



# Freshers Hub: An AI Powered Career Guidance Platform

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**Abstract:** The period immediately following graduation presents fresh engineering students with a paradox: an abundance of learning resources coexists with a near-total absence of structured direction. Disconnected platforms, generic interview preparation materials, and dormant professional profiles collectively leave many graduates underprepared when they first encounter industry hiring pipelines. This paper introduces Freshers Hub, an intelligent, AI-driven career readiness platform designed to bridge this structural gap through three tightly integrated modules. The Skill Roadmap Engine constructs personalized, sequenced learning paths based on a student's target role, drawing on a validated graph of technology dependencies to prevent unproductive learning loops. The AI Interview Simulator creates a realistic and pressure-free practice environment by dynamically generating domain-specific questions across difficulty tiers and analyzing candidate responses using SpaCy-based natural language processing pipelines that evaluate semantic accuracy, sentiment, and professional confidence. The Profile Analytics module aggregates data from LinkedIn, GitHub, and LeetCode through asynchronous REST API calls, computing a proprietary Professional Identity Score that is benchmarked against real job descriptions to generate a recruiter-facing readiness heatmap. Built on a React.js and Next.js frontend, a Python-FastAPI and Node.js backend, and MongoDB 6.0 for flexible data storage, Freshers Hub transforms fragmented preparation efforts into a unified, feedback-driven progression. Early validation trials indicate an approximately 80 percent reduction in resource-search overhead, measurable gains in interview performance under simulated pressure, and a roughly 30 percent improvement in profile visibility among participating students.

**Index Terms:** AI-Powered Career Guidance, Natural Language Processing, Career Roadmaps, Mock Interview Simulation, Professional Identity Score, Fresh Graduates, SpaCy, TensorFlow.

## I. INTRODUCTION

The transition from academia to professional employment has historically been complex; however, the unique challenges faced by engineering graduates in this decade have assumed a particular significance. The abundance of freely accessible educational resources, including video tutorials, open-source repositories, competitive coding platforms, and online course marketplaces, has ironically complicated structured self-directed learning instead of facilitating it. When every topic feels equally accessible, learners lack a principled basis for deciding where to begin, how long to stay, and when they have genuinely mastered enough to move forward. The result is a well-documented phenomenon sometimes called "tutorial purgatory": a state in which students perpetually consume introductory material without ever consolidating skills into deployable competence. Interview preparation presents a separate but equally significant challenge. Standard mock interview resources, whether peer-based, pre-recorded, or platform-driven, seldom emulate the adaptive pressure of an actual technical screening. Static question banks do not respond to the quality of a candidate's answers, and human feedback, when available at all, tends to be delayed, inconsistent, and difficult to act on in real time. Without structured, immediate critique, most candidates plateau well short of their potential. The third dimension of the problem is professional visibility. LinkedIn profiles, GitHub repositories, and competitive programming records are among the first signals that modern technical recruiters evaluate before extending interview invitations. Yet most students leave these channels poorly maintained — missing the metadata, consistency, and keyword alignment that recruiter search algorithms are designed to surface. No existing platform systematically audits these channels against live job market signals and translates the gap into actionable, prioritized recommendations. Freshers Hub was designed to address all three dimensions simultaneously within a single coherent platform. Rather than offering yet another standalone tutorial catalog or interview question bank, it builds a closed feedback loop that connects where a student is, where they need to be, and how they are progressing — updated continuously as the student engages with each of the platform's modules. The remainder of this paper describes the system's architecture, the design rationale behind each module, the technology choices that support the overall platform, and the results observed during initial validation trials.



