**Building AI-Powered Web Applications with Next.js and Recommendation Systems. [Gen z version].**

***MERCY OKEBIORUN***

**Abstract**

Over the years, technology has grown wide and has expanded its horizons across all frameworks. Web applications powered by Artificial Intelligence have become increasingly popular. For example, Netflix uses AI algorithms to recommend movies based on users’ past viewing habits. This open-source article explores the integration of an AI recommendation system into a web application using Next.js, a versatile and powerful framework for building modern web applications. Join me on this journey as we walk through the step-by-step process of creating a web application with a user-friendly interface and implementing an AI recommendation system that delivers personalized content to users based on their preferences.

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***1.1 AI Recommendation Systems:***

Hello Everyone, I have gathered you all today because there’s a magical alien secret in our midst and it’s dangerous for this secret to dwell amongst us without our knowledge. It’s coming for you and me, so let’s get ready as we embark on this quest of unraveling the secrets behind Artificial Intelligence [AI] Recommendation System! drum rolls 🥁

We are the AVENGERS.

\*1.1 AI Recommendation Systems: Life Changing Mission\*

Avengers, gather round, I just spoke to the oracles, they recommended that we go on this quest with the time traveler tank like we did when we fought the lankahi war. Did you get that? The oracles recommended we go with the tank like we did last time, That's what AI Recommendation Systems do! They are like the oracles who know so much about our present and past preferences, then suggests ideas based on them. AI transforms the web app landscape, enchanting users with content just for them

\*Unraveling the Machine Learning Magic\*

These amazing systems uses a magic called THE MACHINE LEARNING MAGIC. It watches your every move, predicts your next move, learn how to bait you with the things you love. Trying to make your every wish come true.

\*Enhancing User Experience and Engagement\*

With their magic powers of prediction, recommendation systems level up your experience like magical upgrades! They keep you engaged, encased and enchanted, never wanting to leave the wondrous world of the web app!

\*They're Everywhere!\*

These alien systems are everywhere! From online shops to content havens to movie cave and social media territories, they're the secret spice behind your favorite online experiences!

They have few Magical processes through which they carry out their task. Let’s talk about them:

\*\*500 Years later\*\*\*

Collaborative Filtering: I have a bestie and she knows the things I like, she knows I love chocolate cakes, so when she sees chocolate cookies, based on the fact she knows I like chocolate cakes, she brings me the chocolate cookies because it contains chocolate which I love in cakes. This is similar to collaborative filtering. It is like having a friend who knows what you like and recommends things you might enjoy. It suggests things to you (like movies, books, or products) based on what other people with similar tastes have liked or bought.

There are two major types of collaborative filtering. Let’s walk through this.

Imagine you have a bestie who knows you really well and knows what things you like. They also know some other people who have similar tastes to yours.

With user-based collaborative filtering, your bestie would suggest things to you based on what those similar people have liked. So, if those people enjoyed a chocolate yogurt, or other products, your bestie might recommend it to you because they think you'll also like it.

On the other hand, with item-based collaborative filtering, your bestie would look at things you have already liked, such as chocolate cookies, chocolate bars, or probably vanilla products. Then they would find other similar items and recommend those to you. For example, if you liked a certain movie, your bestie might suggest other movies that are similar in style or theme.

In both cases, the goal is to help you discover new things that you might enjoy based on what people with similar tastes have liked or what items are similar to ones you already like.

Content-based filtering: Imagine you have a female personal assistant who helps you in shopping, over the years, while shopping, you picked up a patterned shirt and admired it. she noticed your admiration and noted it, so every time she sees a patterned shirt she thinks you might like, she suggests them to you because you have shown interest in them. Content-based filtering is like a clever shopping assistant that suggests things you might like based on what you've shown interest in before. It looks at the details and characteristics of the things you've looked at or interacted with and then recommends other things that are similar to those. This is really helpful when there's a lot of information about the things you're interested in because it can find more stuff that matches your tastes. So, if you like certain types of movies or books, the content-based filtering will find other movies or books that are similar to the ones you've enjoyed before. It's like having an assistant who knows exactly what you like and can recommend new things you'll love!

The hybrid recommendation approach is like combining two superpowers to make the best recommendations ever! It takes two different ways of suggesting things you might like and puts them together to give you even better suggestions.

One way is by looking at what other people like and suggesting things that are popular among them. This is called collaborative filtering. The other way is by looking at the details of the things you've liked in the past and suggesting similar things. This is called content-based filtering.

