

**NANYANG  
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## Software Requirements Specification for **SkillsBridgeSG**

SC2006 Software Engineering

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# 1. Functional Requirements

## 1.1 Visualizing future paths

### 1.1.1 Description and Priority

This feature shows a clear, data-backed connection between a student's current choices (e.g., subject combinations, polytechnic courses) and their potential future academic and career opportunities. The system leverages government datasets (e.g., Graduate Employment Survey, university/polytechnic enrolment data) to generate predictive pathways.

- **Benefit:** Helps students/parents align passions with realistic future opportunities (UC02)
- **Penalty (if absent):** Students risk making uninformed, stressful choices (UC02)
- **Cost:** Moderate — Requires integration with multiple datasets and recommendation logic (UC02)
- **Risk:** Data freshness/accuracy dependency on government sources (UC02)
- **Priority:** High

### 1.1.2 Stimulus/Response Sequences

#### **Scenario A (Student User):**

1. Student inputs current interests, subjects, or strengths.
2. System matches inputs with datasets available.
3. System displays multiple pathways (secondary → poly/JC → university → career).

#### **System Responses:**

- Show pathways as an interactive flowchart/timeline.
- Display pathways in comparison view.

### 1.1.3 Functional Requirements

- **REQ-1.1:** The system shall allow users to input student profile.
- **REQ-1.2:** The system shall map these inputs to relevant post-secondary courses using data.gov.sg datasets.
- **REQ-1.3:** The system shall map these inputs to relevant jobs using data.gov.sg datasets.

- **REQ-1.4:** The system shall build potential career pathways using the mapped courses and jobs.
- **REQ-1.5:** The system shall display these potential career pathways in a visual, interactive manner (timeline or flowchart).
- **REQ-1.6:** The system shall save all potential career pathways upon command from the user.
- **REQ-1.7:** The system shall generate a sharable link for the page containing the career pathways upon request from the user.
- **REQ-1.8:** The system shall display a fallback message when no matching pathway is found and suggest related areas.

## 1.2 Exploring options holistically

### 1.2.1 Description and Priority

This feature enables students and parents to explore multiple academic and career pathways beyond simple school/course listings. It integrates skills, experiences, and industry relevance into each option, helping users see the **bigger picture** rather than making decisions in isolation.

- **Benefit:** Encourages informed decision-making by showing a complete landscape (UC03/ UC05)
- **Penalty (if absent):** Students may make choices with a narrow or short-term view (UC03/ UC05)
- **Cost:** Moderate — requires data integration and additional visualization modules (UC03/ UC05)
- **Risk:** Users may feel overwhelmed with too much information (UC03/ UC05)
- **Priority:** High

### 1.2.2 Stimulus/Response Sequences

#### **Scenario A (Student User):**

1. Students select a subject combination (e.g., Pure Sciences).

2. System retrieves related post-secondary options (Polytechnic diplomas, JC subject streams).
3. System highlights not only courses, but also **soft skills gained** along the way (e.g. teamwork skills etc.).
4. Student clicks into one pathway → sees a combination of **academic modules + soft skills + industry links**.

**Scenario B (Parent User):**

1. Parent explores a career domain (e.g., Healthcare).
2. The system shows the full range of educational paths leading to that career (e.g., nursing diplomas, biomedical science degrees, alternative allied health roles).
3. Parent compares holistic paths to discuss with child.

**System Responses:**

- Present options as **cards** showing courses, soft skills, real-world applications.
- Provide a “**zoom-out**” view of multiple pathways across industries.

### 1.2.3 Functional Requirements

- **REQ-2.1:** The system shall recommend options based on student profile.
- **REQ-2.2:** The system shall retrieve the skills and experiences available at the recommended educational options.
- **REQ-2.3:** The system shall present the skills and experiences available at the recommended educational options.
- **REQ-2.4:** The system shall further retrieve any other possible career fields that could be branched out based on the student profile.
- **REQ-2.5:** The system shall allow users to view a “zoomed-out” multi-pathway map across the interconnected industries.
- **REQ-2.6:** The system shall display up to 2 recommended courses in comparison view for the user.
- **REQ-2.7:** The system shall display a fallback message when no matching pathway is found and suggest related areas.

## 1.3 Providing Context (Industry & Workforce Landscape)

### 1.3.1 Description and Priority

This feature gives students and parents a **macro-level understanding** of industries, workforce demand, and how education ties into employment opportunities. Instead of just showing “where you can study,” it shows “why these matter in the real world.” It bridges the classroom and workplace using government datasets (e.g., Graduate Employment Survey, MOM labor reports, SkillsFuture).

- **Benefit:** Builds awareness of future-proof skills and industries (UC04)
- **Penalty (if absent):** Students risk pursuing irrelevant or declining fields (UC04)
- **Cost:** High — requires integration with multiple job/industry datasets (UC04)
- **Risk:** Job market forecasts may shift rapidly, affecting accuracy (UC04)
- **Priority:** High

### 1.3.2 Stimulus/Response Sequences

#### **Scenario A (Student User):**

1. Students select an interest area (e.g., Artificial Intelligence).
2. System retrieves industry data showing AI-related roles, growth projections, and median salaries.
3. System displays which university/polytechnic courses lead to those roles.
4. Students can “bookmark” promising industries to track future trends.

#### **System Responses:**

- Show dashboards with **employment rates, job demand growth, skills in demand.**
- Highlight **risks** (e.g., declining demand in certain industries).

## 1.4 Functional Requirements

- **REQ-3.1:** The system shall retrieve employment and industry data from trusted sources (e.g., data.gov.sg, MOM, SkillsFuture).
- **REQ-3.2:** The system shall display workforce insights including employment rates, job demand growth, and salary benchmarks.
- **REQ-3.3:** The system shall provide visual dashboards for industry trends (graphs, charts, infographics).
- **REQ-3.4:** The system shall allow users to bookmark or save industries/careers for later review.
- **REQ-3.5:** The system shall generate warnings when users select industries marked as declining or highly competitive.

## 2. Nonfunctional Requirements

### 1. Performance Requirements

- UC01 Onboard & Enter Profile → UC02 Generate Pathway Roadmap: First-time onboarding plus roadmap generation must complete within 2 minutes for at least 80 % of first-time users.
- UC02 Generate Pathway Roadmap: Render the roadmap view within 2 seconds for at least 95 % of requests.
- UC05 Compare Two Courses: Produce the two-course comparison view within 2 seconds for at least 95 % of requests.
- UC07 Save/Share Plan: Generate a shareable link or export (UC13) within 2 seconds of request.
- UC16 Search & Filter: Return filtered course results within 1 second for at least 90 % of queries.
- UC08 Update Data: Daily dataset refresh must complete within 5 minutes of scheduled start.

