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LifeMap: AI-Powered Visual Roadmap Builder for Career Goals

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Peer Review Information	Abstract
<p><i>Submission: 05 Nov 2025</i></p> <p><i>Revision: 25 Nov 2025</i></p> <p><i>Acceptance: 17 Dec 2025</i></p>	<p>This research paper presents LifeMap, an AI-powered visual career roadmap system. Its purpose is to assist individuals in planning their long-term professional goals, tracking their progress, and adjusting them as needed. While traditional task managers focus solely on short-term activities, LifeMap provides a structured visual roadmap that breaks down larger career goals into smaller, achievable steps. The system is grounded in goal-setting theory, self-regulated learning, and self-determination theory, fostering continuous and meaningful career development. LifeMap provides personalized and relevant suggestions using natural language input, embedding-based resource matching, reinforcement learning-based scheduling, and fairness-aware ranking. By analyzing a user's educational background, interests, and career aspirations, the system recommends relevant skills, certifications, internships, and opportunities. Additionally, the platform includes community features that promote collaboration, progress sharing, and motivation, such as groups, discussions, and challenges.</p> <p>The platform is developed using React.js, Node.js, Express.js, MongoDB, and OpenAI-based models. Overall, LifeMap offers a scalable and human-centered solution that makes career planning more intuitive and effective through visual roadmaps, intelligent AI guidance, and collaborative community support.</p>
<p>Keywords</p> <p><i>LifeMap, roadmap, Career planning, goal visualization.</i></p>	

Introduction

The nature of modern careers is no longer as simple, linear, and stable as it once was. Today, people face dynamic and multi-directional career paths rather than simply progressing in a single direction. Rapid technological advancements and digital transformation require individuals to constantly learn new skills, adapt to diverse roles, and meet evolving industry demands. Global labor studies also clearly indicate that employers now value adaptable skills, a capacity for continuous learning, and project-based practical experience more than static expertise. However, this new reality presents significant challenges on both cognitive and motivational levels. Lifelong

learning has become essential, but a clear path forward is often elusive. However, this new reality presents significant challenges on both cognitive and motivational levels. Lifelong learning has become essential, but a clear path forward is often elusive. This problem highlights the limitations of modern digital tools. Traditional to-do apps and calendars are only suitable for organizing daily tasks they don't provide the clarity needed for long-term career planning. Professional project management tools, on the other hand, are designed for team-based work; they are neither simple nor adaptable enough for individual career development journeys. Similarly, educational platforms only

suggest courses, but they don't provide a comprehensive, end-to-end career roadmap.

To bridge this gap, we introduce LifeMap an AI-powered integrated system that acts as a personal co-pilot for an individual's career development. LifeMap provides a visual roadmap builder that helps break down large goals into smaller objectives and actionable steps. This visual structure reduces cognitive load and makes plans more clear and actionable. The LifeMap system is powered by an intelligent AI engine that performs three main functions:

1). Translation and Structuring: Transforming broad and ambiguous career goals into a clear, organized, and step-by-step goal structure.

2). Personalized Recommendations: Providing AI-based, precise recommendations of skills, resources, and learning tasks based on the user's background, interests, and career objectives.

3). Motivational Engagement: Maintaining user motivation over the long term through reminders, analytics, achievements, and motivation-based design techniques.

Simply creating an application is not enough; its effectiveness depends on a strong theoretical and methodological foundation. Therefore, this research paper presents LifeMap as a comprehensive research-oriented framework. Going beyond a description of features, it provides a detailed analysis of the psychological and technical principles that underpin the system.

Background and Motivation

The last decade has seen unprecedented changes in the nature of work, driven by automation, platform economies, and global digitalization. Multiple surveys report persistent skill gaps in areas such as data literacy, cloud computing, user experience, and domain-specific analytics. Moreover, many learners cite lack of clarity and inconsistent motivation as barriers to completing reskilling programs. LifeMap attempts to bridge this gap by coupling AI recommendation systems with a visual, reflective interface that externalizes goals and progress.

Three principal motivations underlie LifeMap:

1). Clarity and decomposition: Transform high-level career goals into temporally-ordered, dependent milestones and trackable micro-tasks to reduce cognitive load and increase actionability.

2). Adaptive personalization: Use behavioral signals and content matching to recommend relevant resources and scheduling patterns aligned to user constraints and preferences.

3). Sustained engagement: Integrate motivational design and social accountability to maintain consistent effort over long periods.

The combination of these elements aims to reduce the time-to-competency for career transitions and make lifelong learning more accessible and structured.

