Universidad Politécnica de Cartagena
Ingeniería Telemática

Aplicaciones en Internet

Web de recomendación de películas

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Chapter 1

Introducción

Este documento tiene como objetivo explicar el funcionamiento de la aplicación web de recomendación de películas llamada `El Recomendador`.

El proyecto incluye funcionalidades clave como la autenticación de usuarios, gestión de perfiles, un catálogo dinámico de películas, un sistema de puntuación y comentarios, y algoritmos avanzados para la recomendación y el ranking de películas. Además, se ha diseñado una interfaz intuitiva y una arquitectura robusta basada en PHP, JavaScript, MATLAB y SQL.

Cada capítulo abordará las distintas funcionalidades y aspectos técnicos del proyecto de forma sintética y clara para poder así comprender el funcionamiento al completo de la aplicación.

Chapter 2

Index

En primera instancia, el usuario accederá a esta página. En ella, el usuario se puede encontrar una portada con una breve descripción de la web, y en ella va incluida dos formularios, una de registro y otra de inicio de sesión. Se ha optado por una portada simple y minimalista para que el usuario pueda acceder rápidamente a la web.

2.1   index.html

A nivel técnico, la página principal se compone de un formulario de inicio de sesión y un formulario de registro. Ambos formularios están diseñados como una extensión HTML del archivo *index.html* de tal modo que son gestionadas por separado y se pueden encontrar en los directorios */auth/register.php y /auth/registerform.html* para el registro y */auth/login.php y /auth/loginform.html* para el inicio de sesión.

¿Por qué se ha optado por hacer eso?

La razón principal es la posibilidad de implementar un formulario HTML pero que no esté visible al cargar la página, sino que se muestre al hacer clic en el botón correspondiente. La respuesta al botón se realiza mediante *JavaScript*, pero la implementación de dos formulario, con mismo estilo que aparezca como respuesta a un *script*, nos ha llevado a la llamada externa de dichos formularios y que se gestionen por separado en distintos documentos y además a la creación de un archivo de estilos llamado *core.css*, que será un archivo con los estilos comunes a todas las páginas de la web.

2.2   core.css

En este archivo podemos encontrar la configuración común a todas las páginas de la web. En él se han definido los estilos de los formularios, las cabeceras, los pie de página, la fuente y el tamaño de la letra...

Todas las páginas de la web heredarán dichos archivos, y si en alguna página se quiere modificar algún estilo, se puede hacer de forma individual en el archivo de la página correspondiente.

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11.1 README.md

Sleek Template is a minimal collection of LaTeX packages and settings that ease the writing of beautiful documents. While originally meant for theses, it is perfectly suitable for project reports, articles, syntheses, etc. – with a few adjustments, like margins.

It is composed of four separate packages which can be used individually: `sleek`, `sleek-title`, `sleek-theorems` and `sleek-listings`.

```
\usepackage[english]{babel}
\usepackage[noheader]{packages/sleek}
\usepackage{packages/sleek-title}
```

Listing 11.1. Example of Sleek Template packages usage.

If you are a LaTeX beginner consider the excellent tutorial **overleaf**, **overleaf**. Also, there are a lot of symbols available in LaTeX and, therefore, in this template. I recommend the use of **pakin2020comprehensive**, **pakin2020comprehensive** for searching symbols.

Chapter 12

Features

12.1 `sleek`

`sleek` is the main package. It imports the packages (see Table A.1) and setups the settings that make Sleek Template easy to use. Two options are provided:

1. `header` adds a header with the current chapter to pages;
2. `french` makes the French setup consistent with other languages.

But nothing prevents you from tweaking the settings to your liking in the source code. For example, you can change the font of the document from "Latin Modern Roman" to "Linux Libertine", by replacing

```
% Font
\RequirePackage{lmodern}
\RequirePackage[T1]{fontenc}
```

with

```
% Font
\RequirePackage{libertine}
\RequirePackage{libertinust1math}
\RequirePackage[T1]{fontenc}
```

in the `sleek.sty` file.

12.1.1 Mathematics

This template uses `amsmath` and `amssymb`, which are the de-facto standard for typesetting mathematics. Additionally, `esint` provides alternative integral symbols (see Table 78 in [**pakin2020comprehensive**]) and `bm` is used for bold math symbols like vectors (see (12.1)).