### 2. Safety Requirements

- Every employment or salary statistic shown in UC02, UC03, UC04, UC05, or UC12 must display its data source and dataset reference year (vintage).
- If any dataset's reference year is older than 3 years, the UI must show a Warning Badge.
- UC04 must trigger a Risk Warning when the selected industry is flagged as declining or highly competitive.
- Unsaved user inputs (skills, course choices) from UC01, UC03, UC10, UC11, UC12, UC14, and UC16 must persist through a single page refresh via local storage to prevent accidental loss.

### 3. Security Requirements

- All data transmission must occur over HyperText Transfer Protocol Secure (HTTPS) using Transport Layer Security version 1.2 (TLS 1.2).
- User accounts (UC09) must use secure password hashing (bcrypt or Argon2).
- Role-Based Access Control (RBAC):
  - Admin can upload datasets and manage glossary entries (UC08).
  - End-users (Student, Parent, Counsellor) may access only UC01–UC07, UC10–UC16.

- Only minimal Personally Identifiable Information (PII)—specifically the user’s email address and age band—will be stored.
- Telemetry (anonymous analytics such as number of roadmap saves) is opt-in only; no data is collected until the user consents.

#### 4. Software Quality Attributes

- Usability: At least 80 % of first-time users must reach their first roadmap (UC02) within 2 minutes.
- Reliability: After any backend restart, restore all major features (UC01–UC07, UC10–UC16) within 5 minutes.
- Maintainability: Datasets for UC02, UC03, UC04, UC05, and UC08 must be configurable via a single schema file without code changes.
- Portability: The database layer supporting UC01–UC08 must be replaceable with any relational DB supporting standard SQL by updating configuration and migration scripts only.
- All user interfaces must comply with the Web Content Accessibility Guidelines version 2.1, Level AA (WCAG 2.1 AA), including support for full keyboard navigation, adequate color-contrast ratios, and alternative text (alt-text) for all non-text content.

#### 5. Business Rules

- Each recommendation or comparison (UC02, UC03, UC04, UC05) must display at least one cited data source.
- UC05 Compare Two Courses is limited to exactly two courses at a time.
- Roadmap recommendations (UC02) must always include at least one quantitative (e.g., salary) and one qualitative (e.g., skills focus) indicator.

### 3. Other Requirements

- Internationalization: English only; currency in SGD; metric units.
- Legal/Compliance: Attribute all datasets used in UC02–UC05 to their original sources and comply with relevant open-data licences.
- Database: Must support schema evolution (migration scripts) without loss of saved plans.
- Dataset Refresh: Schedule and complete a daily dataset refresh via UC08.

