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Artificial Intelligence in Support of Web Development

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ABSTRACT

This paper explores the role of artificial intelligence (AI) platforms in supporting web developers, with a focus on their practical application and impact on the development process. The study compares a website coded by students during specialized Information Technology (IT) classes with automatically generated code produced by AI tools. The research also examines how AI-driven platforms can assist students in refining their original projects.

Keywords: artificial intelligence, web development, code comparison.

INTRODUCTION

In recent years, the spread, accessibility, and growing popularity of various AI-powered platforms have undoubtedly had a transformative influence on students, university learners, and established IT professionals alike. While many view these tools as valuable aids, there is also growing discourse suggesting that advanced AI algorithms could eventually surpass human capabilities, threatening certain professions, including programming. This perspective inspired the authors to examine AI not as a replacement but as a supportive tool for code development.

Today's adaptive and resourceful youth successfully leverage advanced technologies, carefully selecting AI-powered services to achieve meaningful educational and professional outcomes [1].

EXPERIMENTAL

This paper describes the results of two students' work on a task involving the creation of a German-language webpage. The main page components are text, images, and audio. The students applied basic HTML, CSS, and JavaScript skills while also improving their language proficiency. The same tasks were then performed using two AI platforms.

Methodology

The study was carried out through a combination of approaches, including:

- Conducting detailed research on the topic using reliable and up-to-date sources to gain a clear understanding of its scope and applications.
- Applying programming skills in HTML,

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CSS, and JavaScript, acquired during a multi-year course at Apostol Arnaudov Vocational High School of Electrical Engineering and Electronics in Ruse, which emphasizes learning through lectures, exercises, and collaborative projects, ultimately leading to professional certification.

- Selecting and synthesizing relevant information to achieve project goals, supported by discussion, analysis, and evaluation.
- Using various AI assistants to complete the school project. The work of ChatGPT was compared to that of Perplexity, a platform specifically marketed to IT professionals for programming support.
- Distinguishing AI-generated code from human-created solutions and analysing the differences.
- Consulting a supervising teacher throughout all stages, particularly for summarizing research, experiments, and conclusions. Feedback was provided by IT teachers, as well as by the AI tools themselves, which identified mistakes, stylistic issues, and formatting weaknesses to achieve the best possible final product.

Artificial intelligence is transforming programming by automating repetitive tasks. A GitHub study shows that 92 % of developers already use AI tools, reducing development time while improving code quality and maintainability. Intelligent code completion accelerates software development by suggesting code snippets in real time, reducing errors and increasing efficiency. AI is also widely applied in project management, analysing codebases, predicting issues, and optimizing workflows [2, 3].

AI is now an integral part of software engineering in major tech companies like Google and Microsoft, driving the rapid deployment of innovative products and services. Examples include virtual assistants that execute tasks based on voice commands. Meta, for instance, uses AI to moderate posts and comments according to community guidelines [4].

Another major use case is marketing, where AI helps create unique content, improve user experience, and personalize recommendations. Companies like Netflix, Spotify, and BMW rely on AI-driven algorithms for content curation, playlist generation, and even advertisement design.

Emerging advancements in quantum computing further enhance AI's capabilities, particularly in natural language processing [5]. Quantum chips promise compact data storage and more sustainable infrastructure, offering an optimistic contrast to the environmental concerns associated with large-scale AI-driven systems.

A practical example of creative human programming is shown by comparing AI-generated work with student-coded solutions for the same project.

The assignment was part of a project-based learning approach in German language and IT classes. Students were assigned to create an Advent Calendar web page, displaying a German word for each day between December 1st and 24th.

Fig. 1 and 2 show the students' web project, created in modules 3 and 4 of the IT track. (Web Design and Problem-Solving with Information and Communication Technology). Each word appears in a pop-up window with an accompanying image, a definition, and a translation.

The project was implemented using HTML, CSS, and JavaScript.

The site follows all basic web design standards, supplemented with freely licensed images, background audio, and animations for a modern look. The layout uses a dark background for better contrast, with simple fonts (Garamond), a holiday-inspired color scheme, and asymmetrical red windows for a dynamic feel. Subtle fade-in animations enhance the design without distracting users. Despite its simplicity, the project demonstrates a solid understanding of front-end development fundamentals.