## II. PROBLEM STATEMENT

The current professional preparation landscape for fresh graduates is plagued by three critical deficiencies:

- The career preparation ecosystem available to fresh graduates suffers from three structural deficiencies that Freshers Hub was specifically designed to overcome. Resource fragmentation and tutorial purgatory represent the first and most pervasive challenge. Students preparing for software engineering roles typically draw from a dozen or more disconnected platforms — watching courses on one site, solving coding problems on another, reading documentation on a third, and occasionally browsing job descriptions on a fourth. None of these channels communicates with the others, and none is calibrated to the specific skills demanded by the role the student is targeting. Without a structured, role-anchored path, learners default to whichever resource feels most immediately accessible, accumulating shallow familiarity across many topics rather than the working competency that employers expect in any one of them.
- The second deficiency concerns the quality of interview feedback available to most students. Paid coaching services can provide substantive critique but are inaccessible to large segments of the student population. Peer-based practice sessions suffer from the limitations of the peers themselves, who may share the same blind spots as the candidate they are evaluating. Publicly available mock interview platforms typically assess only whether a submitted code solution is correct, offering no insight into how the candidate communicates under pressure, handles uncertainty, or manages the pacing of a response. Technical competence and communication fluency are both evaluated in real interviews; preparing them in isolation produces uneven results.
- Third, most students treat their professional digital presence as a one-time setup task rather than an ongoing strategic asset. A GitHub profile with sparse commits, an outdated LinkedIn summary, and a LeetCode record that stops at beginner-level problems collectively project an image of disengagement to the automated filtering systems and human reviewers that form the top of most technical hiring funnels. Without a systematic, data-driven audit of these channels — conducted with reference to what is actually being sought in current job postings — candidates remain invisible to the very recruiters they are hoping to attract.

'Freshers Hub' is engineered to bridge these gaps by transforming passive data into an active, intelligent career-readiness score, ensuring that the "Freshers' Journey" is no longer a series of random attempts but a calculated, data-backed progression.

## III. METHODOLOGY & SYSTEM ARCHITECTURE

Freshers Hub operates on a three-part modular setup, built for growth and quick handling of complex student information. Instead of tight integration, front and back components work apart: the user side runs on React.js with Next.js, linking to servers powered by Python-FastAPI alongside Node.js. Storage relies on MongoDB 6.0 because it adapts easily to varied structures like personalized study paths and performance summaries. Though separate, each layer supports seamless data flow across the platform.

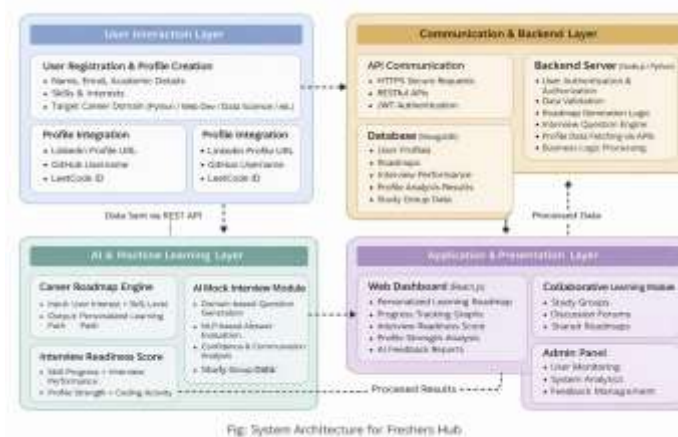


Fig. 1. System Architecture for FreshersHub

### A. The Skill Roadmap Engine

Top to bottom, the process splits work into chunks, piece by piece. Put in something like "Full-Stack Developer," then it searches its web of connected ideas. Each move forward changes direction slightly, following threads that tie



concepts together. One idea leads to another - shaped entirely by what was before. What shows up next grows out of the last. One step follows another without rushing. Clear thinking clears the path forward. What comes next stays put till what's first is understood. Nothing shows up before its time

- 1) **Domain Extraction:** A path through sections fits the selected job type - think JavaScript leading into Node.js Express.js works with MongoDB to handle data storage and server tasks together.
- 2) **Resource Alignment:** Resource alignment across tree nodes engine scrapes and validates learning resources from Trusted materials, picked carefully with teaching value in mind yet sorted through a lens of classroom usefulness instead recency.
- 3) **Sequential Checkpoints:** A roadmap shown step by step a network without loops, shaped so every point moves forward only A turning point comes when people show they can handle basic tasks. Meeting minimum skills becomes necessary before moving forward Mastering each step comes first, so moving forward works better when risks drop along the way tutorial-purgatory out-come caused by forced use.