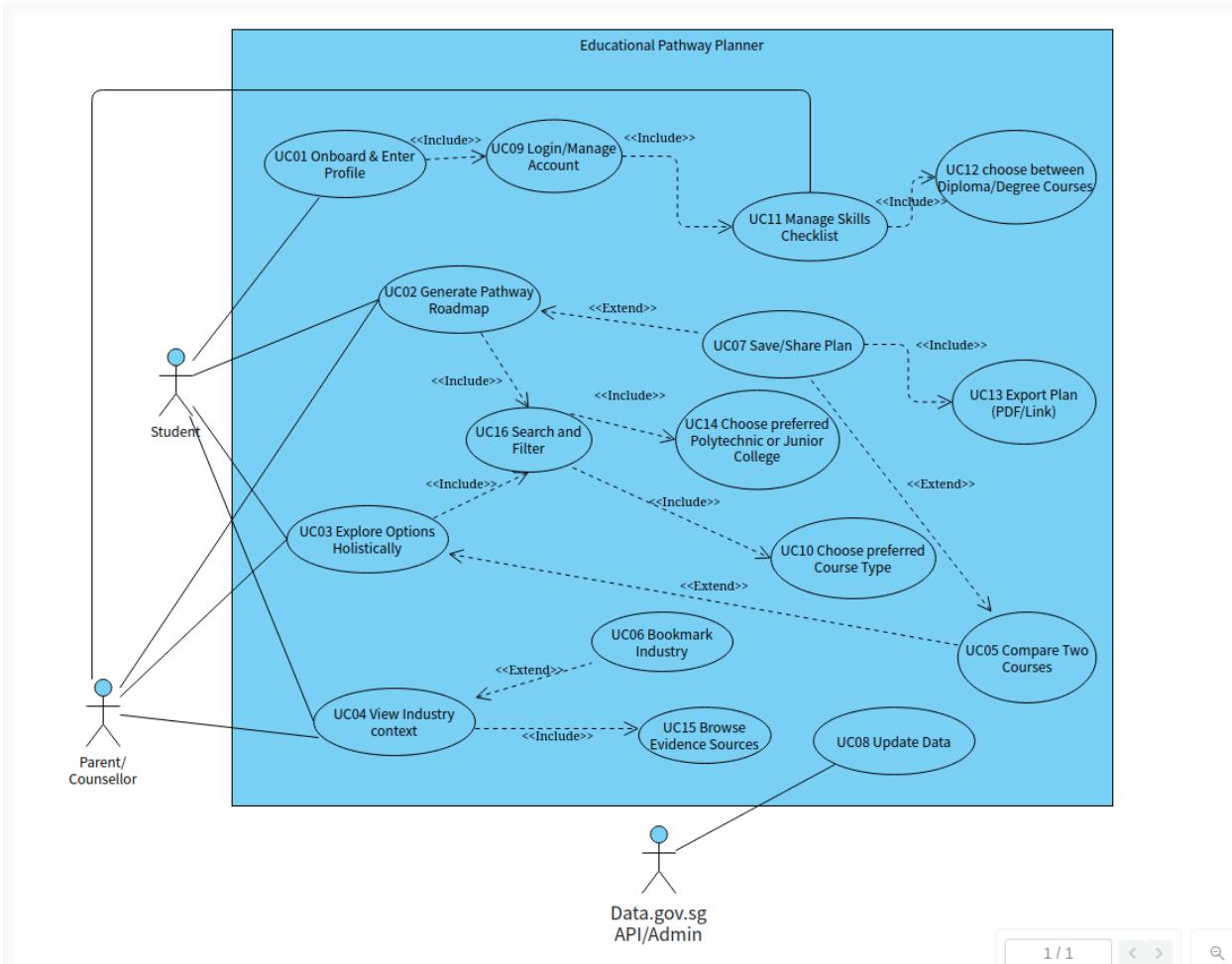
## 4. Data Dictionary

Term	Definition
<b>Student</b>	Primary end-user who inputs interests/subjects/CCAs/skills to explore options and view pathways/roadmaps.
<b>Parent</b>	Supportive end-user who explores options, industry outlook, and compares courses to guide a student's choices.
<b>Counsellor</b>	(If applicable) Power user who helps students interpret pathways and industry context using the system's views.
<b>Student Profile</b>	The information the student provides during onboarding (e.g., interests, subjects, CCAs, strengths, selected skills) used to personalize recommendations and pathways.
<b>Course</b>	A programme of study offered by a post-secondary institution (e.g., Polytechnic diploma, JC stream, University degree) that users can explore and compare.
<b>Diploma / Degree</b>	Post-secondary (diploma) and university (degree) qualifications that appear in pathway options and comparisons.
<b>Pathway</b>	A data-backed sequence of educational milestones (e.g., Secondary → Poly/JC → University → Career Role) generated from datasets and user inputs.
<b>Roadmap</b>	The visual presentation of a chosen pathway (timeline/flow), showing how current selections link to future studies and potential jobs.
<b>Visualizing Future Paths</b>	Feature that displays the connection between current choices and potential academic/career opportunities using public datasets.
<b>Exploring Options Holistically</b>	Feature that shows courses together with skills/experiences and broader opportunities (not only listings).

<b>Providing Context (Industry &amp; Workforce Landscape)</b>	Feature that surfaces industry demand, employment rates, salary benchmarks, growth outlook, and links them to related courses.
<b>Two-Course Comparison (Compare)</b>	View that presents <b>exactly two</b> selected courses side-by-side (admissions/skills/outcomes) to support decision-making.
<b>Skills (Checklist)</b>	A set of competencies the user selects; used to tailor recommendations and pathway generation.
<b>Industry Context</b>	Labour-market indicators (employment rate, median salary, demand growth, skills in demand) used to justify recommendations and flag risks.
<b>Evidence Item / Evidence Panel</b>	Data-backed justification attached to a pathway or comparison (e.g., employment rate, salary benchmark, skills gained), with charts/tables and citations.
<b>Dataset Reference Year (Vintage)</b>	The year the statistic represents (e.g., Graduate Employment Survey 2022); shown with every statistic, with warnings if older than three years.
<b>Saved Plan</b>	A persisted roadmap chosen by the student that can be revisited or shared with stakeholders.
<b>Shareable Link</b>	A read-only URL generated for a Saved Plan to share with others.
<b>Trusted Sources</b>	Official public datasets used by the system (e.g., data.gov.sg, MOM, SkillsFuture) that provide education and labour-market data.
<b>Quantitative Indicator</b>	A numeric metric presented as evidence (e.g., employment rate, median salary).
<b>Qualitative Indicator</b>	A descriptive insight (e.g., dominant skills focus, typical experiences) that complements numeric evidence.

<b>Bookmark</b>	An action that lets users save industries/careers of interest for later review in the context feature.
<b>Warning Badge</b>	UI indicator that alerts users when underlying data is stale (older than three years) or when an industry is flagged as declining/highly competitive.
<b>Dataset Refresh (Daily)</b>	The scheduled retrieval and update of datasets from external sources to keep recommendations current (see UC08).
<b>data.gov.sg API</b>	External service supplying public data; appears as an actor in <b>UC08 Update Data</b> .

## 5. Use case diagram



## 6. Use Case Descriptions

### UC01 – Onboard & Enter Profile

Use Case ID	UC01
Use Case Name	Onboard & Enter Profile
Actors	Student
Preconditions	System online and accessible.
Postconditions	Profile stored and ready for roadmap generation.
Priority	High
Frequency of Use	Each new student user
Flow of Events	<ol style="list-style-type: none"><li>1. Student clicks 'Get Started' on landing page.</li><li>2. System displays onboarding form for interests, subjects, and strengths.</li><li>3. Student enters details and selects skills checklist.</li><li>4. System validates input and saves profile to database.</li></ol>
Alternative Flows	If mandatory fields missing, system prompts for completion.
Exceptions	Network failure logs error and informs user.
Includes	Includes: UC09 Login/Manage Account
Special Requirements	Store profile data securely over HTTPS/TLS 1.2; save operation responds within 2 s for 95 % of requests.
Assumptions	Stable internet connection and valid datasets.
Notes & Issues	None at present.

## UC02 – Generate Pathway Roadmap

Use Case ID	UC02
Use Case Name	Generate Pathway Roadmap
Actors	Student
Preconditions	UC01 completed; datasets refreshed by UC08.
Postconditions	Roadmap displayed with evidence panels.
Priority	High
Frequency of Use	Each time a roadmap is requested
Flow of Events	<ol style="list-style-type: none"> <li>1. Student selects 'Generate Roadmap' on dashboard.</li> <li>2. System retrieves profile and dataset version.</li> <li>3. System applies course type, preferred institution, and study level filters.</li> <li>4. System displays roadmap with summary evidence and metrics.</li> </ol>
Alternative Flows	If no matching pathways, system shows fallback message with suggestions.
Exceptions	API/data fetch failure: system retries and logs error.
Includes	Includes: UC16 Search and Filter
Special Requirements	Render roadmap within 2 s for 95 % of requests; each metric must show source and reference year; secure API calls via HTTPS/TLS 1.2.
Assumptions	Stable internet connection and valid datasets.
Notes & Issues	None at present.

## UC03 – Explore Options Holistically

Use Case ID	UC03
Use Case Name	Explore Options Holistically
Actors	Student, Parent/Counsellor
Preconditions	Datasets updated by UC08.
Postconditions	List of courses and industries displayed.
Priority	High
Frequency of Use	Frequent
Flow of Events	<ol style="list-style-type: none"> <li>1. User selects 'Explore Options' from menu.</li> <li>2. System loads course and industry data.</li> <li>3. User browses cards and applies search/filter (UC16).</li> <li>4. User may open course or industry details or compare courses (UC05).</li> </ol>
Alternative Flows	If no courses match filters, system shows 'No results' and suggests adjustments.
Exceptions	System or API failure logs error and informs user.
Includes	Includes: UC16 Search and Filter
Special Requirements	Filtered results must display within 1 s for 90 % of queries.
Assumptions	Stable internet connection and valid datasets.
Notes & Issues	None at present.

