CS 510 Project Proposal (Development Track) : Browser Plugin for Web-based Summarization and Contextual Retrieval

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1. Functions and Users

- Software Tool Description - A browser extension for Chrome that analyzes the user's current webpage (e.g., a news story, sports article) and automatically fetches relevant supporting information, definitions, or alternative perspectives from a curated index or open web.

- Major Functions:
    - Automated Content Extraction: Scrapes or summarizes the main content of the currently open webpage.
    - Relevant Information Retrieval: Generates queries from extracted content and fetches relevant snippets, articles, or references.
    - Sidebar/Overlay Display: Presents search results in a side-panel overlay without forcing the user to leave the current page.

- Potential Future Functions:
    - User Feedback Loop: Allows users to "like" or "dismiss" a retrieved snippet, refining future retrieval results.
    - TTS Functionality: Implementing text-to-speech functionality for low vision users to improve accessibility and enhance user experience.

- Users - Researchers, students, journalists, knowledge workers, or casual readers who frequently read web-based content and want instant context or references. In today's digital age, where everyone wants quick information and attention spans are shrinking, this tool helps people rapidly grasp new topics and stay focused without opening multiple tabs.

2. Significance

- Pain Point - Currently, users must manually switch tabs or open new windows to search for context (definitions, references, related articles). This disrupts their reading flow and may lead to missing key information or alternative viewpoints.
- How This Addresses the Problem - By proactively delivering related context right within the page, the browser plugin reduces cognitive load and saves time, improving reading efficiency and ensuring users have a more holistic understanding of the content.
- Societal/Practical Impact - Encourages more informed reading, helps prevent misinformation, and supports a "one-stop" reading experience. This tool can be especially beneficial for users, who often read multiple sources and need quick cross-references.

3. Approach

- Browser Extension: Implement an extension that runs a content script to capture page text.
- Back-End IR Service: Build or integrate an IR pipeline to process extracted text, generate queries, and retrieve relevant documents.
- Automatic Query Generation: Extract keywords/phrases from the web page to form dynamic search queries.

- Content Summarization: Summarizing the content on the web page using Text summarization techniques / tools such as LLM agents, and integrating that into the backend IR service.
- Technologies - Browser Extension (JavaScript/TypeScript, Manifest V3 (Chrome)), IR Pipeline (Python (Flask/FastAPI), LLM agents), Front-End UI (HTML/CSS/JS).

4. Evaluation

- Usefulness - Survey feedback: Ask users if the retrieved context was relevant, helpful, or if it improved their reading experience.
- Correctness - Use known benchmarks or a test corpus (e.g., a set of sample articles and relevant references), or creating our own datasets for a gold standard of test corpus.

5. Timeline

- April 15th - Tech stack setup and a couple basic implementations of features
- April 30th - Most features completed with some identified bugs
- May 5th - Working code completion, testing phase
- May 10th - Project Report completion, submission
- May 13th - Demo

6. Task Division

- Anurag Choudhary: Back-end IR engine setup and integration.
- Hammad Ali: Browser extension development
- Manu Ravichandrakumar: Text summarization , LLM agent integration
- Sahil Bhende: Content keyword extraction, NLP-based query generation.