Now, imagine if we could use both of these ways at the same time! That's exactly what the hybrid approach does. It takes the best parts of both methods and puts them together to make sure you get really accurate and diverse recommendations. It's like having two awesome besties working together to find the perfect things for you!

So, with the hybrid approach, you'll get recommendations that are not only popular among people but also match your specific tastes. It's like having a super-powered recommendation system that knows you inside out and always finds the coolest stuff you'll love!

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***1.2 Next.js: A Brief Introduction*** ##

Next.js is like a topnotch tool for creating awesome websites! It's built on top of React.js, which is already pretty cool. But Next.js takes it to the next level with a lot of Rizz!!!

One of its Alté ability is to make your website load really fast. It can do this by splitting your code into smaller pieces and loading only what's needed, making your site move with a crazy speed.

Next.js is also a boss at handling different types of rendering. It can handle rendering stuff on the server side, which means your website will show up really quickly for users. And it can also do rendering on the client side, making your site super interactive and fun to use!

Another cool thing is that Next.js comes with built-in tools for handling how your pages are shown and linked together. It's like having a GPS for your website, so users can find their way around easily.

And guess what? Next.js can even deploy your website in a super cool way called "serverless." This means it uses the newest technology to make your website work really well without you having to worry about managing servers.

Crazy right?

Overall, Next.js is like a web development Badass Boss that makes building modern, fast, and awesome websites a breeze. It's perfect for making websites that look great, work fast, and make users happy!

## 2. Setting Up the Development Environment

Before we start creating our fire 🔥 web application with the AI recommendation system, we need to get our ingredients ready! Get ready, we’re cooking. 😋

To do that, for now, we'll need two most important personnels, The main Chef and the assistant chef, i.e recipe called Node.js and npm respectively. Node.js is the main chef in our kitchen, and npm as its helpful assistant, called recipe. They help us manage all the things we need to make our web application work smoothly.

Node.js is like the brain behind the functionality of our kitchen, and it allows us to run special code that makes our web application come to life. It's like the magic behind the scenes that makes everything work.

npm is like the recipe that holds all the little pieces we need to build our web application. It's like having a recipe boo full of all the spices, sauces, and ingredients that the chef needs to cook a great meal.

So, before we start building our awesome web application with the AI recommendation system, let's make sure we have Node.js and npm ready to go. Once they're set up, we can start cooking up something amazing!

### 2.1 Installing Node.js and npm

Let’s get serious 🧐

To get started with Node.js and npm, just follow these easy steps:

1. First, go to the Node.js website (https://nodejs.org) and download the latest version that's best for your computer.

2. Once you've downloaded it, run the installer. It's like installing any other program, and you just need to follow the instructions on the screen.

3. After you've installed Node.js and npm, open a special window on your computer called a terminal or command prompt. Don't worry; it's not as scary as it sounds!

4. In the terminal or command prompt, type `node -v` and press Enter. It's like asking Node.js to introduce itself, and it will show you which version it is. Cool, right?

5. Now, type `npm -v` and press Enter again. This time, npm will tell you its version. It's like saying, "Hey, I'm here too!"

If everything went well, you should see the versions of Node.js and npm that you just installed. And that's it! You're all set and ready to start using Node.js and npm to build amazing projects with JavaScript. Have fun exploring the amazing world of web development!

### 2.2 Creating a New Next.js Project

Now that we have Node.js and npm installed, we can create a new Next.js project. Open a terminal or and run the following commands:

1. Create a new Next.js project:

npx create-next-app my-next-app

Or whatever you want to name it

2. Navigate to the project directory:

cd my-next-app

3. Start the development server:

npm run dev

Next.js will set up a new project with a basic folder structure and start the development server at `http://localhost:3000`. You can access this URL in your web browser to see the initial Next.js application.

## 3***. Designing the Web Application: Bring Your Creativity to Life.***

\*A Great-Looking Web Interface is Super Important\*

1. Imagine you have a really beautiful website with smart recommendations just for you! But to make it awesome, we need to design it well. Artists, time to bring your creativity to life.

2. To do that, we'll use something called React components. They are like building blocks that create different parts of our website.

3. We'll make sure our website looks nice and organized by giving each component its own special style. It's like choosing nice colors and shapes for different parts.

4. We'll use a special trick called CSS Modules to make sure our styles don't get mixed up and cause a mess. CSS Modules are like name tags for each style, so they only apply to the right parts.