## UC04 – View Industry Context

Use Case ID	UC04
Use Case Name	View Industry Context
Actors	Student, Parent/Counsellor
Preconditions	Access to trusted data sources.
Postconditions	Industry context dashboard displayed.
Priority	High
Frequency of Use	Frequent
Flow of Events	<ol style="list-style-type: none"> <li>1. User selects an industry from roadmap or explore view.</li> <li>2. System retrieves employment rate, salary, and growth metrics from evidence sources.</li> <li>3. System displays dashboard with graphs and key statistics.</li> <li>4. User may bookmark the industry (UC06) or browse evidence sources (UC15).</li> </ol>
Alternative Flows	If dataset reference year >3 years, system displays Warning Badge.
Exceptions	Data fetch failure: system logs and shows error message.
Includes	Includes: UC15 Browse Evidence Sources
Special Requirements	Display data source and reference year with each metric; show Risk Warning if industry flagged as declining.
Assumptions	Stable internet connection and valid datasets.
Notes & Issues	None at present.

## UC05 – Compare Two Courses

Use Case ID	UC05
Use Case Name	Compare Two Courses
Actors	Student, Parent/Counsellor
Preconditions	Two courses selected and datasets updated.
Postconditions	Side-by-side comparison displayed.
Priority	Medium
Frequency of Use	Occasional
Flow of Events	<ol style="list-style-type: none"> <li>1. User selects two courses from Explore Options (UC03).</li> <li>2. System retrieves course details and employment metrics.</li> <li>3. System displays comparison table with evidence.</li> </ol>
Alternative Flows	If user selects more than two courses, system prompts to reduce selection.
Exceptions	Data fetch failure: system logs and shows error message.
Includes	None
Special Requirements	Render comparison within 2 s for 95 % of requests; show data source and reference year for each metric.
Assumptions	Stable internet connection and valid datasets.
Notes & Issues	None at present.

## UC06 – Bookmark Industry

Use Case ID	UC06
Use Case Name	Bookmark Industry
Actors	Student, Parent/Counsellor
Preconditions	UC04 active.
Postconditions	Industry saved to user profile.
Priority	Medium
Frequency of Use	Occasional
Flow of Events	<ol style="list-style-type: none"> <li>1. User clicks the bookmark icon in Industry Context view.</li> <li>2. System saves the industry to the user's bookmarked list.</li> </ol>
Alternative Flows	If user not logged in, system prompts login (UC09).
Exceptions	Database failure logs error and notifies user.
Includes	None
Special Requirements	Bookmark action must persist within 1 s for 95 % of requests.
Assumptions	Stable internet connection and valid datasets.
Notes & Issues	None at present.

## UC07 – Save/Share Plan

Use Case ID	UC07
Use Case Name	Save/Share Plan
Actors	Student
Preconditions	UC02 completed and UC09 login successful.
Postconditions	Plan saved and shareable link generated.
Priority	High
Frequency of Use	Occasional
Flow of Events	<ol style="list-style-type: none"> <li>1. Student clicks 'Save Plan' after roadmap generation.</li> <li>2. System saves roadmap as a Saved Plan.</li> <li>3. Student selects 'Share' to generate a read-only link or export (UC13).</li> <li>4. System returns link or exported file.</li> </ol>
Alternative Flows	If network fails during save, system retries and informs user.
Exceptions	System outage logged and user notified.
Includes	Includes: UC13 Export Plan (PDF/Link)
Special Requirements	Generate shareable link or export within 2 s for 95 % of requests; all links must be HTTPS/TLS 1.2.
Assumptions	Stable internet connection and valid datasets.
Notes & Issues	None at present.

## UC08 – Update Data

Use Case ID	UC08
Use Case Name	Update Data
Actors	Data.gov.sg API/Admin
Preconditions	Admin authenticated and network available.
Postconditions	Datasets refreshed and version logged.
Priority	High
Frequency of Use	Daily
Flow of Events	<ol style="list-style-type: none"><li>1. Admin schedules or triggers data refresh.</li><li>2. System requests latest datasets from external APIs.</li><li>3. System validates, stores, and records reference year and version.</li></ol>
Alternative Flows	If API unavailable, system retries up to three times and logs failure.
Exceptions	Permanent external API failure triggers admin alert.
Includes	None
Special Requirements	Daily dataset refresh must complete within 5 min; all transmissions over HTTPS/TLS 1.2; refresh logs stored for audit.
Assumptions	Stable internet connection and valid datasets.
Notes & Issues	None at present.

## UC09 – Login/Manage Account

Use Case ID	UC09
Use Case Name	Login/Manage Account
Actors	Student, Admin
Preconditions	User registered and system online.
Postconditions	User session established.
Priority	High
Frequency of Use	Each login
Flow of Events	<ol style="list-style-type: none"> <li>1. User clicks 'Login' button.</li> <li>2. System prompts for email and password.</li> <li>3. User enters credentials.</li> <li>4. System authenticates and establishes a session.</li> </ol>
Alternative Flows	If credentials invalid, system prompts retry.
Exceptions	System outage logs error and shows maintenance message.
Includes	Includes: UC11 Manage Skills Checklist
Special Requirements	All transmissions over HTTPS/TLS 1.2; passwords hashed using bcrypt or Argon2.
Assumptions	Stable internet connection and valid datasets.
Notes & Issues	None at present.

## UC10 – Choose Preferred Course Type

Use Case ID	UC10
Use Case Name	Choose Preferred Course Type
Actors	Student
Preconditions	Course dataset loaded.
Postconditions	Course type stored in user profile and applied to filters.
Priority	Medium
Frequency of Use	Occasional
Flow of Events	<ol style="list-style-type: none"> <li>1. Student opens Course Type selection from settings or roadmap filters.</li> <li>2. Student selects preferred type (e.g., Science, Arts, Engineering).</li> <li>3. System stores preference and updates roadmap filters.</li> </ol>
Alternative Flows	If no course type selected, default remains 'Any'.
Exceptions	Database failure logs error and informs user.
Includes	None
Special Requirements	Selection must persist immediately; used by UC02 and UC16 for filtering.
Assumptions	Stable internet connection and valid datasets.
Notes & Issues	None at present.

## UC11 – Manage Skills Checklist

Use Case ID	UC11
Use Case Name	Manage Skills Checklist
Actors	Student
Preconditions	Onboarding or profile edit in progress.
Postconditions	Selected skills stored for use in recommendations.
Priority	Medium
Frequency of Use	Occasional
Flow of Events	<ol style="list-style-type: none"> <li>1. Student opens Skills Checklist during onboarding or from profile settings.</li> <li>2. System displays list of skills.</li> <li>3. Student selects or updates skill choices.</li> <li>4. System saves updated skills.</li> </ol>
Alternative Flows	If network error occurs, system retries and informs user.
Exceptions	Database write failure logged with alert.
Includes	Includes: UC12 Choose between Diploma/Degree Courses
Special Requirements	Skill selections must persist within 2 s and update roadmap filters instantly.
Assumptions	Stable internet connection and valid datasets.
Notes & Issues	None at present.

