



Bern University  
of Applied Sciences



# URL-Archiver

Project report

Course of study

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Project 1

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- Technik und Informatik
- Informatik

# Abstract

One-paragraph summary of the entire study – typically no more than 250 words in length (and in many cases it is well shorter than that), the Abstract provides an overview of the study.

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# Listings

# 1. Introduction

## 1.1. Initial Situation

The Internet is constantly evolving, which means that there is no guarantee that a website as it exists today will still exist in a few years' time, let alone contain the same information. While this might not be a concern that the average Internet user has to grapple with, it poses a challenge to the academic demographic, where it becomes crucial to reference sources and potentially integrate links to additional data. If links become inactive, verifying the sources becomes challenging, if not impracticable.

Archiving the existing status of a website is achievable, but it currently necessitates a manual and hence time-intensive operation, which not many people take the time to do. The objective of this project is to devise an automated solution to this predicament that is independent of platforms.

The stakeholders for this solution include:

- ▶ Legal professionals and researchers who need to preserve web content as evidence or for case study references.
- ▶ Journalists and media agencies that require archiving web pages for future reporting or fact-checking.
- ▶ Librarians and archivists tasked with the digital preservation of online materials for historical records.
- ▶ Content creators and marketers who wish to maintain records of web content for portfolio or audit purposes.
- ▶ Educators and students who need to collect and cite online resources for academic projects and research.
- ▶ Organizations and businesses that need to archive their web presence for compliance and record-keeping.

## 1.2. Product Goal

The product goal is a platform independent Java application called "URL-Archiver". The application must be Free/Libre and Open Source Software (FLOSS) licensed and fulfil the



following functionalities:

1. The software should be CLI<sup>1</sup>-based and offer a clear command line.
2. The software should allow the user to input a path, which can be a folder or any Unicode text file.
3. The software examines the contents of a file or folder to extract any web URLs using a standard regular expression or similar method.
4. If desired, URLs can be automatically opened in a web browser.
5. The extracted URLs are archived on archive.today and/or web.archive.org (known as The Wayback Machine) as per the user's preference.
6. The software outputs the resulting archive URLs to the user.
7. The software generates a CSV file containing the original URL and the archived Version of the URL.
8. Optionally, the archived Versions are written back into the provided .bib file.

The product goal is achieved if the software covers all the functionality listed above. Furthermore, the code should be minimalistic, modular, and self-explaining. In addition to the code, it is essential that the following documents are provided:

- ▶ User manual
- ▶ Installation instructions (including installation script)
- ▶ Software documentation

### 1.3. Priorities

The following priorities are listed in order of importance:

1. **Functionality:** The primary priority is the accurate extraction and archiving of URLs. The software should reliably identify URLs in varied file types and ensure their successful archiving on <https://archive.ph> or Wayback Machine.
2. **Usability:** Given the diverse potential user base, the program should be platform-independent and possess a user-friendly interface. While the underlying mechanisms may be complex, the user experience should be seamless and intuitive.
3. **Code Quality:** Emphasis should be placed on writing clean, minimal, and modular code. This not only aids in potential future enhancements but also in debugging and troubleshooting.

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<sup>1</sup>Command Line Interface

4. **Documentation:** As with any software project, proper documentation is paramount. The project report should be concise, adhering to the principle of being “maximally informative, minimally long,” ensuring clarity of information without overwhelming the reader.
5. **Integration with Existing File Types:** The ability to seamlessly insert archived URLs into .BIB files is a priority, given the potential academic applications of the software.

## 2. Specification

### 2.1. System Delimitation

#### 2.1.1. System Environment (statics)

##### System Overview

The primary purpose of the URL-Archiver is to extract URLs from Unicode text files and PDFs, and archive them on supported platforms: Archive.today and the Wayback Machine. The system provides the archived URL versions to the user via a CSV file. Additionally, when a .bib file is provided by the user, the original bib file is updated with a note field containing these archived URLs for each entry.

##### Hardware Specifications

The URL-Archiver does not impose any special hardware requirements. However, an internet connection is essential for the archiving process to function.

