0.53	0.71	11.77	20.55	12.14
Base (t=0)	0.61	0.44	0.62	23.45	35.87	22.31
CoT (t=0)	0.38	0.24	0.39	39.31	58.28	39.81

Prompt	United_Diff			Tree_Diff		
	Mean value	Mean worst value	Pair mean value	Mean value	Mean worst value	Pair mean value
Concise (t=1)	0.44	0.34	0.48	0.54	0.42	0.59
Base (t=1)	0.33	0.27	0.46	0.41	0.33	0.56
CoT (t=1)	0.45	0.35	0.51	0.55	0.43	0.61
Concise (t=0)	0.83	0.74	0.84	0.88	0.82	0.89
Base (t=0)	0.41	0.39	0.67	0.50	0.46	0.74
CoT (t=0)	0.71	0.58	0.72	0.78	0.67	0.79

Table 11. RQ6: Prompt engineering techniques (APPS).

Request	Test Pass Rate					
Complexity	Mean value	Mean variance	Mean max diff	Max diff	Ratio of worst cases	
Concise (t=1)	0.41	0.04	0.35	1.00	10.00%	
Base (t=1)	0.42	0.04	0.35	1.00	10.40%	
CoT (t=1)	0.42	0.04	0.33	1.00	8.40%	
Concise (t=0)	0.38	0.01	0.13	1.00	2.60%	
Base (t=0)	0.43	0.01	0.14	1.00	1.80%	
CoT (t=0)	0.43	0.02	0.21	1.00	4.20%	
Request	OER			OER (no ex.)		
Complexity	Mean value	Ratio of worst cases	Pair mean value	Mean value	Ratio of worst cases	Pair mean value
Concise (t=1)	0.26	54.8%	0.46	0.23	57.0%	0.41
Base (t=1)	0.27	51.0%	0.47	0.25	53.4%	0.42
CoT (t=1)	0.27	51.2%	0.47	0.25	53.8%	0.42
Concise (t=0)	0.58	24.4%	0.75	0.51	31.4%	0.66
Base (t=0)	0.56	27.4%	0.73	0.50	32.8%	0.65
CoT (t=0)	0.43	34.4%	0.62	0.37	39.4%	0.54
Request	LCS			LED		
Complexity	Mean value	Mean worst value	Pair mean value	Mean value	Mean worst value	Pair mean value
Concise (t=1)	0.24	0.16	0.23	48.84	63.96	48.58
Base (t=1)	0.23	0.16	0.24	47.37	61.55	46.94
CoT (t=1)	0.24	0.16	0.24	47.12	61.19	46.77
Concise (t=0)	0.73	0.58	0.73	10.17	17.15	10.14
Base (t=0)	0.65	0.50	0.66	18.18	28.41	17.40
CoT (t=0)	0.40	0.25	0.40	35.21	52.66	35.75
Request	United_Diff			Tree_Diff		
Complexity	Mean value	Mean worst value	Pair mean value	Mean value	Mean worst value	Pair mean value
Concise (t=1)	0.54	0.42	0.56	0.65	0.53	0.67
Base (t=1)	0.43	0.35	0.52	0.54	0.47	0.63
CoT (t=1)	0.55	0.43	0.57	0.65	0.53	0.68
Concise (t=0)	0.83	0.74	0.84	0.87	0.81	0.89
Base (t=0)	0.49	0.46	0.70	0.60	0.57	0.77
CoT (t=0)	0.73	0.61	0.73	0.81	0.71	0.81

Table 12. RQ6: Prompt engineering techniques (HumanEval).

Request Complexity	Test Pass Rate					
	Mean value	Mean variance	Mean max diff	Max diff	Ratio of worst cases	
Concise (t=1)	0.63	0.08	0.47	1.00	34.15%	
Base (t=1)	0.63	0.09	0.53	1.00	39.63%	
CoT (t=1)	0.65	0.08	0.48	1.00	38.41%	
Concise (t=0)	0.69	0.02	0.11	1.00	6.10%	
Base (t=0)	0.65	0.03	0.17	1.00	14.02%	
CoT (t=0)	0.84	0.01	0.11	1.00	4.27%	
Request Complexity	OER			OER (no ex.)		
	Mean value	Ratio of worst cases	Pair mean value	Mean value	Ratio of worst cases	Pair mean value
Concise (t=1)	0.43	45.73%	0.67	0.40	48.17%	0.62
Base (t=1)	0.39	47.56%	0.67	0.35	51.22%	0.61
CoT (t=1)	0.43	48.78%	0.68	0.40	51.83%	0.63
Concise (t=0)	0.85	10.37%	0.92	0.77	17.07%	0.84
Base (t=0)	0.77	18.29%	0.89	0.72	23.17%	0.82
CoT (t=0)	0.84	8.54%	0.92	0.83	9.15%	0.90
Request Complexity	LCS			LED		
	Mean value	Mean worst value	Pair mean value	Mean value	Mean worst value	Pair mean value
Concise (t=1)	0.38	0.24	0.40	28.45	44.69	28.27
Base (t=1)	0.42	0.25	0.41	26.56	43.91	27.10
CoT (t=1)	0.40	0.25	0.40	29.31	44.91	29.31
Concise (t=0)	0.88	0.80	0.89	1.65	3.69	1.81
Base (t=0)	0.80	0.68	0.81	7.80	14.73	7.67
CoT (t=0)	0.67	0.52	0.70	12.55	21.18	12.03
Request Complexity	United_Diff			Tree_Diff		
	Mean value	Mean worst value	Pair mean value	Mean value	Mean worst value	Pair mean value
Concise (t=1)	0.69	0.56	0.70	0.72	0.61	0.74
Base (t=1)	0.60	0.47	0.67	0.62	0.48	0.70
CoT (t=1)	0.65	0.53	0.69	0.69	0.56	0.73
Concise (t=0)	0.93	0.88	0.93	0.94	0.91	0.95
Base (t=0)	0.67	0.63	0.81	0.70	0.65	0.83
CoT (t=0)	0.91	0.83	0.91	0.93	0.87	0.93