## UC12 – Choose between Diploma/Degree Courses

Use Case ID	UC12
Use Case Name	Choose between Diploma/Degree Courses
Actors	Student
Preconditions	UC11 active or profile editing in progress.
Postconditions	Study level preference stored for recommendations.
Priority	Medium
Frequency of Use	Occasional
Flow of Events	<ol style="list-style-type: none"> <li>1. Student chooses either 'Diploma' or 'Degree' option from the Skills Checklist or profile settings.</li> <li>2. System records choice and updates filters for roadmap generation.</li> </ol>
Alternative Flows	If no choice made, default is 'No preference'.
Exceptions	Database failure logs error and prompts retry.
Includes	None
Special Requirements	Selection must persist within 1 s and be applied to UC02 and UC16 searches.
Assumptions	Stable internet connection and valid datasets.
Notes & Issues	None at present.

## UC13 – Export Plan (PDF/Link)

Use Case ID	UC13
Use Case Name	Export Plan (PDF/Link)
Actors	Student
Preconditions	UC07 completed and plan saved.
Postconditions	PDF file or shareable link generated.
Priority	Medium
Frequency of Use	Occasional
Flow of Events	<ol style="list-style-type: none"> <li>1. Student selects 'Export Plan' from Saved Plan screen.</li> <li>2. System generates PDF with roadmap and evidence snapshot or creates a secure shareable link.</li> <li>3. System provides download link or copies shareable link to clipboard.</li> </ol>
Alternative Flows	If PDF generation fails, system shows error and allows retry.
Exceptions	Network or file-write failure logged and user notified.
Includes	None
Special Requirements	Generate PDF or link within 2 s for 95 % of requests; link must be HTTPS/TLS 1.2.
Assumptions	Stable internet connection and valid datasets.
Notes & Issues	None at present.

## UC14 – Choose preferred Polytechnic or Junior College

Use Case ID	UC14
Use Case Name	Choose preferred Polytechnic or Junior College
Actors	Student
Preconditions	UC02 active or user editing preferences.
Postconditions	Preferred institution stored for filtering roadmap results.
Priority	Medium
Frequency of Use	Occasional
Flow of Events	<ol style="list-style-type: none"> <li>1. Student opens Institution Preference from settings or roadmap filters.</li> <li>2. Student selects one or more preferred polytechnics or junior colleges.</li> <li>3. System stores selection and applies it to roadmap generation and search.</li> </ol>
Alternative Flows	If no institution selected, default is 'Any'.
Exceptions	Database failure logs error and prompts retry.
Includes	None
Special Requirements	Selection must persist within 1 s and be applied to UC02 and UC16 searches.
Assumptions	Stable internet connection and valid datasets.
Notes & Issues	None at present.

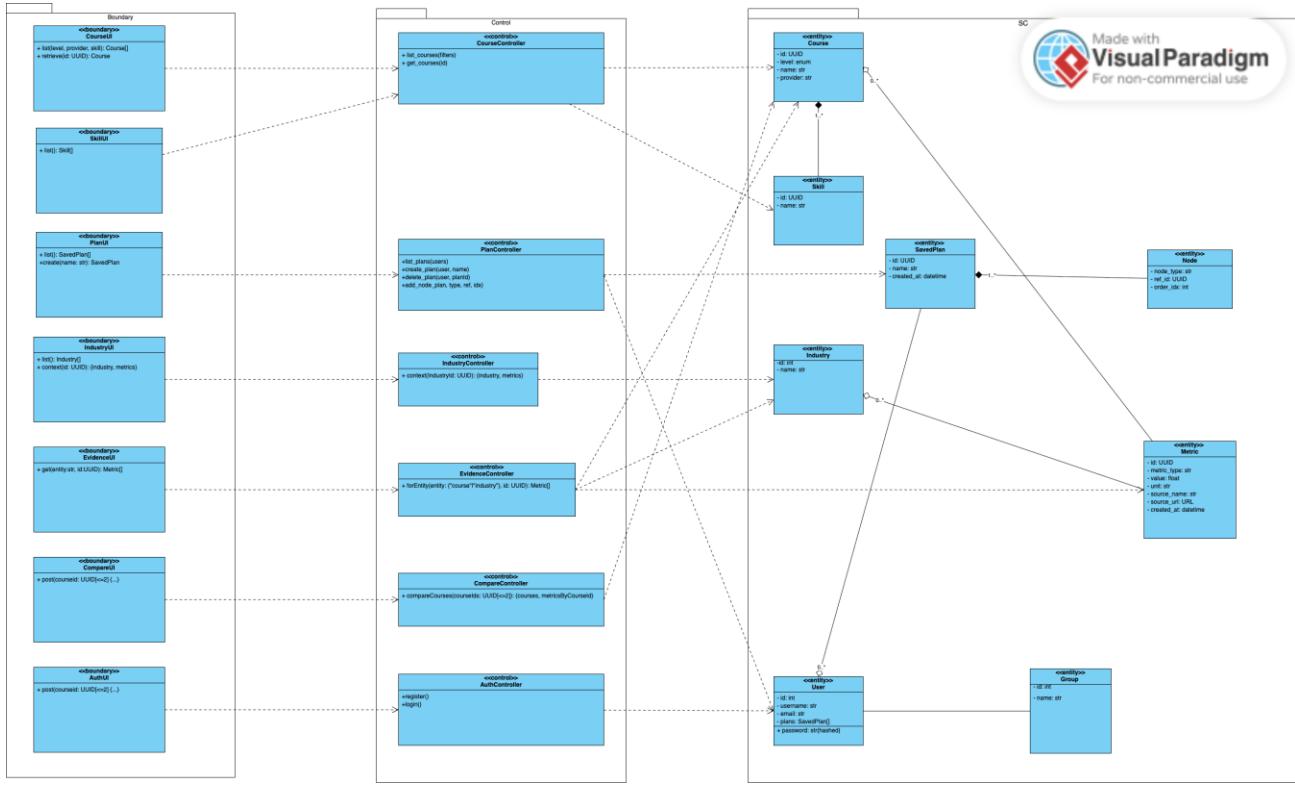
## UC15 – Browse Evidence Sources

Use Case ID	UC15
Use Case Name	Browse Evidence Sources
Actors	Student, Parent/Counsellor
Preconditions	Evidence available for selected course or industry.
Postconditions	Evidence panel displayed with citations and links.
Priority	Medium
Frequency of Use	Occasional
Flow of Events	<ol style="list-style-type: none"> <li>1. User clicks 'View Evidence' from an industry or course context screen.</li> <li>2. System retrieves list of supporting datasets and publications with reference year.</li> <li>3. System displays citations and links for each metric.</li> </ol>
Alternative Flows	If dataset missing, system shows 'No evidence available'.
Exceptions	External link failure logged but does not block display.
Includes	None
Special Requirements	Each evidence source must display dataset name, provider, and reference year.
Assumptions	Stable internet connection and valid datasets.
Notes & Issues	None at present.

