

Codeforces Companion (CoCo)



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Competitive Programming





Competitive Programming Platforms



No Category-Specific Rating - Only Generalized across All Types of Problems

Few Problem Difficulty Levels - Hard to Match Problems Users can Solve

Over 6000 Problems - Hard to Select and Choose a Best One



Codeforces Companion (**Coco**)

Recommender System for Programming Problems



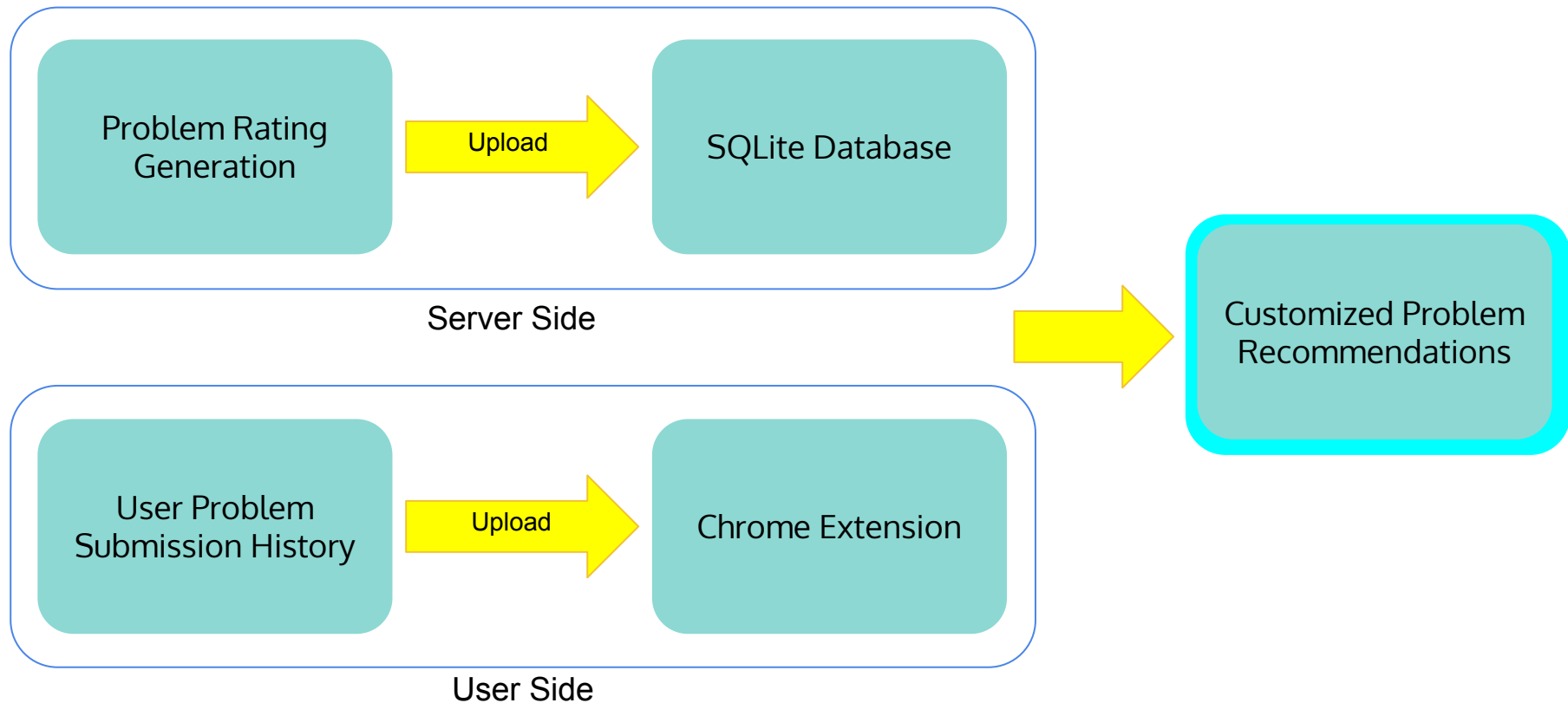
Category Specific Rating Generation and Personalized Curriculum

Problem Rating Generation based on Real Submission Data

Personalized Recommendation for Optimal Programming Progress



How does Coco Work?





