KARO TAKHLEEQ 2026

IEEE CS × IEC × TAKHLEEQ

PHASE 4 SUBMISSION

Supporting Features, UI/UX & Evaluation

Smart Course Registration Chrome Extension

MVP Complete UI Polished Demo Ready Tested Documented

Team Members

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github.com/Syed-Mohammad-Hussain-Bukhari/Hackathon

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1. Problem Statement

The Problem We're Solving

Every semester, 16,000+ UCP students face a frustrating, time-consuming course registration process that often results in suboptimal schedules.

1.1 Key Pain Points Identified

Time-Consuming
70% spend 45+ minutes

Schedule Conflicts
75% struggle to avoid clashes

Large Gaps
55% end up with wasted hours

Sections Close
70% lose sections while deciding

1.2 Impact on Students

- **Academic:** Suboptimal schedules affect study time and productivity
- **Financial:** Extra campus days = more transport costs
- **Mental:** Stress and frustration during registration period
- **Time:** Hours wasted that could be spent on academics

2. Our Solution

Smart Course Registration Chrome Extension

A browser extension that **automatically** scans available courses, applies user preferences, and generates **optimized conflict-free timetables** in seconds.

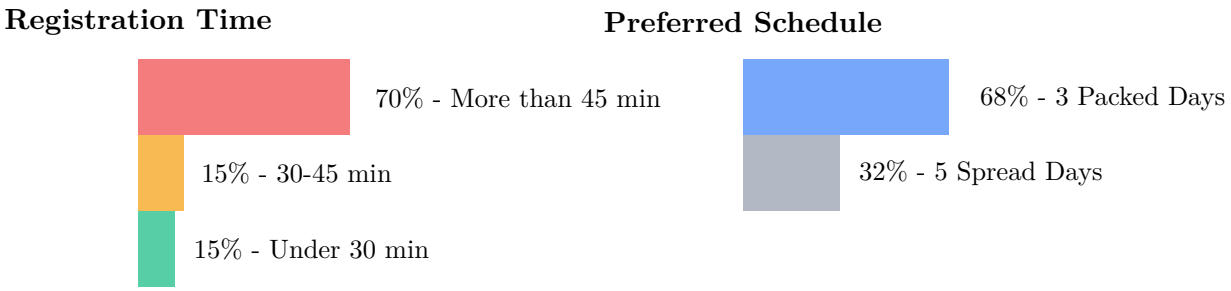
2.1 Key Solution Features

Feature	How It Helps
Day Preference Selection	Choose only Mon/Wed/Fri for 3-day schedules
Time Range Filter	Set 9AM-3PM to avoid evening classes
No-Gap Option	Get back-to-back classes with zero wasted time
Conflict Detection	Automatically eliminates overlapping sections
Top 10 Options	Compare and choose the best schedule
Closed Section Watcher	Get notified when full sections reopen

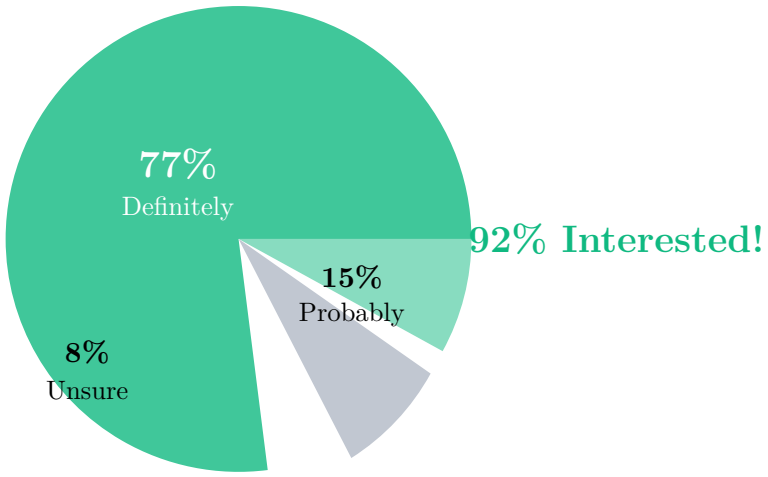
3. Survey Summary & User Validation

We conducted a survey with **30+ UCP students** across semesters 1-8 to validate our assumptions.