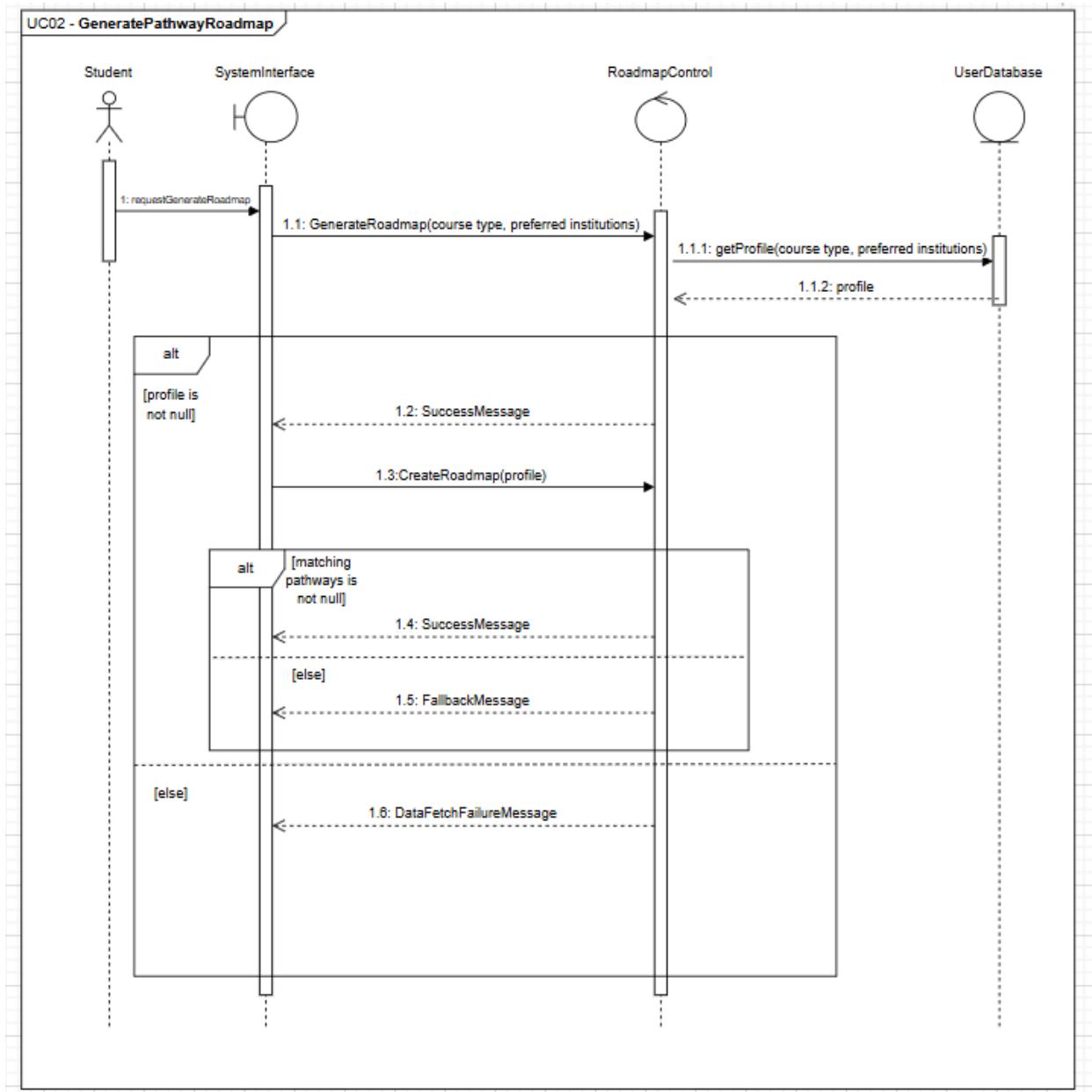
## UC16 – Search and Filter

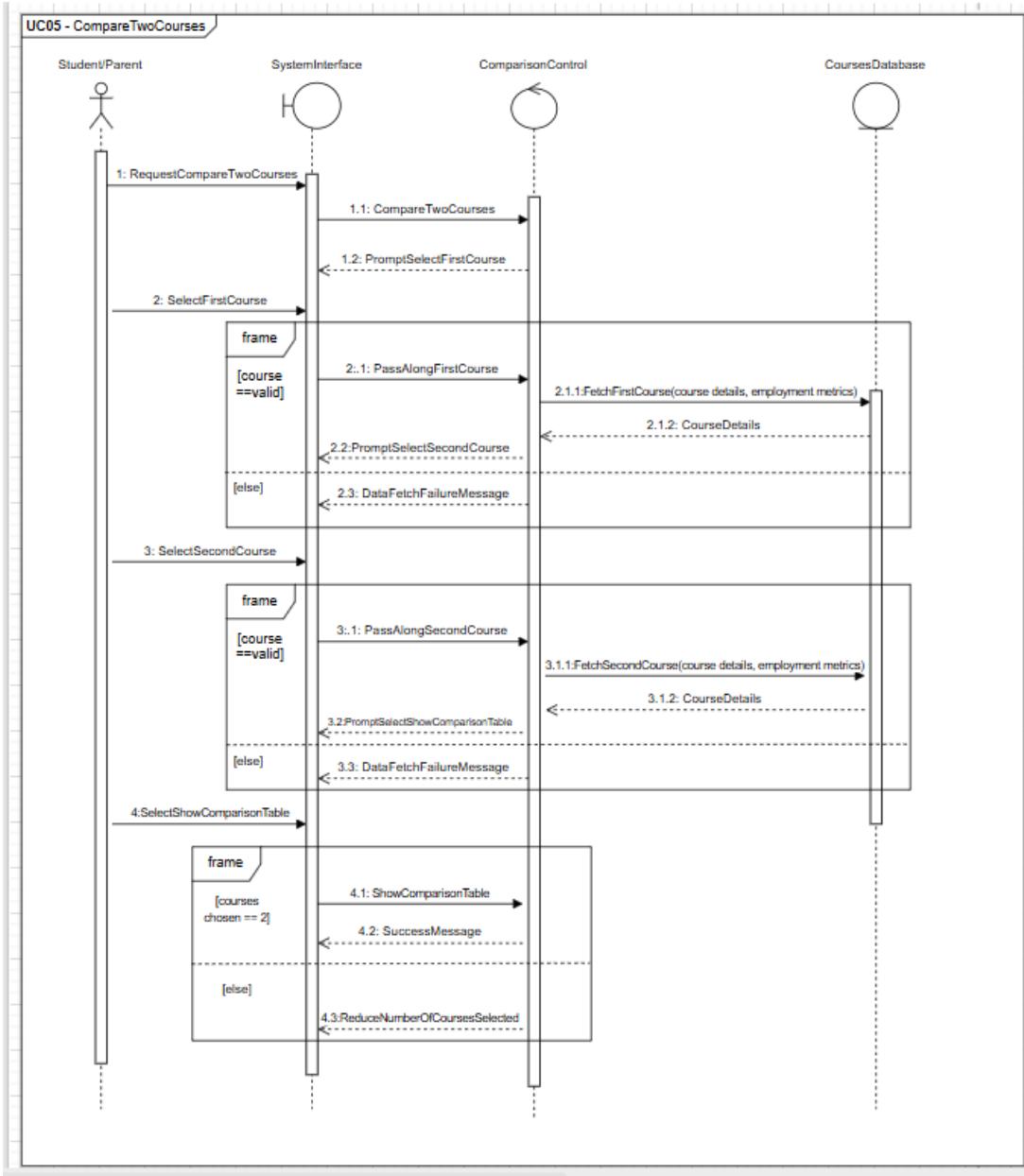
Use Case ID	UC16
Use Case Name	Search and Filter
Actors	Student
Preconditions	Course dataset loaded.
Postconditions	Filtered course list returned.
Priority	High
Frequency of Use	Frequent
Flow of Events	<ol style="list-style-type: none"> <li>1. User enters keywords or adjusts filters (course type, institution, study level, skill match, salary threshold).</li> <li>2. System queries dataset using the entered criteria.</li> <li>3. System displays filtered results instantly and updates as filters change.</li> </ol>
Alternative Flows	If no results, system displays 'No matches found' and suggests clearing filters.
Exceptions	Database or API failure logs error and shows fallback message.
Includes	Includes: UC10 Choose Preferred Course Type and UC14 Choose Preferred Polytechnic or Junior College
Special Requirements	Filtered results must return within 1 s for 90 % of queries.
Assumptions	Stable internet connection and valid datasets.
Notes & Issues	None at present.