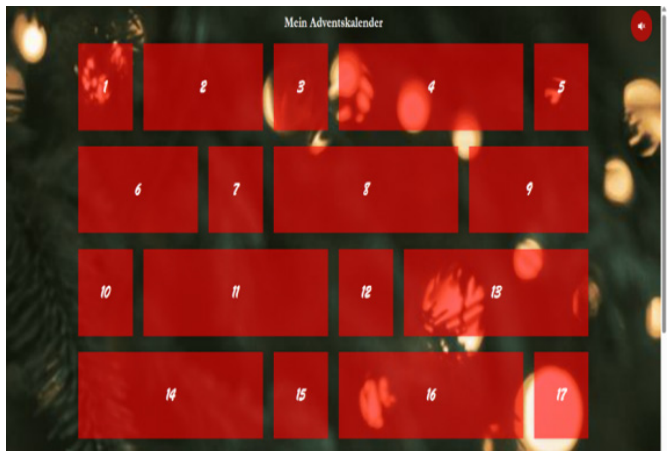

Fig. 1. Student-coded Advent Calendar project.

Der Adventskranz | die Adventskränze

Венец

An jedem der vier Adventsonntage vor Weihnachten wird eine neue Kerze auf dem Kranz angezündet.

Fig. 2. Pop-up window for day 5.

To illustrate the implementation in practice, a short excerpt of the student-written source code is provided (Listing 1). It demonstrates how the interactive calendar doors are dynamically created and linked to their corresponding German vocabulary words, translations, and images. When a user clicks on a day, a modal pop-up window is displayed with the relevant content (Fig. 2).

Listing 1. Excerpt from the student-coded Advent Calendar project.

```
<div class=”calendar” id=”calendar”></div>
<script>
  const doorInfo = [
    {
        word: “der Weihnachtsbaum | die Weihnachtsbäume”,
```

```
        translation: “Коледна елха”,
        image: “images/door1.png”,
        extraInfo:
            “In Deutschland sind die ersten Weihnachtsbäume mit Lebkuchen, Äpfeln, Waffeln und Süßigkeiten geschmückt.”
      }
    ];

    for (let i = 1; i <= 24; i++) {
    const door = document.createElement(“div”);
      door.className = “door”;
      door.textContent = i;
       door.addEventListener(“click”, function () {
        openDoor(i, doorInfo[i - 1]);
      });
      calendar.appendChild(door);
    }

    function openDoor(day, info) {
    const modal = document.createElement(“div”);
      modal.className = “modal”;

        const content = document.createElement(“div”);
      content.className = “modal-content”;

        const image = document.createElement(“img”);
      image.src = info.image;

    const word = document.createElement(“p”);
      word.innerHTML = info.word;
        const translation = document.createElement(“p”);
      translation.textContent = info.translation;

      content.appendChild(image);
      content.appendChild(word);
      content.appendChild(translation);
      modal.appendChild(modal);
      document.body.appendChild(modal);
    }
  </script>
```

The same task was then given to ChatGPT with the following prompt:

“You are a student learning German and tasked with creating an Advent Calendar project that shows a German word for each day in December. Create a simple webpage with pop-up windows for each day showing a Christmas-related word and image. Write HTML and CSS code that best fulfills this task.” A follow-up request was added to include animations.

RESULTS AND DISCUSSION

The AI-generated and student projects are structurally similar, but design and media choices differ. While the AI-generated code closely followed the assignment structure, it lacked key elements such as hyperlinks and a cohesive design theme.

Fig. 3. Code generated by ChatGPT.

Fig. 4. Pop-up window for Day 1.

The project was then reviewed using Perplexity by asking what could be improved in the original prototype. Key suggestions included:

- Developing a mobile-friendly version for accessibility across devices.
- Optimizing loading speeds for better performance.
- Improving accessibility features, such as audio navigation and keyboard controls.

However, these recommendations were generic and not tailored to the specific project goals.

CONCLUSIONS

This paper presents the students' work on a German-language Advent Calendar webpage using HTML, CSS, and JavaScript, as well as results from replicating the same task in ChatGPT and Perplexity.

Key findings:

- ChatGPT's support for a relatively simple web project was mixed: the student-coded version met all teacher requirements and had a polished design, while the AI version lacked important details.
- Its effectiveness is limited for smaller, design-oriented tasks; the human-coded project demonstrated greater attention to detail and creativity.
- AI-based workflows often require iterative prompting, making them as time-intensive as manual coding for certain tasks.
- Perplexity provides valuable but generic feedback, underscoring the need for human oversight in AI-assisted development.

Ultimately, AI represents a powerful supplementary tool for students and professionals, particularly for larger-scale, complex projects. As AI continues to advance, its integration in software engineering will likely expand, raising critical considerations regarding security, intellectual property, and environmental impact.

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