A few custom macros have also been added such as `\rbk`, `\sbk` and `\cbk` for respectively round, square and curly brackets or `\abs` for absolute value. Here follows some examples showcasing what is possible with the default packages of `sleek`.

$$(\pi), \quad \left[\dfrac{\pi}{2}\right], \quad \left\{\pi = 3 + \cfrac{1}{7 + \cfrac{1}{15 + \cfrac{1}{1 + \ldots}}}\right\}, \quad |2\pi|, \quad \left\|\dfrac{\pi}{4}\right\|, \quad \left\lceil\dfrac{22}{7}\right\rceil, \quad \left\lfloor\dfrac{\pi^2}{6}\right\rfloor$$

$$\oiint_S \boldsymbol{E} \cdot \mathrm{d}\boldsymbol{s} = \iiint_V \frac{\rho}{\varepsilon_0} \, \mathrm{d}V \tag{12.1}$$

$$e = \sum_{n=0}^{\infty} \frac{1}{n!}$$

$$\frac{\mathrm{d}x}{\mathrm{d}t} = \alpha x - \beta xy \tag{12.2a}$$

$$\frac{\mathrm{d}y}{\mathrm{d}t} = \delta xy - \gamma y \tag{12.2b}$$

$$\ln|x| + C = \int \frac{1}{x} \, \mathrm{d}x$$

$$\exp(x) = \lim_{n \to \infty} \left(1 + \frac{x}{n}\right)^n$$

$$\begin{cases} x = r \sin\theta \cos\phi \\ y = r \sin\theta \sin\phi \\ z = r \cos\theta \end{cases} \tag{12.3}$$

$$P(A, B) = P(A \mid B) P(B)$$
$$\Leftrightarrow \quad P(A \mid B) = \frac{P(A, B)}{P(B)}$$
$$= P(B \mid A)\frac{P(A)}{P(B)}$$

12.1.2 Units

The `siunitx` package [**wright2022siunitx**] provides three commands to typeset numbers, units and quantities: `\num`, `\unit` and `\qty`.

It is possible to write, both in text or math modes, numbers without units (*e.g.* 1, 1.0, -1, $3.141\,59$, 10^{100}, $N_A = 6.022 \times 10^{23}$), units without quantity (*e.g.* $\mathrm{J} = \mathrm{N\,m} = \mathrm{kg\,m^2\,s^{-2}}$) and, finally, quantities with their units (*e.g.* $9.81\,\mathrm{m\,s^{-2}}$, $c = 299.6 \times 10^6\,\mathrm{m\,s^{-1}}$).

12.1.3 Lists

Sleek Template uses `enumitem` to enhance the listing capabilities of LaTeX. There are several lists environments:

- `itemize` for unordered lists;
- `enumerate` for ordered lists;
- `description` for descriptive lists.

In a list, each element is preceded by the command `\item`. It is possible to modify the labels 1. individually with `\item[newLabel]` or 2. for the whole environment with the `label=newLabel` option.

In the case of `enumerate`, `newLabel` can contain special expressions (see Table A.4) that will adapt to the item number. For example, `label=(\alph*)` defines the label sequence "(a), (b), (c), ...". Still in the case of `enumerate`, the `\setcounter` and `\addtocounter` commands allow to modify the current item number.

One could want to reduce the space between items with the `noitemsep` option or to delete the left margin with the `leftmargin=*` option.

It is also possible to write nested lists. Here follows a very condensed example.

- Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua.

  Arcu ac tortor dignissim convallis aenean et tortor. In eu mi bibendum neque egestas congue quisque.

+ Semper quis lectus nulla at volutpat diam ut. Felis eget velit aliquet sagittis id. Blandit aliquam etiam erat velit scelerisque in dictum non consectetur.

$$a^2 + b^2 = c^2 \tag{12.4}$$

- Nibh sed pulvinar proin gravida hendrerit lectus. Pretium aenean pharetra magna ac placerat vestibulum lectus mauris. Non consectetur a erat nam at lectus urna duis.

    i. Nibh tortor id aliquet lectus. Sit amet justo donec enim diam vulputate ut pharetra sit.
   iv. Condimentum id venenatis a condimentum vitae. Quis eleifend quam adipiscing vitae proin sagittis nisl.
   xx. Proin sagittis nisl rhoncus mattis rhoncus urna neque viverra.