3.1 Key Survey Findings



3.2 Would Students Use This Extension?



3.3 Most Requested Features

1. **Auto-generate 3-day timetable** (45% of responses)
2. **Compare schedules side-by-side** (35% of responses)
3. **Minimize gaps between classes** (20% of responses)

4. Mission Accomplished

Before vs After

Before	→	After
45+ minutes of frustration		Under 5 minutes
Manual conflict checking		Automatic detection
5-day scattered schedule		Optimized 3-day timetable
No gap control		Zero-gap option available
Miss closed sections		Watch & get notified

5. Supporting Features Added (Phase 4)

★ Backtracking Search Algorithm

Replaced brute-force combination generation with an intelligent **backtracking algorithm** that:

- Prunes invalid branches early (conflict detection at each step)
- Finds valid schedules without generating all combinations
- Handles up to 500,000 search steps efficiently
- Returns up to 100 valid schedules in under 2 seconds

★ Conflict Detection & Resolution

When conflicts are detected, the system now:

- Shows **which courses conflict** with each other
- Displays the **exact day and time** of the clash
- Attempts **partial scheduling** by removing problematic courses
- Provides clear resolution suggestions

★ Side-by-Side Comparison View

Users can now compare top timetable options:

- View multiple mini-timetables on one screen
- Quick visual comparison of days and gaps
- Click any option to view full details

★ Enrollment Cart Integration

- View already enrolled courses in the extension
- Toggle between "All Courses" and "Enrollment Cart" views
- Visual indication of enrolled sections

Closed Sections Watcher

New feature to track full/closed sections:

- **View Closed** button shows all closed sections
- **Notify Me** button adds section to watchlist
- Content script receives `watch` action and stores section
- Visual feedback: button changes to " Watching"
- Prepares for future auto-enrollment when section opens

6. UI/UX Improvements

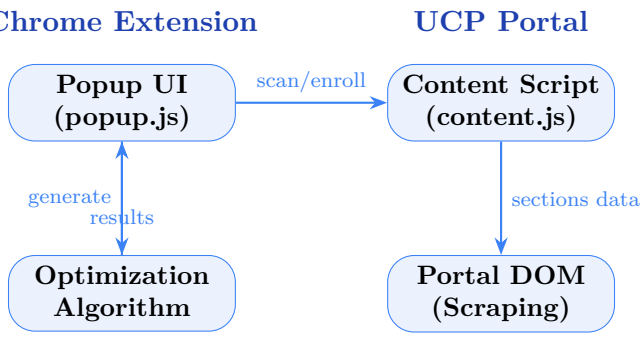
6.1 Extension Popup Enhancements

- Gradient headers with blue theme
- Interactive chip selection for days
- Stats row with course/section counts
- Warning page for excluded courses
- Comparison view for schedules
- Result cards with days + gaps info

6.2 Portal Prototype Enhancements

- Timetable grid visualization
- Filter buttons (Cart, Timetable, Closed)
- Closed section watcher notifications
- Color-coded course cells