5. Now, we'll create different pages for our website, like a home page and a recommended content page. It's like dividing the website into sections for easy navigation.

6. We'll set up buttons or links to help users move between these pages. It's like creating a map to guide them through the website.

And that's it! By designing the user interface using React components and adding some stylish CSS magic, we'll make our web application with AI recommendations look super trendy and easy to use. Users will love it!

### 3.1 Building the User Interface with React Components

React components form the building blocks of the user interface in Next.js applications. We'll create reusable components to display content, receive user feedback, and show recommended items.

I guess it sounds confusing, lol 😂, it’s not that difficult, let’s dive into it.

let's have some fun explaining the code!

\*Header Component\*

jsx

// components/Header.js

import React from 'react';

// Hey, I'm a special component called Header!

const Header = () => {

// When someone asks, "What do you do?"

// I say, "I return a cool header that says 'My Web Application'!"

// And that's all I do here , creating the header for your web app! I don’t do much but without me, your web app is trash 🗑

return <header>My Web Application</header>;

};

// Don't forget to tell all your friends I'm here to make their web app look awesome!

export default Header;

\*ContentCard Component\*

jsx

// components/ContentCard.js

import React from 'react';

// Hey, I'm another special component called ContentCard!

const ContentCard = ({ title, description }) => {

// I have a cool trick! I take two things - a title and a description.

// And then, guess what? I use them to create a beautiful card for you!

// Inside my card, I put the title as a big heading (h2) and the description as a little paragraph (p).

// It's like having a card with a nice title and a little note!

return (

<div className="content-card">

<h2>{title}</h2>

<p>{description}</p>

</div>

);

};

// Woo-hoo! Everyone can use me to make amazing content cards on their web app and I like to believe I’m more important.

export default ContentCard;

So, in these fun explanations, we met two amazing characters - `Header` and `ContentCard` components. The `Header` loves to create a beautiful header for the web app, while the `ContentCard` enjoys making cool cards with titles and descriptions. They are all set to make your web application look fantastic! Just use them in your code, and they'll do their magic. Enjoy building awesome web apps!

***### 3.2 Adding Styling with CSS Modules: Your Favorite Makeup Artists***

Next.js supports CSS Modules, which allow us to scope CSS styles to specific components and prevent global style conflicts. CSS is like your favorite makeup artist, glamming you up.

css

let's make CSS fun to understand!

\*Header Styling\*

css

/\* styles/Header.module.css \*/

/\* Hey there! I'm the best makeup artist for the header! \*/

header {

/\* When I work, I speak beauty I give the header a nice dark color like the night sky! \*/

background-color: #333;

/\* And I make the text inside the header bright white, so it shines like stars! \*/

color: #fff;

/\* To make it cozy, I add some padding all around, like a warm hug! I am just amazing 🤩 \*/

padding: 1rem;

/\* And finally, I make you the center of attraction, I make sure the text is in the center of the header, like a moon in the sky! \*/

text-align: center;

}

\*ContentCard Styling\*

css

/\* styles/ContentCard.module.css \*/

/\* Hey, I'm the amazing makeup artist for the content cards! \*/

.content-card {

/\* My first trick - I draw a border around the card, like a nice frame! \*/

border: 1px solid #ccc;

/\* To keep things comfy, I add some padding inside the card, like a soft cushion! \*/

padding: 1rem;

/\* And I give some space around the card, like a friendly buffer zone! \*/

margin: 1rem;

}

/\* Oh, here's something special! I dress up the title inside the card with a cool color! \*/

.content-card h2 {

color: #333;

/\* I also make sure the title has a little space at the bottom, like a stylish gap! \*/

margin-bottom: 0.5rem;

}

/\* And the description inside the card? I give it a different color - like a unique personality! \*/

.content-card p {

color: #666;

}

In this fun world of CSS, we have fantastic but proud makeup artist - one for the `Header` and another for the `ContentCard`. The `Header` stylist loves to create a dark night sky with bright shining stars, while the `ContentCard` stylist enjoys making cozy cards with borders like frames and soft cushions inside. The title gets a cool color and a little gap, and the description gets a unique personality with a different color. Together, they make your web app look super stylish and attractive! Enjoy the beauty world of CSS! 🎨✨

***### 3.3 Creating Pages and Navigation***

Back to the kitchen illustration! Our pages are like our ingredients and spices e.g the onions, the pepper, the pasta…

\*HomePage - The Starting Point\*[our cooking H2O]

jsx

// pages/index.js

// Hey there! I'm the HomePage, I’m like the water you use in cooking, very important, I go first. This is the first page of your Fire web app!