- Elit scelerisque mauris pellentesque pulvinar pellentesque habitant morbi tristique senectus.

  Ridiculus mus mauris vitae ultricies leo. Mollis aliquam ut porttitor leo a diam. Velit egestas dui id ornare arcu odio ut sem nulla.

  Nullam vehicula ipsum a arcu. Nibh sit amet commodo nulla facilisi nullam. At erat pellentesque adipiscing commodo elit. Libero volutpat sed cras ornare arcu dui.

12.1.4 Figures

Thanks to the `graphicx` package, it is possible to include external graphic documents (images, plots, etc.) in your document with the `\includegraphics` command. Most image

type format (`jpg`, `png`, `bmp`, etc.) are supported by this command. However, it should be noted that it is highly preferable to use vectorial types, such as `pdf` or `eps`.

Figure 12.1. Random University logo.

12.1.5 Tables

The `multirow` package comes handy for complex table formatting such as multi-column or multi-row cells.

a			qrs
b	ef	jkl	tuvx
cd	ghi	mnop	wyz

Table 12.1. Example of multi-column cells.

a	b	c
	de	fg
	hij	klm
nopq	rstuv	wxyz

Table 12.2. Example of multi-row cells.

The `booktabs` package also provides tools to build publication-ready tables. The tables in Appendix A are good examples.

12.2 `sleek-title`

Sleek Template offers a custom title-page with the package `sleek-title`. The formatting of the title-page is automatically inferred from the fields that the user has provided.

The fields are \logo, \institute, \faculty, \department, \title, \subtitle, \author, \supervisor, \context and \date.

Among these, only \title, \author and \date have to be provided. However, none of the fields should stay empty. Prefer deleting or commenting the line if so.

```
\logo{./resources/pdf/logo.pdf}
\institute{Random University}
\faculty{Faculty of Whatever Sciences}
%\department{Department of Anything but Psychology}
\title{A sleek \LaTeX{} template}
\subtitle{With a sleeker title-page}
\author{\textit{Author}\\Francois \textsc{Rozet}}
%\supervisor{Linus \textsc{Torvalds}}
%\context{A long time ago in a galaxy far, far away...}
\date{\today}
```

Listing 12.1. Example of `sleek-title` title-page definition.

It is also possible to use Sleek Template without `sleek-title`, in which case the default LaTeX title-page will be used.

12.3 `sleek-theorems`

`sleek-theorems` is based on the `amsthm` and `thmtools` packages. It provides a handful of theorem-like environments, each of which have different style and purpose: `theorem`, `lemma`, `proposition`, `proof`, `definition`, `hypothesis`, `method`, `question`, `answer`, `example`, `remark`, `note` and `tip`.

Note. The `french` and `german` options translate the names of the provided environments. It is also possible, and easy, to add your own language as an option in the source code.

Theorem 1 (Triangle inequality)**.** *Let be a triangle in Euclidean space. Then the sum of the lengths of two of its sides always surpass or equals the length of the third.*

Proof 1.1. Let a, b and c be the lengths of the sides of a triangle in Euclidean space and α, β, γ their respective opposite angle. By the generalized Pythagoras' theorem, we have

$$
\begin{aligned}
c^2 &= a^2 + b^2 - 2ab\cos\gamma \\
&\leq a^2 + b^2 + 2ab \\
&\leq (a+b)^2 \\
\Leftrightarrow \quad c &\leq a + b
\end{aligned}
$$

Therefore in any triangle, the sum of the lengths of two sides always surpass or equals the length of the third. ∎

In addition, these environments also have framed versions – `fmd-theorem`, `fmd-lemma`, etc. – for better encapsulation.

Theorem 2. Triangle inequality

Let be a triangle in Euclidean space. Then the sum of the lengths of two of its sides always surpass or equals the length of the third.

Proof 2.1

Let a, b and c be the lengths of the sides of a triangle in Euclidean space and α, β, γ their respective opposite angle. By the generalized Pythagoras' theorem, we have

$$
\begin{aligned}
c^2 &= a^2 + b^2 - 2ab\cos\gamma \\
&\leq a^2 + b^2 + 2ab \\
&\leq (a+b)^2 \\
\Leftrightarrow \quad c &\leq a + b
\end{aligned}
$$

Therefore in any triangle, the sum of the lengths of two sides always surpass or equals the length of the third. ∎

Question

Based on the theorem 2, what is the shortest path from a point A to a point B in Euclidean geometry ?