##### Software Components

The URL-Archiver is platform-independent, operating on major systems such as Windows (tested on Windows 10, version 22H2 and Windows 11, version 23H2), macOS (tested on macOS Sonoma), and Linux (tested on Ubuntu 20.04.3 LTS). The system has varying browser dependencies based on the operating system: Chrome is required for macOS, Edge for Windows, and Firefox for Ubuntu/Linux (Latest stable versions of the browsers are recommended). Users can change the default Browser in the configuration of the application. Other dependencies are installed with the URL-Archiver and do not require separate installation.

##### System Architecture

The URL-Archiver uses the Model-View-Controller (MVC) pattern, as illustrated in figure 2.1, to enable future enhancements, such as adding a GUI interface. The Factory pattern is applied where appropriate to simplify the extension of functionalities. For instance, adding extra archiving services can be easily accomplished by introducing a new archiving service, as shown in figure 2.2.

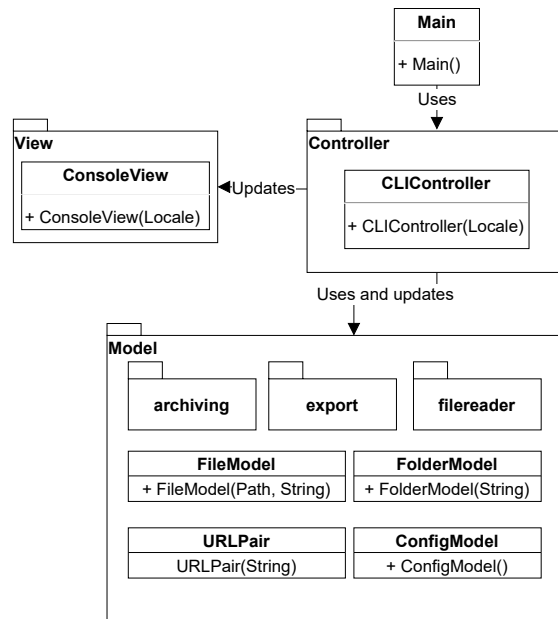


Figure 2.1.: High-level MVC-Pattern from URL-Archiver

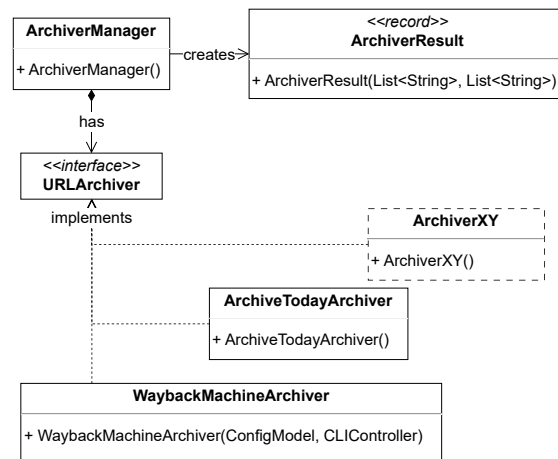


Figure 2.2.: Extension with new archiving service XY (using the factory pattern)

### Data Management

Upon completion of its execution, the URL-Archiver generates a CSV file where each line contains an extracted URL and its archived versions, separated by semicolons. For example, a line like `https://xy.com;https://web.archive.org/xy;https://archive.ph/xy` shows the original URL and its archives. This simple format makes it easy to track and manage archived URLs.

Optionally, URLs are integrated into the note field of each entry. If there's no existing note field, a new one is created with the format `note = Archived Versions: url1, url2`. If a note field already exists, the archived URLs are appended to it in the format `note = <current note>, Archived Versions: url1, url2`. This approach ensures that the archived URLs are neatly added to the Bibtex entries, maintaining the integrity of the original data.

### User Interface

Currently, the system uses a command-line interface. The MVC pattern lays the groundwork for potential future implementation of a GUI interface.

