Enhancing Science Gateways: Improving Access to HPC-ED Training Resources

SGX3 award # 2231406

Addressed Problem

Many institutions struggle to effectively interact with their training resources. Currently, HPC-ED relies on a command-line interface (CLI) for adding and querying training materials in its database. This approach is neither user-friendly nor intuitive and many potential users lack the necessary CLI skills. Consequently, they are unable to access and benefit from the institution's training resources.

Moreover, when seeking information, most people turn to Google, which often yields an overwhelming number of results. This makes it difficult to discern the quality and relevance of sources, leading to inefficiencies and potential misinformation.

Goals

1. **User-Friendly Interface**

   Develop a web-based platform that simplifies the addition and querying of training materials without requiring CLI knowledge.

2. **Database Integration**

   Connect to a database on HPC-ED to store, retrieve, update, and delete training resources (CRUD)

3. **Downloadable Resources**

   Implement functionality for users to download training materials in JSON format for offline access or further processing.

4. **Search Capabilities**

   Incorporate search algorithms to ensure relevant and high-quality search results, minimizing the need to sift through numerous irrelevant entries.

5. **User Authentication/Permissions**

   Set up a user authentication system to manage access levels, ensuring that only authorized users can add and modify resources.
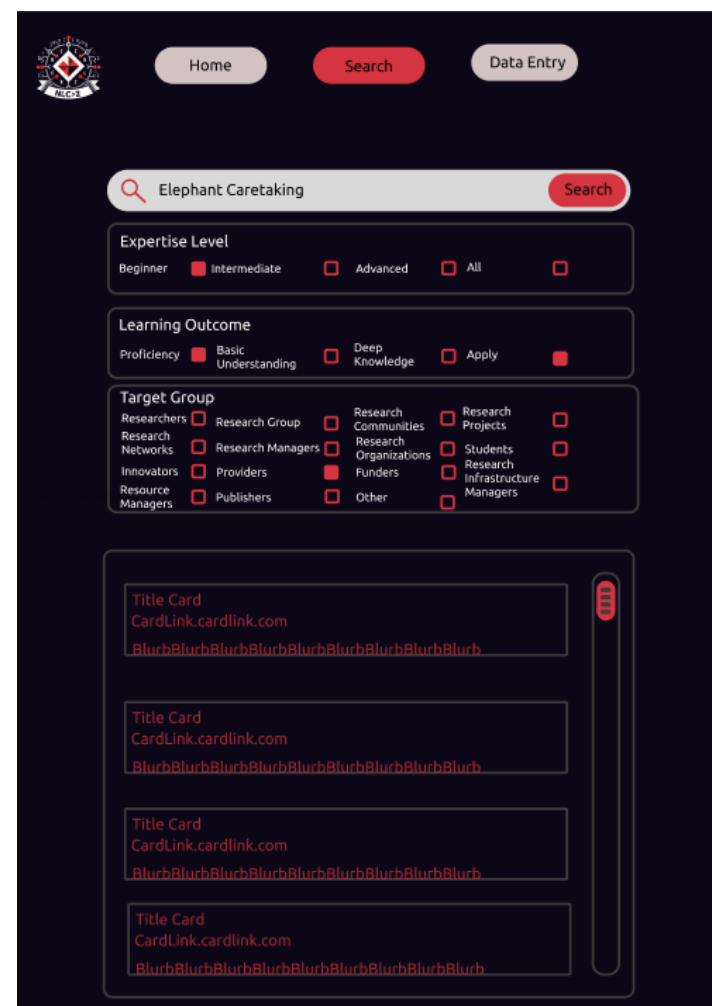
Target Science Gateway

Our Targeted Science Gateway is the HPC-ED Gateway. HPC-ED (High-Performance Computing - Education) is a project to create and share metadata for HPC educational materials, making it easier to discover, access, and publish these resources through a federated catalog system.

HPC ED
HPC-ED.GITHUB.IO

Resource Needs

1. **Web development tools:** Front-end (HTML, CSS), Back-end Python(Django), Globus Search API
2. **Authentication Providers:** Globus, Google OAuth
3. **Hosting/Deployment:** GitHub, Docker
4. **User Interface:** Figma
5. **Collaboration Tools:** Slack, Zoom, Canva
6. **Documentation Platforms:** GitHub
7. **Team:** Frontend/Backend developers, UI/UX designers, documentation creators

Use Cases

Scenario 1: A graduate student new to HPC needs introductory resources to get started on her thesis project. She uses her university credentials via Globus Authentication to search for resources by inserting a text search.

Scenario 2: An institutional librarian wants to organize and make a collection of training resources available on HPC for students and faculty. She uses the platform to upload new training materials, categorize them using the tagging system to ensure they are searchable by relevant keywords.