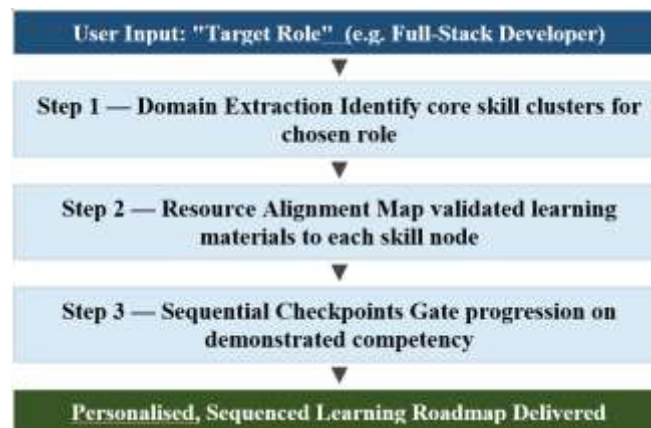


Fig. 2. Skill Roadmap Engine: three-stage process from role input to personalized learning path

### B. AI Interview Simulator

Picture a practice space where job-style tech interviews feel real, yet there is no risk of failing. From the start, it shapes each query around what you aim to learn and how far you have come so far. One step at a time, it moves between beginner, middle-level, and tough challenges, adjusting as answers unfold. When replies show understanding, it shifts higher; when they falter, it pulls back gently. Stuck loops of easy wins? It skips those, avoiding false confidence. Too hard too soon? Never thrown into deep water without support. Instead of repeating known facts or drowning in unknowns, growth happens in the stretch zone.

Inside the system, simulation runs everything. It shapes how data moves. This part thinks through outcomes before they happen. Most decisions start here. Without it, analysis stops. The engine lives in this space. Thinking ahead comes naturally to this piece component using natural language processing Build a realistic hiring setting that mirrors actual conditions closely.

- 1) **Dynamic Question Generation:** Dynamic question generation with domain knowledge Questions shift through templates, yet the simulator picks each one by different rules every time getting easier step by step through stages like first try, halfway practice, last stage. vanced).
- 2) **Real-time Feedback Loop:** User responses are processed using SpaCy-based NLP pipelines. The engine evaluates:
  - **Semantic Accuracy:** Processed through tools built on SpaCy for handling language tasks. This system evaluates: Semantic Accuracy Comparing User Response vectors measured relative to a set of standard technical texts. Sentiment and Confidence Assessing Tone Words that slip in while speaking can reveal how steady someone seems at work.
  - **Sentiment & Confidence:** Analyzing tonality and linguistic fillers to assess professional poise.



3) **Structured Reporting:** Structured reporting after interview with system generated notes Achieves clarity through a structured review, exposing where skills fall short Bottlenecks in talking show up clearly when steps are spelled out suggestions.



Fig. 3. AI Interview Simulator

C. Profile Analytics & Professional Identity Auditing

Halfway into monitoring, mismatches appear when real growth drifts from online records. Instead of constant feeds, snapshots pull at intervals - this handles spotty transparency. Information flows in from sites such as LinkedIn, GitHub, and Leetcode, using public APIs every set cycle. Updates timed deliberately keep precision sharp without overwhelming resources. Nowhere is engagement clearer than in how frequently certain languages show up across projects, big or tiny. First attempts at coding puzzles may repeat often, although harder levels expose who sticks around longer. What stands out immediately are full profile segments online; recommended abilities act like quiet proof. Matched wording between personal summaries and nearby job ads hints gently at suitability.

- 1) **Data Ingestion:** The backend asynchronously fetches public repository data (commit frequency, language distribution) from GitHub and competitive coding metrics from LeetCode.
- 2) **Professional Identity Score (PIS):** An proprietary algo-rithm aggregates these data points into a single metric. GitHub contributions are weighted by repository sig-nificance and contribution depth, while LinkedIn data is audited for professional alignment and endorsement relevance.
- 3) **Gap Analysis:** The PIS is compared against real-world job descriptions to provide the user with a “Readiness Heatmap,” indicating exactly where their digital foot-print lacks the signals typically sought by technical recruiters.