### Integration with Other Systems

The system integrates with the Wayback Machine via API, with certain limitations detailed in their API documentation (<https://archive.org/details/spn-2-public-api-page-docs/mode/2up>). For archiving on Archive.today, which lacks an API, Selenium is used to automate the process as much as possible. However, users must manually complete captchas.

### Maintenance and Support

Currently, there are no specified maintenance requirements or a support framework for the URL-Archiver.

#### 2.1.2. Process Environment (dynamics)

#### 2.1.3. Operational Processes

The URL-Archiver is initiated by the user, who provides a path to Unicode text or PDF files or a directory that contains such files. The application extracts URLs from these files and presents them sequentially to the user. The user then has options to open or archive that URL. He has also the following other options:

- ▶ **s**: Show a list of previously archived URLs.
- ▶ **u**: Update and view pending archive jobs.

- ▶ **n**: Navigate to the next URL.
- ▶ **q**: Quit the application.
- ▶ **c**: Change application settings.
- ▶ **h**: Access the Help Menu for assistance.

Upon completion, the user is prompted to save URL pairs to a CSV file and, if a Bibtex file is provided, to write the archived URLs back into it.

### Event Handling

In the URL Archiver, user actions are efficiently facilitated through the main menu. When archiving a URL, users can select either the Wayback Machine or Archive.today. In addition, the 'c' option in the menu allows users to configure settings, including setting up API keys for the Wayback Machine and selecting a default browser. The application cleverly handles unsupported input and incorrect paths by prompting the user for the correct information or action. This ensures smooth operation and user guidance throughout the process.

### Life Cycle

The URL-Archiver's life cycle begins with launch and path input, proceeding to URL extraction and user interactions via the menu options, and ends with prompts for data saving upon completion. See the high-level process in figure 2.3.

### Error Management

Errors within the URL-Archiver are caught and handled, typically prompting the user with a customized error message asking to retry the action. No system stack traces are shown to the user.

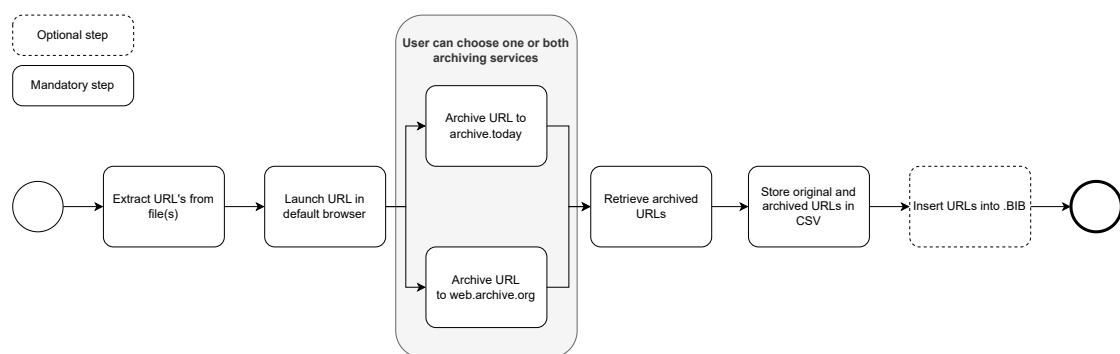


Figure 2.3.: High-level operational process

### Backup and Recovery

Currently, there are no backup features; progress is not saved if the application ends unexpectedly, which is slated for future improvement.

### Update and Upgrade Policies

Software updates require manual download and recompilation from the Git repository. The system does not provide automatic updates or an in-built feature for update checks.

## 2.2. Requirements

### 2.2.1. Epics and User Stories

In this section, we outline the main features (Epics) of the project and break them down into detailed user tasks (User Stories). This helps provide a clear understanding of the desired functions and behaviors of our software.

#### Epic 1: File Input and Processing

**Goal:** Allow the user to input various file types via the command line and prepare these files for further processing.

##### 1. Prompt for File Path Input

- ▶ **Description:** As a user, when I start the tool, I want to be prompted to input the path to my file, so the tool knows which file to process.
- ▶ **Acceptance Criteria:**
  - Upon starting the tool, it prompts the user to enter a file path.
  - On inputting an invalid path or if there are permissions issues, the tool provides a relevant error message.