7. Technical Architecture (Final)



7.1 Algorithm Flow

8. Demo Flow & Presentation Storyline

8.1 Extension Screenshots

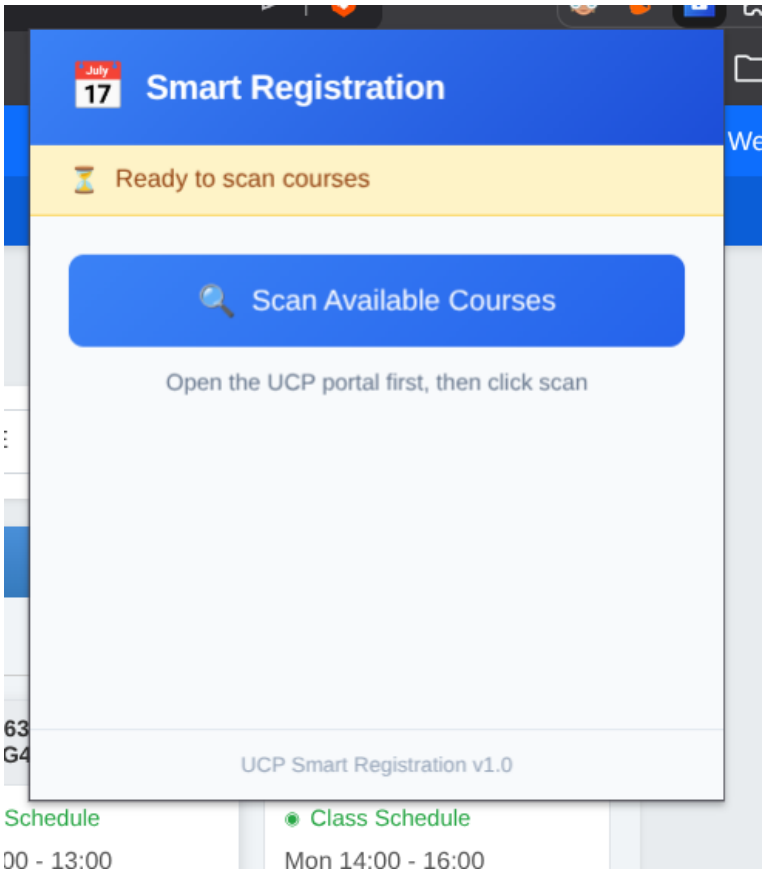


Figure 1: Step 1: Initial scan screen - Ready to scan courses from portal

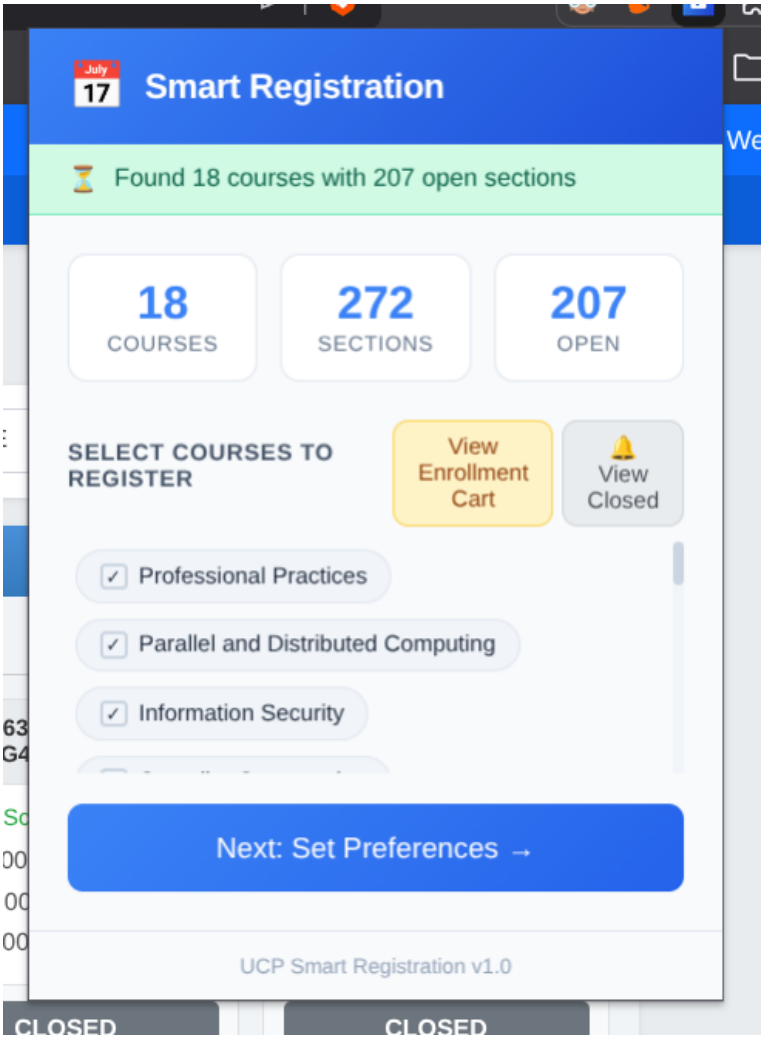
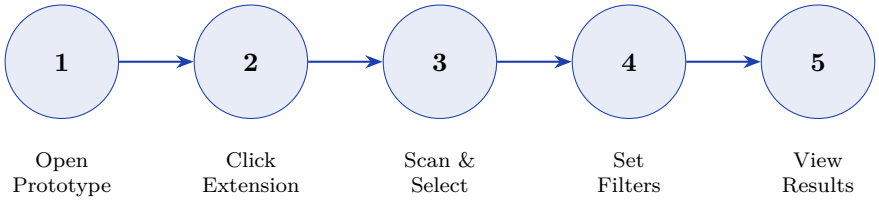