12.4 `sleek-listings`

The `sleek-listings` package is a small collection of styles and languages for the `listings` package, which is useful to showcase nicely samples of code. The package provides the styles `default`, `numbered`, `framed`, `ruled`, `framednumbered` and `rulednumbered` and the languages `latex`, `c*`, `cpp*`, `matlab*`, `python*`, `java*` and `scheme`, with a simple color scheme for keywords and comments.

For instance, if you want to showcase Python code within a ruled code block (top and bottom rule) with line numbers, you can either import a `.py` file with

```
\lstinputlisting[style=rulednumbered, language=python*]{filename.py}
```

or paste the code within the LaTeX document as

```python
1  import numpy as np # Unnecessary import
2
3  a, b = 69., .420
4
5  def f(a: float, b: float) -> float:
6      r"""Sum two numbers
7
8      Parameters
9      ----------
10     a: first number
11     b: second number
12
13     Returns
14     -------
15     the sum of 'a' and 'b'
16     """
17
18     return a + b
19
20  c = f(a, b)
21
22  print('{:f} + {:f} equals {:f}'.format(a, b, c))
```

Appendix A

Tables

Package	Purpose
amsmath	Mathematical typesetting
amsthm	Mathematical environments for theorems, proofs, etc.
booktabs	Weighted rules for tables
biblatex	Bibliography
csquotes	Inline and display quotations
enumitem	Lists and enumerations
float	Floating objects such as figures and tables
graphicx	Graphics
hyperref	Hyperlinks and bookmarks
listings	Code listings
multirow	Table cells that span multiple columns or rows
siunitx	Typesetting of units
subcaption	Sub-figures and sub-captions

Table A.1. List of the most relevant packages imported by Sleek Template.

`{\rmfamily abcABC123}`	abcABC123
`{\sffamily abcABC123}`	abcABC123
`{\ttfamily abcABC123}`	abcABC123
`{\mdseries abcABC123}`	abcABC123
`{\bfseries abcABC123}`	**abcABC123**
`{\itshape abcABC123}`	*abcABC123*
`{\scshape abcABC123}`	ABCABC123
`{\slshape abcABC123}`	*abcABC123*
`{\upshape abcABC123}`	abcABC123
`\emph{abcABC123}`	*abcABC123*
`\lowercase{abcABC123}`	abcabc123
`\normalfont{abcABC123}`	abcABC123
`\textrm{abcABC123}`	abcABC123
`\textbf{abcABC123}`	**abcABC123**
`\textit{abcABC123}`	*abcABC123*
`\textsc{abcABC123}`	ABCABC123
`\textsf{abcABC123}`	abcABC123
`\textsl{abcABC123}`	*abcABC123*
`\textsubscript{abcABC123}`	abcABC123
`\textsuperscript{abcABC123}`	abcABC123
`\texttt{abcABC123}`	abcABC123
`\underline{abcABC123}`	abcABC123
`\uppercase{abcABC123}`	ABCABC123

Table A.2. Available text fonts in LaTeX.

`$\mathcal{abcABC123}$`	⊣⌊⌋𝒜ℬ𝒞∞∈∋
`$\mathit{abcABC123}$`	*abcABC123*
`$\mathnormal{abcABC123}$`	*abcABC123*
`$\mathrm{abcABC123}$`	abcABC123
`$\mathbb{abcABC123}$`	⊃𝔸𝔹ℂ⊬⊯⊯
`$\mathfrak{abcABC123}$`	𝔞𝔟𝔠𝔄𝔅ℭ123

Table A.3. Available math fonts in LaTeX and AMS.

Expression	Description
`\arabic*`	Arabic numbers (1, 2, 3, ...)
`\alph*`	Lowercase letters (a, b, c, ...)
`\Alph*`	Uppercase letters (A, B, C, ...)
`\roman*`	Lowercase Roman numerals (i, ii, iii, ...)
`\Roman*`	Uppercase Roman numerals (I, II, III, ...)

Table A.4. Special expressions for the label of `enumerate` environments.