Scenario 3: An IT staff Training Manager needs to provide his team with up-to-date resources on the latest HPC technologies. He uses the platform to find beginner and advanced training materials.
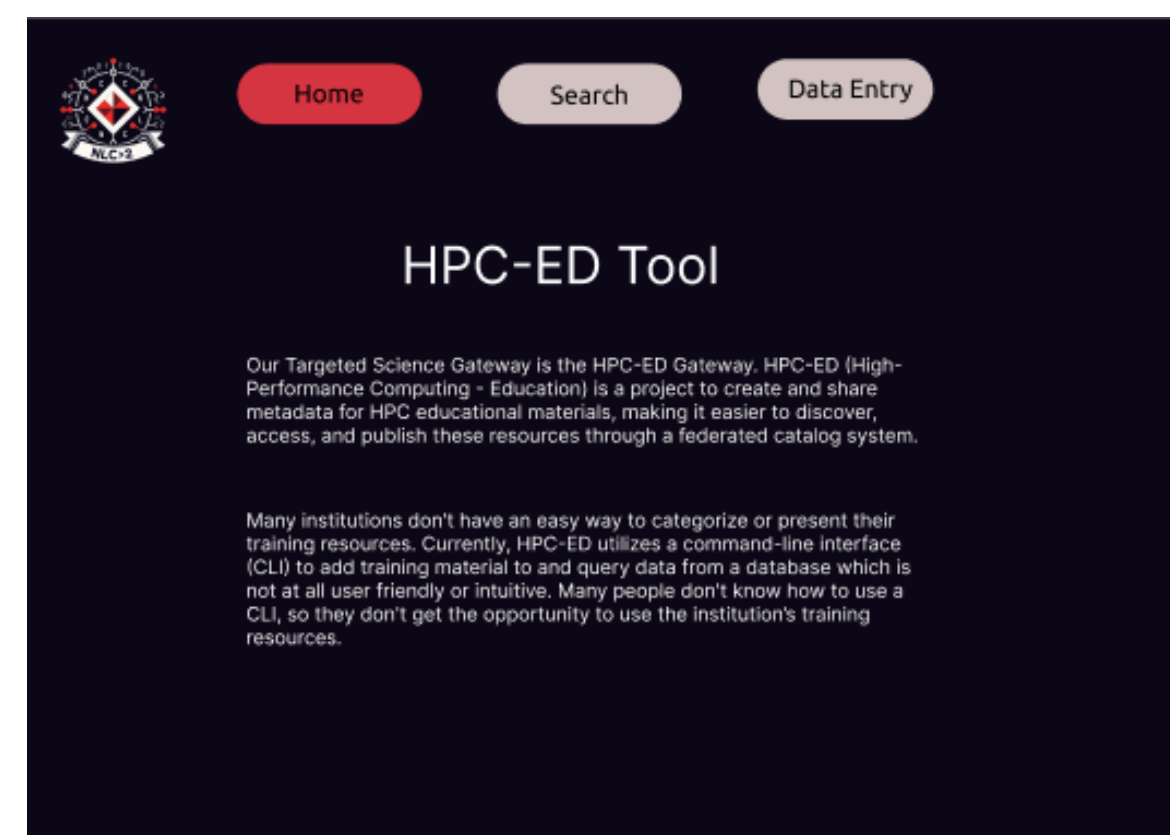
Methodology

Planning and Requirements Gathering
All team members participated in defining project goals and gathering user requirements. The team created a detailed project timeline and established key milestones.

Design Phase
The design team created wireframes based on user requirements, focusing on ensuring a user-friendly experience.

Front-End Development
Front-end developers converted the wireframes into HTML and CSS, implementing interactive elements and ensuring intuitive navigation. They also integrated the front-end with back-end services using APIs.

Back-End Development
The back-end team set up the server environment using Python and Django. They implemented APIs for CRUD operations (Create, Read, Update, Delete) and implemented user authentication and authorization using Globus.

Integration and Testing
The team integrated the front-end with back-end APIs. They performed comprehensive integration testing and conducted usability testing with a group of potential users, identifying and fixing bugs and performance issues.