Literature Review

A. Recommender Systems for Education and Careers

Research on educational recommender systems includes content-based filtering, collaborative filtering, and hybrid models, which are used to suggest learning materials and career options. Recent work has utilized embedding techniques and semantic similarity to match job descriptions, course content, and user profiles. These systems improve resource discovery, but most are limited to content recommendations and do not support long-term, structured career planning. Many existing approaches rely on academic outcomes, pre-defined interests, or static behavioral data, making them less effective in providing real-time adaptation and personalization.

B. Personal Informatics and Visual Analytics

Research in personal informatics shows that data-tracking systems help individuals understand their learning behavior and progress. Previous studies have found dashboards and structured information presentation helpful in tracking ongoing tasks and increasing self-awareness. While their use is common in educational and productivity applications, most solutions are limited to simple data tracking and do not provide comprehensive, goal-oriented career mapping.

C. Motivation, Gamification, and Behavior Change

Research on gamification shows that elements such as progress indicators, challenges, and peer comparisons can increase user engagement, especially when aligned with the user's own goals. Previous systems have also shown that meaningful challenges and adaptive guidance lead to sustained user engagement. However, gamification is often very limited or only superficially implemented in many career recommendation platforms, resulting in short-term engagement rather than a long-term learning journey.

D. Integration Across Domains

Recent research emphasizes that developing effective career guidance systems requires the integrated use of multiple domains such as recommendation systems, personal informatics, learning analytics, and motivational design. Most existing career recommendation systems focus on only one or two aspects, such as simply suggesting resources or basic goal setting. A truly effective solution requires the integrated

functioning of AI-based personalization, structured skill development, understanding of user behavior, and engagement-enhancing mechanisms. This type of multi-domain integration is still under-explored in research and presents a significant research direction for next-generation career planning systems.

Theoretical Foundations

LifeMap is conceptually based on three complementary theoretical frameworks:

A. Goal-Setting Theory

Specific, challenging goals with feedback are associated with higher performance than vague goals. LifeMap implements specificity by dividing goals into milestones with deadlines; and implements feedback through periodic analytics and micro-reflection prompts.

B. Self-Regulated Learning (SRL)

SRL theory posits that effective learners plan, monitor, and reflect. Lifemap structures the user journey into stages - 'planning' through roadmap creation, 'monitoring' through dashboards and event logs, and 'reflection' through weekly prompts and retrospective analytics.

C. Self-Determination Theory (SDT)

SDT suggests that autonomy, competence, and relatedness are key drivers of intrinsic motivation. Lifemap supports 'autonomy' through customizable roadmap creation, 'competence' by providing measurable micro-goals and milestones, and 'relatedness' through mentor and peer sharing features.

Conceptual System Overview

Although this paper avoids implementation-specific code, we outline the conceptual modules and their responsibilities.

A. Recommendation Engine

The Recommendation Engine uses a sophisticated hybrid architecture to generate personalized user support. It works in distinct stages:

First, natural language processing (NLP) and embedding-based matching techniques analyze the user's goals and current context to identify a candidate set of relevant resources and micro-tasks.

Next, a reinforcement learning (RL)-based scheduling module optimizes the timing of these notifications, and determines the most opportune moments to provide reminders and new tasks.

Finally, all recommendations go through a two-stage ranking process: first, they are ranked according to the user's immediate needs (relevance), and then fairness-aware adjustments are made to them. This final step is critical to

reducing potential algorithmic biases and ensuring equitable outcomes for all users.

B. Roadmap Builder

An interactive canvas where users clarify goals, define milestones, specify dependencies, and estimate effort. This builder allows for 'progressive disclosure'—meaning users can add details incrementally—and provides templates for common career transitions, such as "Full Stack Developer".

C. Analytics Engine

The analytics engine transforms raw logs of user interaction into meaningful insights on learning velocity and engagement. It aggregates event data to measure key performance indicators (KPIs) such as task completion rates, time allocation across skill domains, and engagement streaks, as well as identifying longitudinal trends.

A key feature of this engine is its 'presentation layer'. Instead of displaying raw metrics, it synthesizes data into two user-centric formats: digestible summaries for rapid comprehension and structured reflections. These reflections are specifically designed to encourage users to critically evaluate their own learning habits and progress patterns.

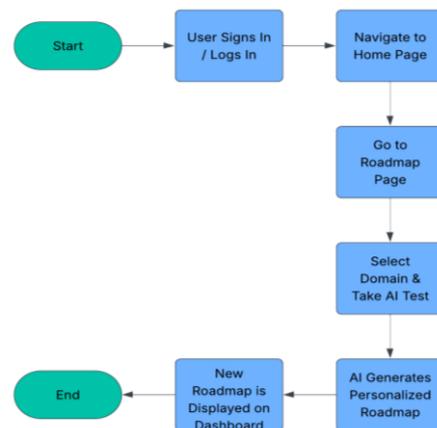


Fig. 1. System Diagram of LifeMap

Natural Language Intake and Goal Parsing

A frictionless, accurate intake mechanism is critical for user uptake. Users often prefer natural text over rigid forms; LifeMap's NLU pipeline supports this by extracting structured intent from free text.