Figure 2: Step 2: Course selection - Found 18 courses with 207 open sections

8.2 Demo Flow



Demo Script:

1. **Problem Statement** (30s): "45+ minutes to register, conflicts, gaps..."
2. **Solution Overview** (30s): "Chrome extension that optimizes automatically"
3. **Live Demo** (3 min):
   - Open prototype portal
   - Click extension icon
   - Scan → Select 4-5 courses
   - Set preferences (3 days, no gap)
   - Show top results

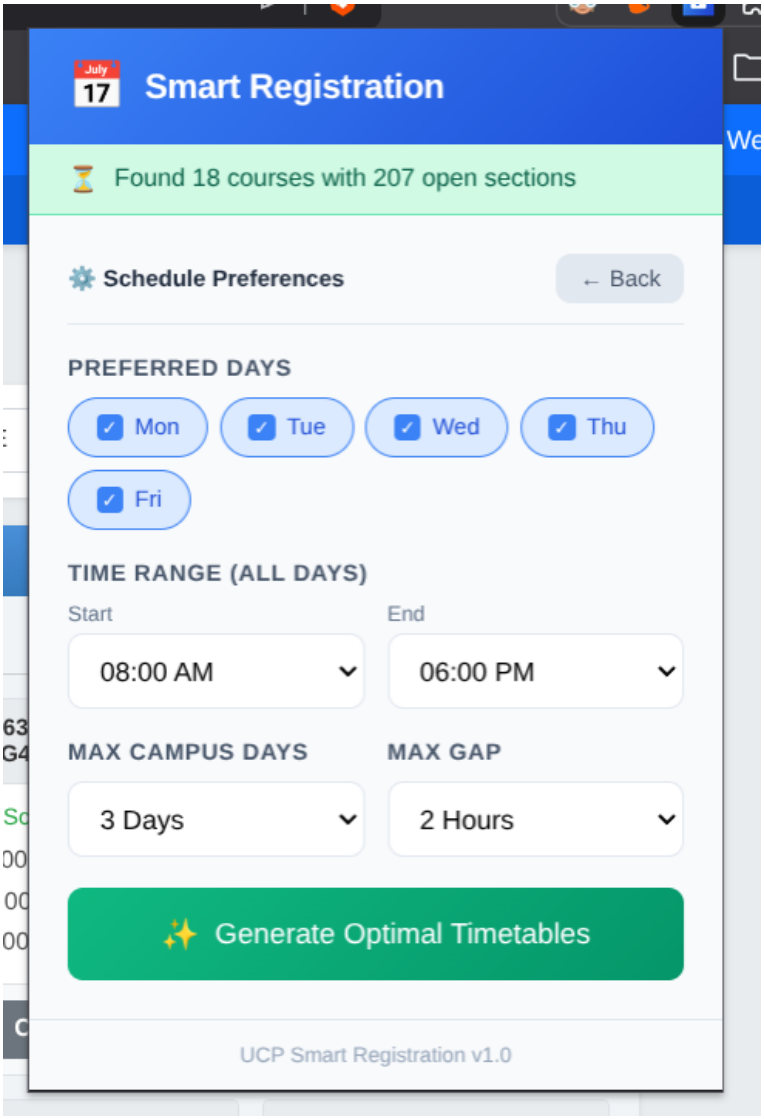


Figure 3: Step 3: Schedule preferences - Set preferred days, time range, and gap options

- View timetable grid
- Compare options side-by-side

4. **Technical Highlights** (1 min): Backtracking algorithm, conflict resolution
5. **User Research** (30s): Survey results validation