## 7. Class Diagram



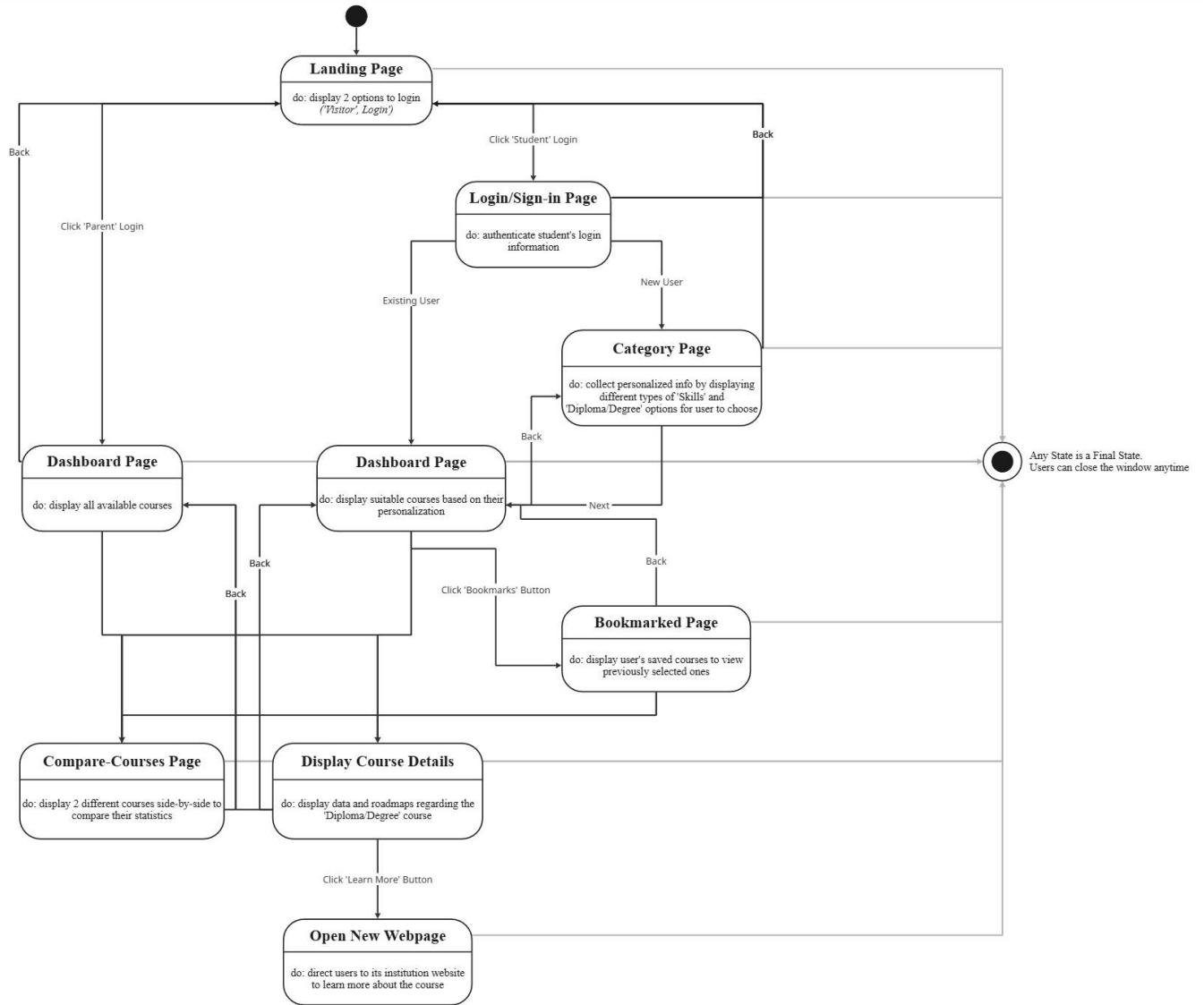
## 8. Sequence Diagrams



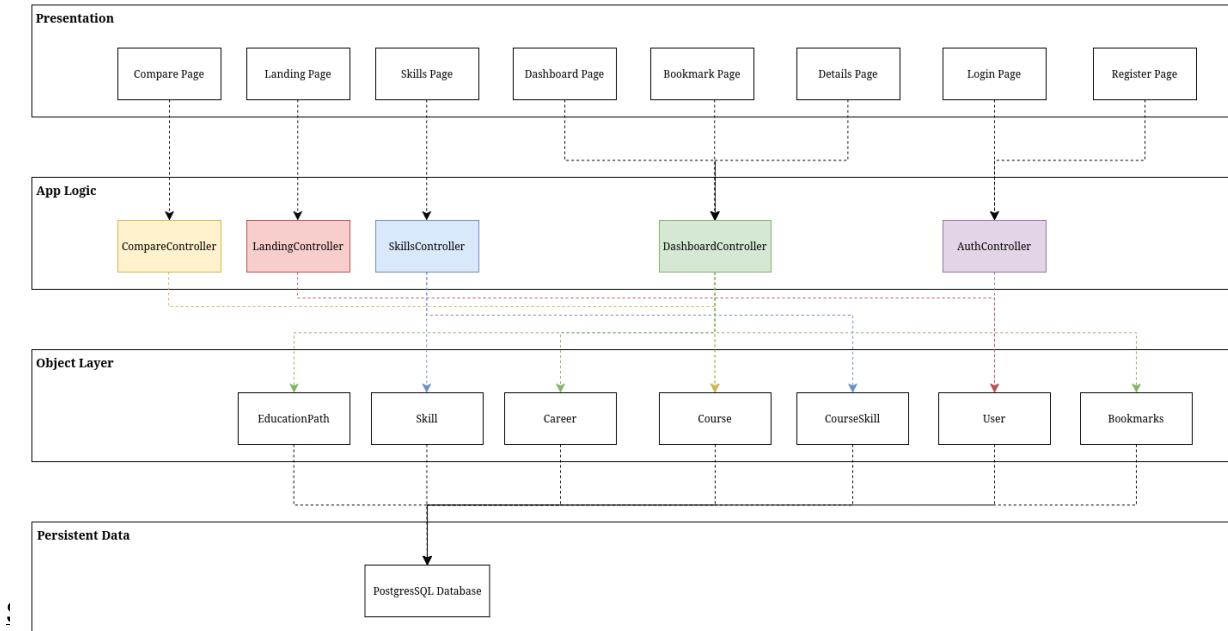




## 9. Dialogue Map



# 10. System Architecture



The system architecture is designed using a four-layered architecture: Presentation, Application Logic, Object and Persistent Data Layers.

This layered approach ensures clear separation of concerns between user interface, business logic, data modeling and database storage, which improves maintainability, scalability.

## Presentation Layer

The presentation layer is responsible for interaction between the user and system. It consists of various react pages that form the interface of the application. Each page communicates with the corresponding controller in the Application Layer to retrieve or send data via REST APIs.

### **1. Compare Page**

Displays comparative statistics such as indicative grade profile (IGP), employment rate, and salary across different courses.

It utilizes the services of CompareController.

### **2. Landing Page**

Serves as the entry point to the website, presenting featured skills, popular courses and navigation options.

It interacts with LandingController to fetch and display data summaries.

### **3. Skills Page**

Allows users to select or search for their current skills and view courses or careers that match those skills.

It connects to SkillsController

#### **4. Dashboard Page**

Acts as the personalized home page after logging in, showing user information, saved courses and recommendations.

It interacts with DashboardController

#### **5. Bookmark Page**

Displays the list of courses or careers bookmarked by the user.

It communicates with DashboardController and indirectly with Bookmarks entities.

#### **6. Details Page**

Shows in-depth information about a specific course or career, including required skills and job prospects.

It retrieves detailed data from Course and Career entities through DashboardController

#### **7. Login / Register Page**

Enables user authentication and account creation.

Both pages rely on AuthController to handle user login, registration and token management.

### Application Logic Layer

This layer contains all controllers, which implements business logic and serve as the intermediary between the presentation and data objects.

This Layer consists of:

#### **1. CompareController**

Handles course comparison Logic

#### **2. LandingController**

Retrieves data for featured skills and courses

#### **3. SkillsController**

Matches selected skills to related courses and careers

#### **4. DashboardController**

Manages user dashboards, bookmarks and personalized data.

#### **5. AuthController**

Manages user authentication and token validation

### Object Layer

This layer defines core entities representing system data, managed by Django ORM.

**1. EducationPath**

Represents academic routes that offer different courses.

**2. Skill**

Represents individual skill sourced from SkillsFuture