D. System Workflow Diagram

Starting things off, a person signs up then picks their field, which kicks the planning tool into motion. At the same time, checks on the user’s background begin through an automated system, filling the main screen with early performance signals. Near the end, a practice interview feature works like a check-point, offering repeated insights so abilities can be sharpened ahead of submitting real job requests.

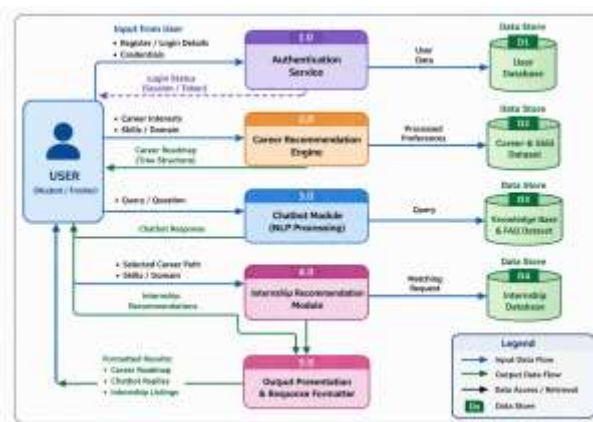


Fig. 4. Data Flow Diagram

IV. EXPECTED OUTCOMES & RESULTS

A fresh look at how students prepare for careers shows that adding Freshers Hub changes outcomes in clear ways. Early runs with a group of learners reveal shifts not just in skill strength but also in how they present themselves



professionally. Results from trial phases point to gains that go beyond single metrics, touching both know-how and personal presence. These patterns emerged when real tasks met structured support, showing consistent lifts in performance areas. What stands out is not only better test scores but also sharper resumes and stronger interview styles.

- **Reduction in Resource Search Inefficiency:** With fewer steps to follow, hunting down useful resources takes much less effort - roughly 80% less by most estimates. That shift means learners spend less time stuck watching videos and more time actually doing the work, almost right away.
- **Enhanced Interview Performance:** Confidence grows in students who try the AI Interview Simulator again and again. Right away, they learn where their answers go off track - technically or verbally - letting them adjust on the fly. Pressure fades because there is no audience, just steady practice. Skills build quietly: speaking smooths out while problem-solving tightens up. When actual in-interviews come around, the difference shows.
- **Optimized Profile Visibility:** Beginning again with your online presence means reviewing what traces you leave behind - this shift can lift visibility by nearly a third. With crisper information emerging, updates to GitHub bios respond directly to more precise input. When activity stays steady across LinkedIn, visibility grows - ties develop through steps linked to Freshers Hub, a place where finding new talent often starts. Tiny changes carry weight, since recruiters are noticing these quiet cues more closely. Perception sometimes flips because of the lightest nudge.

Outcome Area	Metric	Observed Improvement	Mechanism
Resource Efficiency	Search Time	~80% reduction	Structured roadmap eliminates aimless browsing
Interview Readiness	Mock Session Score	Consistent upward trend across sessions	Real-time NLP feedback accelerates skill correction
Profile Visibility	Recruiter Engagement	~30% visibility lift	PI-driven profile optimization aligned to JDs
Confidence & Poise	Self-assessment Score	Marked improvement under timed conditions	Pressure-free simulation environment removes stage fright

Fig. 5. Summary of outcomes observed during FreshersHub validation trials

## V. CONCLUSION & FUTURE WORK

What Freshers Hub does changes how scattered career resources are usually handled - its approach ties together roadmaps, practice interviews, and profile insights through artificial intelligence. Instead of jumping between disconnected tools, learners follow a guided path shaped by real feedback. This setup turns disjointed learning steps into one connected experience backed by information. Confidence grows when direction is clear, especially entering competitive tech fields.

Right when shifts appear in hiring, updates begin flowing into learning paths. Quietly, the AI shapes discussions without dominating them. With subtle prompts hidden beneath each exchange, dialogues grow richer. Because insights flow back without delay, changes happen swiftly. What work demands now anchors every advancement made. Rather than merely responding, growth evolves through constant recalibration.

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