9. Final Testing Results

Test Case	Expected	Result
Scan all courses from portal	Extract 18 courses, 270 sections	PASS
Generate with "No Gap" filter	Only gap-free schedules	PASS
Handle too many combinations	Auto-limit, still return results	PASS
Detect and show conflicts	Display conflicting courses	PASS
Partial scheduling on conflict	Remove problematic course	PASS
Side-by-side comparison	Show mini-grids	PASS
Apply schedule to cart	Click enroll buttons	PASS
View closed sections	Display all full/closed sections	PASS
Watch closed section	Add to watchlist, show confirmation	PASS

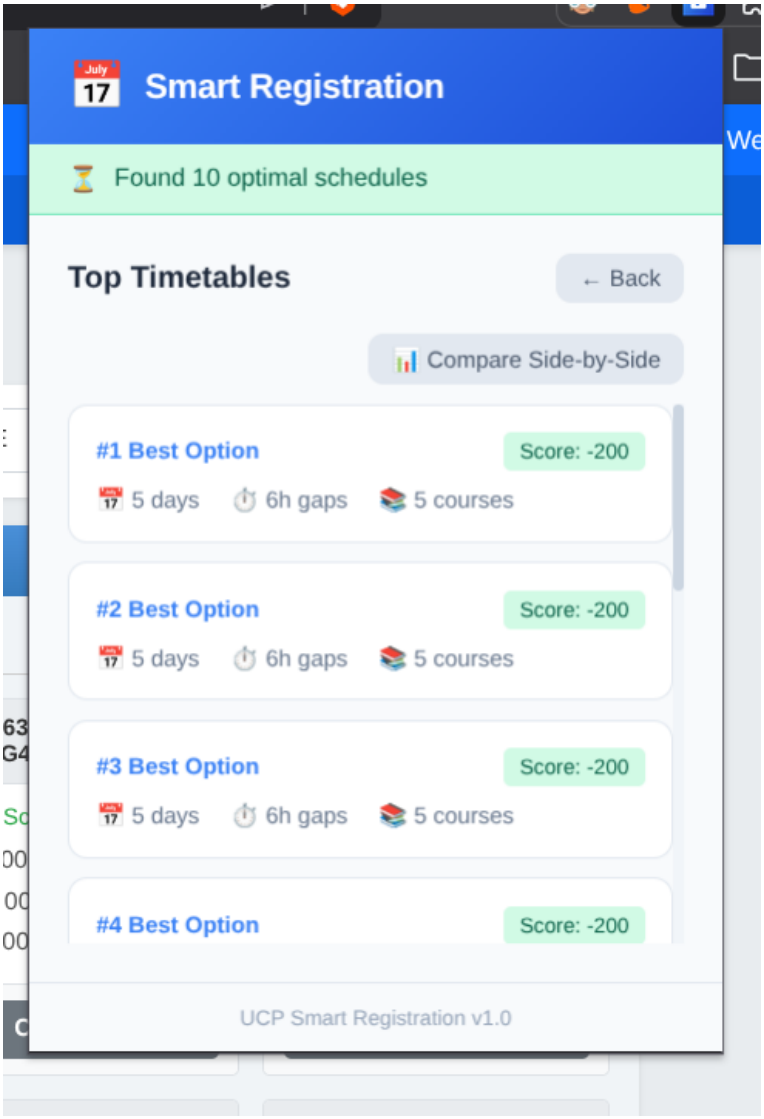


Figure 4: Step 4: Results - Top 10 optimal schedules ranked by score

10. Repository Structure

GitHub Repository

```
github.com/Syed-Mohammad-Hussain-Bukhari/Hackathon/
|-- extension/
|   |-- manifest.json
|   |-- background.js
|   |-- popup/
|   |   |-- popup.html (225 lines)
|   |   |-- popup.css (520 lines)
|   |   |-- popup.js (978 lines)
|   |-- content/
|   |   |-- content.js
|   |   |-- content.css
|   |-- icons/
|-- prototype/
|   |-- index.html
|   |-- styles.css
|   |-- app.js (525 lines)
|   |-- data.js (18 courses, 270 sections)
```