Deployment
The project is not deployed anywhere, only stored in GitHub. Future plans include containerizing the application with Docker and adding it to the public repository of Docker images.
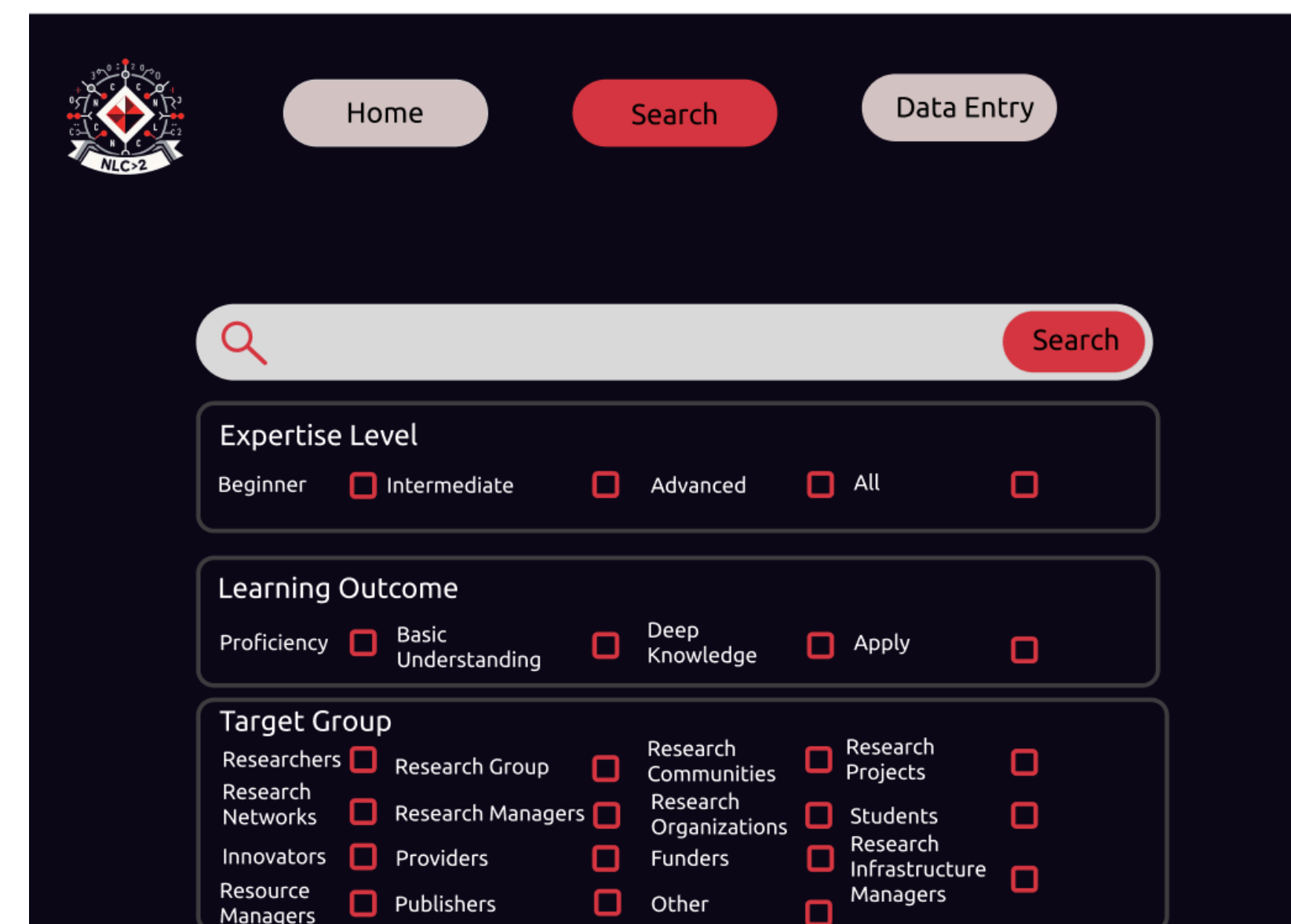
Possible Expansions

Given more time, there are several ideas and expansions we had in mind to further enhance this project. These include:

1. **Improved Search Capabilities:**
   Generate unique lists of filters based on the metadata in database entries, allowing users to refine their searches more effectively.
2. **Enhanced Authentication:**
   While authentication through Globus has been implemented, adding Google authentication would provide an additional layer of security, making the platform more secure and versatile for users.
3. **AI-Powered Resource Suggestions:**
   Integrate AI to provide resource suggestions based on user data and behavior. This would assist users in finding relevant training materials more efficiently, tailoring recommendations to their specific needs and interests.
4. **Responsive Design:**
   Ensure the platform is fully responsive and accessible on various devices, including desktops, tablets, and smartphones. This will cater to a wider range of users, providing a seamless experience regardless of the device being used.
5. **Community and Collaboration Features:**
   Add features such as discussion forums, resource sharing, and collaborative workspaces to foster a community of practice among users. These features will encourage collaboration, knowledge sharing, and peer support, enhancing the overall user experience.

By implementing these expansions, the platform can significantly improve the accessibility, usability, and effectiveness of training resources.
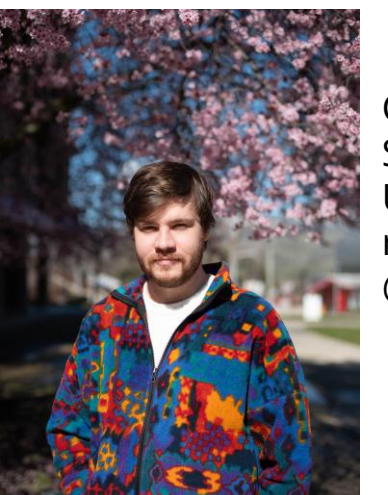
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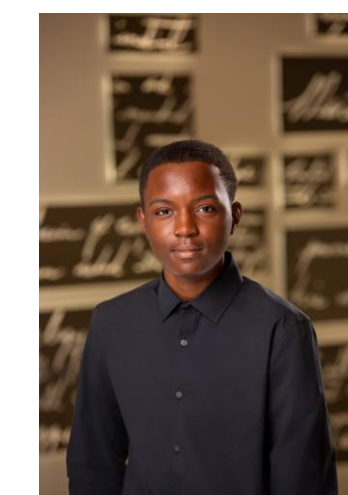
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