A. Pipeline Overview

Input text undergoes:

- **Normalization:** date/time recognition, slang handling, unit standardization.
- **Entity extraction:** roles, skills, durations, constraints.

- **Intent classification:** distinguishing between career pivot, upskill, certification, or exploratory goals.
- **Template mapping:** mapping parsed intent to pre-curated milestone skeletons that can be edited.

B. Model Considerations

To achieve high-quality text comprehension, our system utilizes lightweight Transformer models, such as distilled BERT variants. These models are specifically fine-tuned on a domain-specific corpus composed of job postings, learning resources, and career forums, which significantly enhances their performance.

In applications where minimal response time is critical (latency-sensitive contexts), we employ a hybrid approach. This strategy combines the nuanced understanding of the small neural encoders with the speed and reliability of deterministic rules. These rules are designed to rapidly extract predefined critical entities, such as time durations, ensuring both accuracy and efficiency.

Reinforcement Learning For Adaptive Scheduling

Nudges and reminders benefit from personalization. A scheduling agent modeled by RL can adapt nudge timing and content based on observed engagement behaviors.

State, Action, Reward

State: recent completion history, time-of-day preferences, streak length, last interaction lag, self-reported fatigue.

Action: send reminder, suggest micro-task, suggest break, defer reminder.

Reward: positive for completion within a time window; negative for repeated ignored prompts or high unsubscription rates.

User Modeling And Cold-Start Strategies

Cold-start is a pervasive issue. LifeMap adopts pragmatic strategies:

Bootstrapping via templates: role-based skeleton roadmaps offering immediate structure.

Lightweight surveys: a 3-5 question onboarding survey to capture availability, learning preferences, and constraints.

Transfer learning: use generic priors from population-level models and refine with user signals.

These methods reduce time to personalization while respecting user effort.

Explainability And User Control

Trust depends on users understanding why recommendations appear. LifeMap offers:

Rationale cards: short explanations like "Recommended because: aligns to your target role and requires skill X."

Confidence indicators: numeric or verbal confidence that informs acceptance or rejection.

Editable decision inputs: users can change preferences that immediately alter future suggestions.

Explainability is also essential for regulatory compliance and user empowerment.

Engagement Mechanics And Gamification Ethics

Rather than indiscriminate reward mechanics, LifeMap employs adaptive gamification rewards are tailored to support intrinsic motives:

Mastery badges: awarded for demonstrated skill competence (project completion), not frequency of logins.

Streaks with grace: to avoid penalizing users for occasional life events.

Community recognition: mentor-endorsed achievements that reinforce social validation.

Careful design avoids manipulative patterns that prioritize engagement over well-being.

Metrics and Analyses

Key metrics:

Completion Rate (CR): ratio of completed milestones to created milestones.

Retention (R): proportion of weekly active users over time windows (4, 8, 12 weeks).

Engagement Intensity (EI): sessions per week \times average session duration.

Self-efficacy Change (SE): pre-post survey measures using standard scales.

Advanced analyses include sequence clustering, causal mediation models to parse which components influence outcomes, and fairness audits (disaggregate metrics by demographic cohorts).

Privacy, Ethics, and Fairness

Ethical deployment must be proactive. LifeMap incorporates:

Data minimization: only store data needed for functionality.

User control: exports, deletions, and consent dashboards.

Differential privacy options: for aggregated analytics.

Regulatory readiness includes documentation of data flows, model versioning, and audit trails.

Case Studies and Illustrative Examples

We describe three representative composite case studies demonstrating LifeMap's applicability across contexts.

Case A: Undergraduate to Data Scientist

A student aims to move into data science within 18 months. LifeMap’s skeleton roadmap suggests a sequence: Python foundations, statistics, SQL, machine learning, project capstone. Embedded project templates and free resource recommendations allow steady progress, with RL scheduling nudges tuned to semester timelines. Outcome: student completed a capstone project and secured a data-focused internship.

Case B: Mid-Career Pivot to Product Management

An experienced engineer transitions to product management. Milestones include business fundamentals, communication, stakeholder mapping, and a cross-functional project. Social features connect the user with mentors; explainability components show how suggested resources align with competency gaps. Outcome: user engaged in targeted networking and landed an internal rotational role.

Case C: Continuous Upskilling for IT Professional

A cloud engineer focuses on certifications. LifeMap sequences certification prep into micro-sprints, optimizing study scheduling around work hours using RL. Gamified mastery badges reflect demonstrated competencies rather than mere course completion, motivating deeper learning. Outcome: multiple certifications achieved and improved promotion prospects. These cases illustrate the platform’s adaptability and user-centered personalization.