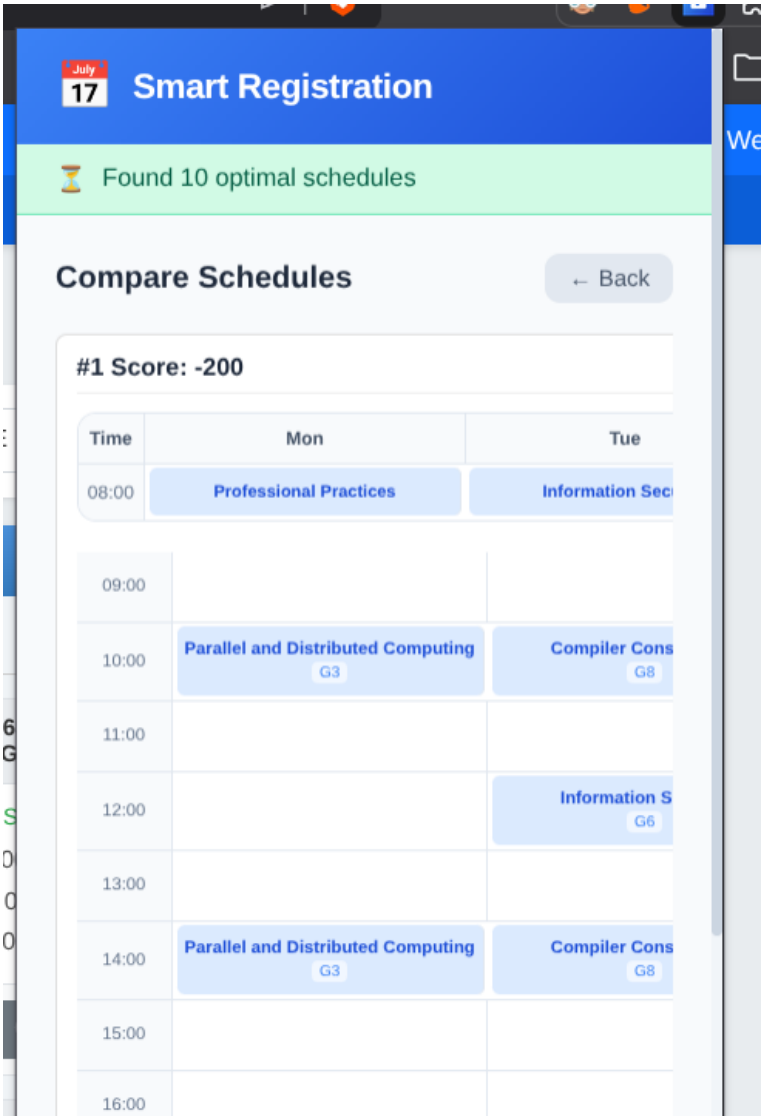


Figure 5: Step 5: Compare schedules - Side-by-side timetable comparison view

```
|-- Phase1_Report/main.tex
|-- Phase2_Report/main.tex
|-- Phase3_Report/main.tex
|-- Phase4_Report/main.tex
|-- docs/
|   |-- USER_GUIDE.md
|   |-- TECHNICAL.md
|-- README.md
```

11. Evaluation Criteria Alignment

Criteria	Our Solution	Score
Depth of problem understanding	Survey of 30+ students, validated assumptions	
Core MVP functionality	Scanning, filtering, optimization, conflict detection	
User value & real-world relevance	45 min → 5 min, addresses real UCP problem	
Technical execution	Backtracking algorithm, 906+ lines of JS	
Quality of UI/UX	Polished popup, gradient design, comparison view	
Startup/incubation potential	Scalable to other universities	

12. Team Contributions (Phase 4)

Member	Contribution
Muhammad Ahmad	Backtracking algorithm, conflict detection, partial scheduling
Syed M. Hussain Bukhari	Comparison view, UI polish, enrollment cart, prototype filters
Abdul Raffay Naeem	Testing, documentation, demo preparation

13. Future Roadmap

- Auto-enrollment (one-click)
- Waitlist notifications
- Multi-semester planning
- Mobile companion app
- Deploy to other universities

Phase 4 Complete

`github.com/Syed-Mohammad-Hussain-Bukhari/Hackathon`

Ready for Final Demonstration