##### 2. Automatic File Type Detection

- ▶ **Description:** As a user, I want the tool to automatically detect the file type (based on file extension) and treat it accordingly so that I don't need to specify the file type separately.
- ▶ **Acceptance Criteria:**
  - The tool automatically identifies if the file is a .BIB, .TEX, .HTML, or .PDF.
  - For unrecognized file types, the tool provides an appropriate error message.

##### 3. Processing of Directories

- ▶ **Description:** As a user, I want to input a whole directory, so the tool processes all supported files contained within.

- ▶ **Acceptance Criteria:**

- The tool can accept directory paths after the prompt.
- It processes all supported file types within the directory.
- The tool gives a message if files within the directory are skipped due to their type.

#### 4. Processing Feedback

- ▶ **Description:** As a user, I want to receive feedback when the tool starts processing the file and when it finishes, to know the status.

- ▶ **Acceptance Criteria:**

- A message is displayed when the processing of a file starts.
- Upon completion, a confirmation message is shown, which also includes any potential errors or warnings.

### Epic 2: URL Detection and Extraction

**Goal:** Accurately detect and extract URLs from input files for further processing.

#### 1. Scan Files for URLs

- ▶ **Description:** As a user, I want the system to scan my input files and identify any embedded URLs so that they can be extracted for archiving.

- ▶ **Acceptance Criteria:**

- System can detect URLs in a variety of file formats including .BIB, .TEX, .HTML, and .PDF.
- Detected URLs are listed without any duplication.

#### 2. Use Regular Expressions for Extraction

- ▶ **Description:** As a user, I want the system to use regular expressions or other reliable techniques to extract URLs so that all valid URLs are captured without error.

- ▶ **Acceptance Criteria:**

- System uses a robust regular expression pattern that matches most URL formats.
- Extracted URLs are validated to ensure they are in the correct format.



### 3. Store URL Line Number or Context

- ▶ **Description:** As a user, when a URL is detected and extracted, I want the system to also store its line number or contextual information from the original file, enabling precise placement of its archived counterpart later on.
- ▶ **Acceptance Criteria:**
  - Upon URL detection, the system captures and stores the line number or relevant context of the URL from the source file.
  - This information is utilized later if archived URLs need to be placed back into the original files.

### 4. Compile a List of URLs

- ▶ **Description:** After extraction, I want all URLs to be compiled into a single list, eliminating any duplicates, so that I have a clean list for archiving.
- ▶ **Acceptance Criteria:**
  - The list contains all the unique URLs found in the input files.
  - Invalid or broken URLs are flagged or removed from the list.

## Epic 3: Web Browser Integration

**Goal:** Seamlessly open detected URLs, one at a time, in a web browser for user verification, and immediately initiate the archiving process upon user decision.

### 1. Sequential URL Preview

- ▶ **Description:** As a user, I want to preview each detected URL in my default browser sequentially to verify its content.
- ▶ **Acceptance Criteria:**
  - System opens one URL at a time in the default browser.
  - Immediately after the URL is displayed, the system presents the user with the option to archive.

### 2. Immediate Archiving Upon Decision

- ▶ **Description:** After reviewing a URL in the browser, I want to decide if it should be archived. If I decide to archive, the system should immediately initiate the archiving process.
- ▶ **Acceptance Criteria:**
  - System provides a prompt to accept or decline the archiving of the displayed URL.

- If the user chooses to archive, the system directly begins the archiving process, and the user may need to manually solve captchas.

### 3. Track Archiving Progress

- ▶ **Description:** As a user, I want a clear indicator of how many URLs have been displayed, archived, and how many are left to process.
- ▶ **Acceptance Criteria:**
  - The system displays a counter indicating the number of URLs already shown to the user.
  - Another counter indicates how many URLs have been chosen for archiving.
  - Yet another counter shows how many URLs remain to be processed/displayed.