// First,you add the mini spices into me, I bring in the awesome Header[spice] to greet your users with a warm welcome!

import Header from '../components/Header';

// Then, I summon the amazing ContentCard to display your cool content! Another spice,

import ContentCard from '../components/ContentCard';

// Now, I’ll add seasoning. I'll introduce myself to your users with a friendly message and tell them to start exploring!

const HomePage = () => {

return (

<>

{/\* Here comes the Header, waving hello to your users! \*/}

<Header />

{/\* And now, behold the ContentContainer, where your content magic happens! \*/}

<div className="content-container">

{/\* Ta-da! The ContentCard is here to show a title and description like a tour guide! \*/}

<ContentCard title="Welcome to My Web App" description="Start exploring content!" />

</div>

</>

);

};

// I'm ready to go and show the world your fantastic HomePage!

export default HomePage;

\*RecommendedPage - The Appetizer \*

jsx

// pages/recommended.js

// Hello there! I'm the RecommendedPage, I am like a clickbait, you can also call me your personal guide to amazing content!

// Just like before, I'll bring in the super cool Header to greet your users!

import Header from '../components/Header';

// And of course, the trusty ContentCard will join me to show your personalized recommendations!

import ContentCard from '../components/ContentCard';

// Now, I'll take the spotlight and show your users some awesome content recommendations!

const RecommendedPage = () => {

return (

<>

{/\* The Header is here again to make your users feel at home! \*/}

<Header />

{/\* Now, prepare to be amazed - the ContentContainer awaits with personalized magic! \*/}

<div className="content-container">

{/\* The ContentCard has a special message just for your users! \*/}

<ContentCard title="Recommended Content" description="Here are some personalized recommendations!" />

</div>

</>

);

};

// I make you savor the aroma of the meal before you taste it. Time to shine and present your tailored recommendations to the world!

export default RecommendedPage;

In this fantastic kitchen of Next.js pages, we have the Initial H20 and spices which is the HomePage and the Appetizer which is the RecommendedPage. The HomePage is the friendly starting point, welcoming your users and encouraging them to explore your content like an adventure. Meanwhile, the RecommendedPage is like a personal guide, showing your users the most amazing and personalized content recommendations, making them feel special.

With these two amazing (meal)pages, your web app is all set to take your users on an unforgettable journey making you savor all through! Enjoy the Kitchen atmosphere of Next.js! ✨

***## 4. Data Collection and Preprocessing***

Welcome to the kitchen of chef AI recommendation systems! 🌟✨ Here, we'll explore how these systems create personalized suggestions that feel like they were made just for you! 🎁💁‍♂️

\*4.1 Understanding User Data: The Secret Sauce\*

Imagine the AI recommendation system as the People-pleaser Chef , eager to satisfy your desired cuisine. But to work its magic, he needs to know more about you! 🧐 That's where user data comes in, like the Chef treasure map to your preferences.

This treasure map holds precious information about what you like, such as what content you view, what you give thumbs up to (likes), and even what you can't resist buying! 💰😉 All these interactions tell the Chef what you enjoy the most, so it can pick out the most exquisite meal recommendations just for you!

\*4.2 Collecting User Feedback: Let Your Voice Be Heard\*

The chef wants to ensure your journey is nothing short of amazing! So, he encourages you to share your thoughts and feelings about the cuisines he suggests. He sets up special feedback forms and buttons just for you! 📝💬

Whenever you find a recommendation that steals your heart, you can give him a thumbs up or leave a little appreciation note (review) for the chef to read. This feedback is like magic fuel that helps the chef fine-tune his skills, making his future suggestions even more delightful! 🌟

\*\*4.3 Preprocessing Data: The Magic Cleaner

You know how dirty and scattered the kitchen gets, still the chef does wonderfully well.

Now, you might wonder how the chef manages to handle so much data[ingredients, dishes, pots and the whole kitchen] and still give you those spot-on meals! 🤔 Well, behind the scenes, the chef has a magic cleaner that helps him preprocess and clean the data before using it. 🪞✨

The magic cleaner makes sure there are no missing puzzle pieces in the data, fixing any gaps it finds. It also transforms the data into a special format that the chef understands, like translating it into a secret language only they share! 🗝🔢

And last but not least, the magic cleaner puts all the numerical data on the same scale, so the chef doesn't get overwhelmed. It's like making sure everyone speaks the same kitchen language!