Server Side

1. Extract Problem Data (Solves) through Codeforces API
2. Determine "Problem Rating" through Binary Search Algorithm on Monotonic Function based on amount of solves and rating of users that attempted the problem
3. Upload Generated Ratings with Category Tags to Server for Lookup

$$E_A = \frac{1}{1 + 10^{\frac{R_B - R_A}{400}}}$$



Actual Solve Count

	A	B	C	D	E	F	G	H	I
1	contestID	problemID	rating	tags					
2	1038	A	847	['implementation']					
3	1038	B	1103	['constructive algorithms', 'math']					
4	1038	C	1311	['greedy', 'sortings']					
5	1038	D	1724	['dp', 'greedy', 'implementation']					
6	1038	E	2320	['bitmasks', 'brute force', 'dfs and similar', 'dp', 'graphs']					
7	1038	F	2877	['dp', 'strings']					
8	1039	A	2159	['constructive algorithms', 'data structures', 'greedy', 'math']					
9	1039	B	2064	['binary search', 'probabilities']					
10	1039	C	2132	['dfs and similar', 'dsu', 'graphs', 'math']					
11	1039	D	2706	['data structures', 'dp', 'trees']					
12	1039	E	4000	['data structures']					



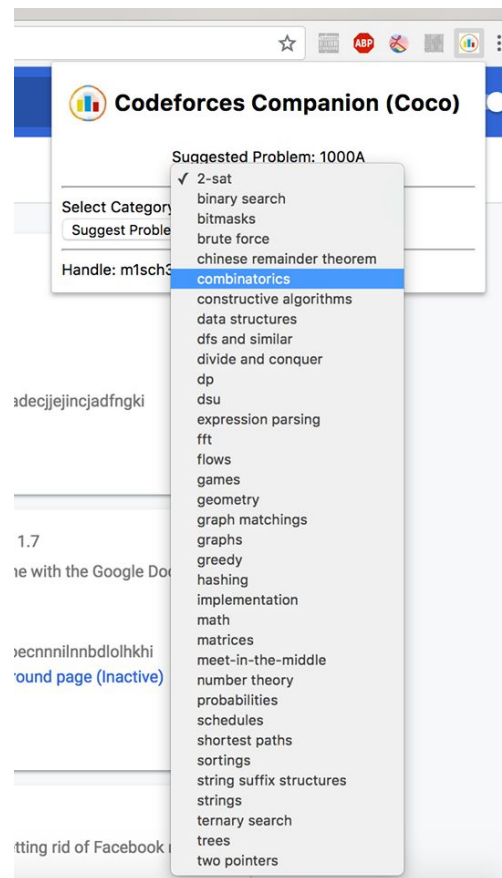
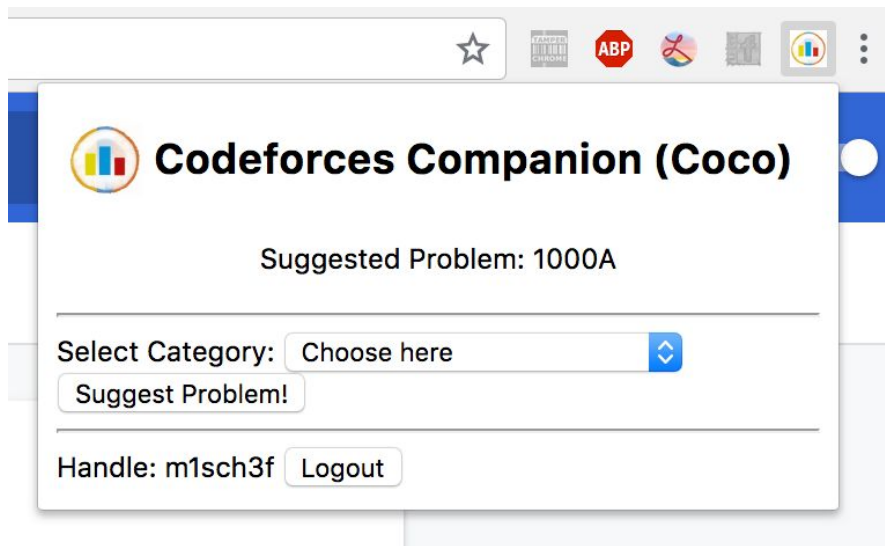
User Side

1. Extract User's Submissions through Codeforces API
2. For Desired Category, determine User's "Category Rating" through similar binary search procedure on previously generated "Problem Rating" values (Penalizing Incorrect Submissions to account for lower pressure in practice compared to contest)
3. Return Calculated "Category Rating" and Problems Solved

$$E_A = \frac{1}{1 + 10^{\frac{R_B - R_A}{400}}} \approx \text{Solve Count} - \text{\#Failed} * 0.2$$

Problem Recommendation

1. From Problem Database, extract problem from the Selected Category closest to the User's "Category Rating"
2. Hyperlink Recommended Program in Chrome Extension for Easy Access



Conclusion/Questions

<https://github.com/wflms20110333/CodeforcesCompanion>