### 4. Store User Decisions for Reporting

- ▶ **Description:** As a user, after making a decision about archiving each URL, I want the system to store my choices so that they can be referred to or reported on later.
- ▶ **Acceptance Criteria:**
  - The system maintains a record of each URL and the user's decision (archived or not archived).
  - The stored decisions are available for any subsequent reporting needs.

## Epic 4: Interaction with archive.ph

**Goal:** Automate the process of archiving URLs via archive.ph while ensuring user interaction is seamless and all necessary data is captured for later use.

### 1. Automated URL Submission

- ▶ **Description:** As a user, I want the system to automatically fill in the URL into the archive.ph input field and submit it for archiving.
- ▶ **Acceptance Criteria:**
  - Upon initiation, system opens the archive.ph website in a browser.
  - System auto-fills the given URL into the appropriate input field.
  - System automatically triggers the submission process for archiving.

### 2. User Interaction for Captchas

- ▶ **Description:** If required, I want to manually solve captchas to ensure the URL gets archived.

▶ **Acceptance Criteria:**

- If archive.ph presents a captcha, the system allows the user to solve it manually.
- The archiving process proceeds once the captcha is successfully solved.

**3. Automatic Retrieval of Archived URL**

▶ **Description:** Once a URL is archived, I want the system to automatically retrieve and display the archived URL to me.

▶ **Acceptance Criteria:**

- System captures the new archived URL from archive.ph after the process completes.
- The archived URL is displayed to the user immediately.
- The archived URL is stored for later processing and reporting.

Epic 5: Output and Reporting

**Goal:** Provide the user with an organized CSV file detailing URLs and their archived counterparts. Also, allow for integration of archived URLs back into supported input files.

**1. Generate CSV File**

▶ **Description:** As a user, I want the system to produce a CSV file containing all original URLs and their corresponding archived URLs.

▶ **Acceptance Criteria:**

- A CSV file is generated upon completion of the archiving process.
- Each row in the CSV contains the original URL and its archived counterpart.

**2. Integrate Archived URLs into Supported Files**

▶ **Description:** If desired, I want the system to insert the archived URL back into the original file, following its corresponding original URL.

▶ **Acceptance Criteria:**

- The system recognizes supported file types for this integration process.
- Upon user approval, the archived URL is inserted in the appropriate location (e.g., following its original URL) within the file.

2.2.2. Functional requirements (added value)

2.2.3. Boundary and Pre-Conditions

## 2.3. Usability

2.3.1. Personas

2.3.2. Storyboard

2.3.3. UX-Prototyping

## 3. Implementation

3.1. Architecture (e.g., back-/frontend)

3.2. Processes

## 4. Deployment/Integration

### 4.1. Licensing and Compliance

#### 4.1.1. Licensing Overview

The project, along with its original source code, is licensed under the permissive and open MIT License. This license aligns with the project's goal of accessibility and ease of use, allowing for free use, modification, distribution, and private use of the software.

#### 4.1.2. Compliance with Open Source Licenses

Although the project itself is licensed under the MIT License, it uses several open-source libraries that are subject to their respective licenses. Please refer to Appendix A.1 for more information. It is worth noting that this project employs libraries licensed under the Eclipse Public License v2.0 (EPL-2.0), including JUnit Jupiter API.

Using EPL-2.0 licensed libraries in a MIT-licensed project is compliant with open source licensing standards, as long as certain conditions are met.

1. **Attribution and Notices:** The project includes a 'Licenses and Attributions' section in the README file. This section acknowledges the use of open-source libraries, specifying their licenses and providing due credits. Additionally, a 'NOTICES.txt' file is included in the project's resources, detailing the open-source components used, their licenses, and where to find the full license texts. This approach is a crucial step to respect and recognize the work of open-source contributors and to maintain transparency about the software's composition.
2. **Separation of Licenses:** It is important to clarify that the MIT License applies to the original code developed for this project. In contrast, the libraries used retain their original licenses (EPL-2.0 in the case of JUnit).
3. **No Modification of EPL-2.0 Libraries:** This project uses the EPL-2.0 licensed libraries in their unmodified form. Any modification to such libraries would require adherence to the specific terms and conditions of the EPL-2.0.