Result

The system has created a clear and easy-to-understand full-stack development roadmap that guides learners from fundamental topics to advanced backend and DevOps concepts. This visual framework systematically outlines key topics, checkpoints, and project ideas, making it easy for users to understand what to learn next and progress with confidence.

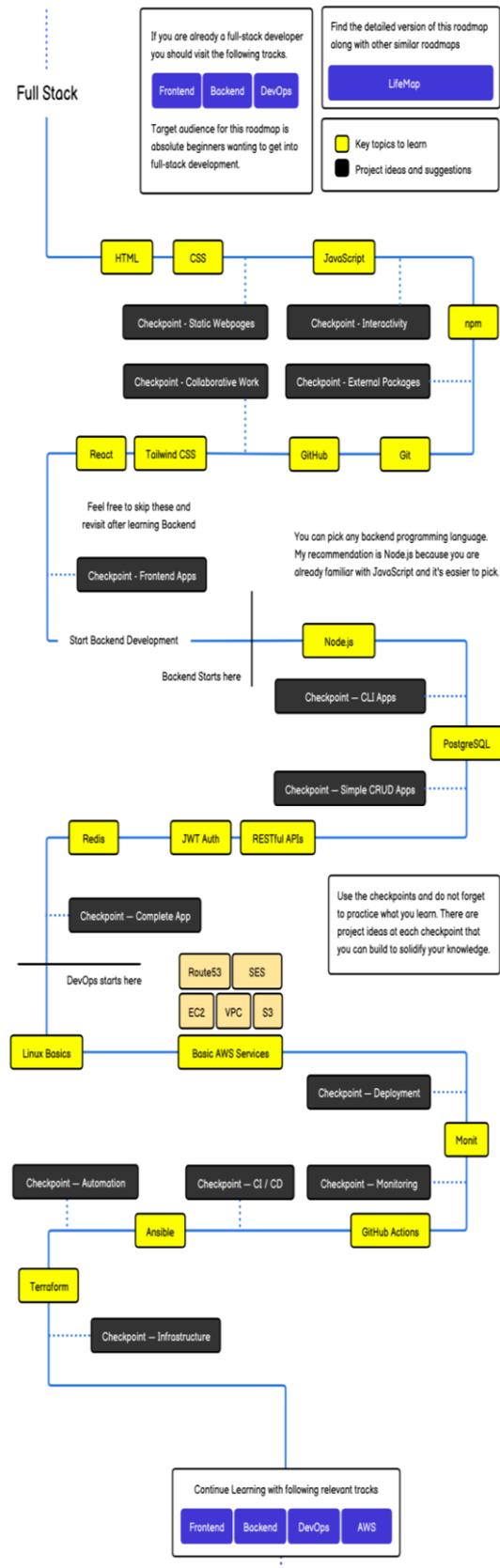


Fig. 2. An example of a LifeMap visual roadmap for a 'Full Stack developer path.'

Limitations

Key limitations and open challenges:

1) Dependence on user input quality: The accuracy of suggestions and analyses depends on how accurately and consistently users enter their data.

2) Lack of offline mode: As the initial version is web-based, it cannot be used without an internet connection.

3) Need for large and high-quality datasets for advanced AI features: Implementing effective AI-based suggestions requires extensive and high-quality data sources, which can be difficult to obtain.

Future Scopes

LifeMap has great potential to evolve into a more intelligent, AI-based, and collaborative career development platform in the future. Future improvements may include the following:

1) Integration with external productivity tools: Integrating tools like Google Calendar, Notion, Trello, and LinkedIn can provide users with features such as auto-scheduling, reminders, and skill verification.

2) Mobile application development: A mobile version of LifeMap can be developed using React Native or Flutter, allowing users to track their progress in real time.

3) Mentorship support: In the future, users could be given the ability to connect with each other, share their goals, or receive guidance from a mentor.

Social Implications and Policy Relevance

If widely adopted, tools like LifeMap could influence labor market dynamics, potentially making reskilling more efficient and democratizing career planning. Policy makers could partner with platforms to deliver targeted upskilling initiatives, reduce mismatch costs, and track workforce development metrics. However, the benefits come with responsibilities: ensuring equitable access, preventing algorithmic gatekeeping, and safeguarding against misuse by employers or gatekeepers.

Conclusion

LifeMap is designed to make career planning simpler and more meaningful for individuals. This platform breaks down long-term goals into smaller, structured steps and presents them as a clear visual roadmap, allowing users to understand where they currently are, what they need to do next, and how they are progressing over time. It bridges the gap between daily tasks and long-term aspirations, making the entire journey feel more manageable and inspiring. Overall, LifeMap acts as a supportive

companion in users' career journeys—providing clarity, structure, and continuous guidance. It empowers individuals to plan their future with confidence and move purposefully towards their goals.

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