**3. Career**

Represents career roles associated with skills and courses

**4. Course**

Represents courses with their institution

**5. CourseSkill**

Defines the many-to-many relationship between course and skill, identifying which skills are developed in each course

**6. User**

Stores user information such as username, password (hashed), preferences and bookmarks.

**7. Bookmarks**

Represents courses or careers that users have saved.

**Persistent Data Layer**

This layer consists of the PostgreSQL database, which stores all persistent data.

# 11. Application Skeleton

*Please refer to the source code in the GitHub repository for the complete implementation of the application skeleton.*

## 1. Frontend

The frontend (built using React.js) mainly consists of multiple pages that allows users to interact with the system.

Each page corresponds to a functional area in the application such as Login, Registration, Dashboard, Skills, and Comparison.

The frontend structure is organised under src/ directory as follows:

- Pages: Contains main UI screens
- Components: Reusable UI elements
- CSS files: Each page has an accompanying stylesheet
- App.jsx: Main entry point that defines routing between pages

This modular structure improves readability, reusability and maintainability, allowing developers to work independently on different sections of the UI.

## 2. Backend

The backend is implemented using Django and Django REST Framework (DRF). It follows a modular architecture, with clear separation between core business logic, API endpoints and data management.

The backend consists of two main Django apps: skillsbridge\_core and api

### 1. skillsbridge\_core

This module handles the core application logic and data models

- models.py: Defines main data entities and their relationships.
- services.py: Contains the controllers
- loaders.py: Handles data ingestion
- utils/: includes supporting utilities
- management/: contains scripts for administrative tasks

### 2. api

This module provides the REST API interface between frontend and backend

- views.py: Implements main API endpoints
- auth\_views.py: handles user auth, registration and token management
- serializers.py: Defines data serializers to convert Django model data into JSON for API responses

- `urls.py`: Routes all API endpoints
  - `tests.py`: Contains unit and integration tests for API endpoints
3. Database

The backend connects to a PostgreSQL database, which stores all persistent entities.

This connection is configured in `settings.py`, and data models are managed via Django ORM migrations.

# Appendix

## Design Patterns used

1. MVC Pattern: Used for our entire application
2. Facade Pattern: Simplified API endpoints for frontend
3. Strategy Pattern: Used to dynamically choose algorithm for course ranking
4. Observer Pattern: Skill and course updates from external API
5. Factory Pattern: Serialize Django objects to JSON
6. Singleton: Database configuration & service

## Tech Stack

1. Frontend: React.js
2. Backend: Django
3. Database: PostgreSQL