#### 4.1.3. Purpose of Compliance

Ensuring compliance with the licensing terms of used libraries is not only a legal requirement but also a commitment to the open-source community's ethical standards. It ensures that the project respects the rights and efforts of other developers and contributes to the sustainable and responsible use of open-source software.

### 4.2. Installation (Sysadmin) Manual & Script

The URL archiver enables the extraction of URLs from any Unicode text or PDF file and allows for interactive archiving on one of the supported archiving services.



The application was designed to be platform-independent. However, it has only been tested on the following systems, so it cannot be guaranteed to work without restrictions on other platforms.

- ▶ Windows 11 (Version 23H2)
- ▶ Windows 10 (Version 22H2)
- ▶ macOS (Sonoma)
- ▶ Ubuntu (20.04.3 LTS)

#### 4.2.1. Requirements

To build and start the application, ensure that the following dependencies are installed on your system:

- ▶ Git: Latest stable version recommended.
- ▶ Maven: Version 3.8 or higher.
- ▶ Java: Version 21.

#### 4.2.2. Clone the repository

To clone the repository, run the following command in a terminal:

```
git clone https://github.com/devobern/URL-Archiver.git
```

#### 4.2.3. Build and run scripts

The build and run scripts are provided for Windows (`build.ps1`, `run.ps1`, `build_and_run.ps1`), Linux, and MacOS (`build.sh`, `run.sh`, `build_and_run.sh`). The scripts are located in the root directory of the project.



The scripts need to be executable. To make them executable, run the following command in a terminal:

- ▶ Linux / MacOS: `chmod +x build.sh run.sh build_and_run.sh`
- ▶ Windows:
  - Open PowerShell as an Administrator.
  - Check the current execution policy by running: `Get-ExecutionPolicy`.
  - If the policy is Restricted, change it to RemoteSigned to allow local scripts to run. Execute: `Set-ExecutionPolicy RemoteSigned`.
  - Confirm the change when prompted.
  - This change allows you to run PowerShell scripts that are written on your local machine. **Be sure to only run scripts from trusted sources.**

## Windows

### Build the application

To build the application, open a command prompt and run the following script:

```
./build.ps1
```

### Run the application

To run the application, open a command prompt and run the following script:

```
./run.ps1
```

### Build and run the application

To build and run the application, open a command prompt and run the following script:

```
./build_and_run.ps1
```

## Linux and macOS

### Build the application

To build the application, open a command prompt and run the following script:

```
./build.sh
```

### Run the application

To run the application, open a command prompt and run the following script:

```
./run.sh
```



### Build and run the application

To build and run the application, open a command prompt and run the following script:

```
./build_and_run.sh
```

## 4.3. User Manual



To follow the instructions in this section, the application must be built. See 4.2.

The URL-Archiver is a user-friendly application designed for extracting and archiving URLs from text and PDF files. Its intuitive interface requires minimal user input and ensures efficient management of URLs.

### 4.3.1. Getting Started

#### Windows

Open Command Prompt, navigate to the application's directory, and execute:

```
./run.ps1
```

#### Linux / MacOS

Open Terminal, navigate to the application's directory, and run:

```
./run.sh
```

### 4.3.2. Operating Instructions

Upon launch, provide a path to a text or PDF file, or a directory containing such files. The application will process and display URLs sequentially.

#### Navigation

Use the following keys to navigate through the application:

- ▶ **o**: Open the current URL in the default web browser.
- ▶ **a**: Access the Archive Menu to archive the URL.
- ▶ **s**: Show a list of previously archived URLs.
- ▶ **u**: Update and view pending archive jobs.
- ▶ **n**: Navigate to the next URL.

- ▶ **q**: Quit the application.
- ▶ **c**: Change application settings.
- ▶ **h**: Access the Help Menu for assistance.

### Archiving URLs

Choose between archiving to Wayback Machine, Archive.today, both services, or canceling.

When opting to use Archive.today for archiving, an automated browser session will initiate, requiring you to complete a captcha. Once resolved, the URL is archived, and the corresponding archived version is then collected and stored within the application.

### Configuration

Customize Access/Secret Keys and the default browser. Current settings are shown with default values in brackets.

### Exiting

To exit, press **q**. If a Bibtex file was provided, you'll be prompted to save the archived URLs in the Bibtex file. Otherwise, or after saving the URLs in the Bibtex file, you'll be prompted to save the archived URLs in a CSV file.

For Bibtex entries:

- ▶ Without an existing note field, URLs are added as: `note = {Archived Versions: \url{url1}, \url{url2}}`
- ▶ With a note field, they're appended as: `note = {<current note>, Archived Versions: \url{url1}, \url{url2}}`

## 5. Conclusion

### 5.1. Discussion

#### 5.1.1. Example from BFH Template - Delete

What is the significance of your results? – the final major section of text in the paper. The Discussion commonly features a summary of the results that were obtained in the study, describes how those results address the topic under investigation and/or the issues that the research was designed to address, and may expand upon the implications of those findings. Limitations and directions for future research are also commonly addressed.

### 5.2. Bottom Line

### 5.3. Future Work

## Bibliography

## A. Original Project Description

### # URL-Archiver

#### ## Description

The goal of this project is to deliver a FLOSS-licensed, platform-independent Java-program (called "URL-Archiver") that

- (1) takes as input (the path of) a directory or any Unicode-text- (e.g.: .BIB, .TEX; .HTML; etc.) or .PDF-file (<https://www.baeldung.com/java-curl>);
- (2) scans it for any URLs (<https://stackoverflow.com/questions/4026614/extract-text-from-pdf-files> , <https://librepdf.github.io/OpenPDF> , <https://pdfbox.apache.org> ; see also [https://en.wikipedia.org/wiki/List\\_of\\_PDF\\_software](https://en.wikipedia.org/wiki/List_of_PDF_software));
- (3) extracts all URLs (regular expression ;- ) from the text;
- (4) optionally spring-loads all URLs in a Web-browser;
- (5) posts all URLs to <https://archive.ph> ;
- (6) gets the resulting archived URLs;
- (7) outputs a CSV-file of the resulting key-value (URL, archived URL) pairs; and
- (8) optionally inserts the archived URLs into a .BIB-file.

The program code should be minimal, modular, and self-explaining.

The project report should be concise (maximally informative, minimally long).

It must contain this project description as a quotation.

#### ## Technologies

Java, LaTeX

#### ## Advisor

Dr. Simon Kramer

## A.1. List of Used Libraries and Their Licenses

Below is the list of libraries used in the project, along with a short description and their versions.

Library	Version	Short Description	Used License
JUnit Jupiter API	5.9.2	Unit testing framework for Java applications.	Eclipse Public License v2.0
JUnit Jupiter Engine	5.9.2	The test engine for running JUnit tests.	Eclipse Public License v2.0
Selenium Java	4.15.0	Automation framework for web applications testing.	Apache-2.0
Selenium Logger	2.3.0	A wrapper for enhanced Selenium log management.	MIT
Mockito Core	5.4.0	Mocking framework for unit tests in Java.	MIT
Mockito JUnit Jupiter	5.4.0	Integration of Mockito with JUnit Jupiter.	MIT
System Lambda	1.2.1	Utilities for testing Java code that uses system properties and environment variables.	MIT
Apache PDFBox	3.0.0	Library for creating and manipulating PDF documents.	Apache-2.0
Jackson Core	2.16.0	Core part of Jackson that defines common low-level features.	Apache-2.0
Jackson Dataformat XML	2.15.2	Support for reading and writing XML encoded data via Jackson abstractions.	Apache-2.0

Table A.1.: List of Used Libraries in the Project

## Declaration of Authorship

I hereby declare that I have written this thesis independently and have not used any sources or aids other than those acknowledged.


All statements taken from other writings, either literally or in essence, have been marked as such.

I hereby agree that the present work may be reviewed in electronic form using appropriate software.

December 30, 2023



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