With this sparkling, sparkling clean data,[kitchen, ingredients and spices] the chef is ready to weave its exquisite ingredients of personalized recommendations, making your meal journey one for the storybooks!

So, with user data and some magical preprocessing, the AI recommendation system is all set to sprinkle its magic and bring you the meal of your dreams! ✨ Enjoy the wonders of personalized recommendations.

***## 5. Building the AI Recommendation System***

Welcome to the Kitchen of AI Recommendation System Building, where we'll unravel the secrets of crafting personalized suggestions that feel like they were sprinkled with cinnamon

\*5. Building the AI Recommendation System: Unleashing the Recipe\*

Now that we've collected and polished the treasure trove of user data, it's time to put that magic to work! 🌟✨ In this exciting chapter, we'll build the heart of our recommendation system that will make cuisines dreams come true!

\*5.1 Collaborative Filtering Algorithm: The Magic of Making Friends\*

It’s your wedding anniversary and you're throwing a fantastic party, and you want to invite guests who share similar taste buds with you. That's exactly what collaborative filtering does! It's like a social butterfly 🦋, observing how users interact with items and finding soulmates who like similar meals.

We have two charming algorithms here, the user-based and the item-based! 🕺💃 The user-based algorithm introduces you to people who have the same tastes as you. It's like finding your foodie buddies! 🤗

On the other hand, the item-based algorithm plays matchmaker with items, introducing them to items that are similar in content. It's like pairing up books with similar magical adventures or movies with thrilling quests!

\*5.2 Implementing Content-Based Filtering: The Magic of Similarity\*

In this corner, we have the marvelous content-based filtering, your personal matchmaker for item based on their unique attributes and features!

Imagine you have a fantastic Italian food menu, and you want to find similar cuisines to add to your favorite meal. 🖼️✨ Content-based filtering does just that! It looks at the unique characteristics of items and matches them with others that have similar traits.

For example, if you love French fries with chicken , this magical algorithm will make sure you get more fantastical meal ideas that tickle your taste buds!

\*5.3 Hybrid Recommendation Approach: The Best of Both Worlds\*

Now, it's time for the final show, where we bring together the best of both worlds in our hybrid recommendation approach!

Just like a brilliant conductor leading an orchestra, the hybrid approach combines collaborative filtering and content-based filtering to create an enchanting symphony of diverse and accurate recommendations!

It's like having not one but two assistants granting your content wishes! The collaborative filtering assistant finds friends who adore the same content as you, while the content-based filtering assistant searches for unique gems tailored to your tastes.

Together, they ensure you get a magical mix of recommendations that will make your content journey an unforgettable adventure!

With these three exquisite matchmakers – collaborative filtering, content-based filtering, and the hybrid approach – our AI Recommendation System is ready to create a personalized wonderland of content for you! Enjoy your magical content journey, dear explorer!

*\*\*\*500 years earlier\*\**

*Welcome, AVENGERS, Based on our quests to find out the alien secrets , we had to travel into the future, now our time travelers are back. With a standing ovation let’s welcome the time travelers for their speech. Hello, we are the avenger time travelers and we will be taking you on a journey to the grand finale of our AI Recommendation System Building adventure! ✨*

\*5.4 Training and Evaluating the Recommendation Model: The Alien School of Training\*

To ensure our spellbinding recommendation system works like a charm, we must train it with historical user data. It's like sending our AI apprentice to an alien school to learn from past experiences!

But wait, we can't just trust it blindly, because the aliens are tricky! We'll put it to the test using metrics like precision, recall, and Mean Average Precision (MAP). See this as our alien exams to see how well our apprentice can make spot-on recommendations!

***\*6. Integrating the AI Recommendation System with Next.js: Uniting Aliens and Technology\****

Now that our AI apprentice is a certified recommendation expert, we'll integrate it with our Next.js web application! It's like inviting our aliens friend to join our awesome adventure!

\*6.1 Setting up API Routes: The Alien Messengers\*

Our Next.js web app needs to talk to the AI recommendation system, right? To do that, we'll set up special Alien messengers, also known as API routes! 📨✉️ They handle requests between the frontend and backend like enchanted carriers!

\*6.2 Sending User Data to the Recommendation Model: The Personalization Formula\*

To make recommendations truly personal, we'll create API endpoints that receive user data! It's like crafting a special formula just for you based on your unique preferences!

\*6.3 Receiving and Displaying Recommended Content: The Treasure Hunt\*

With our API potions in place, our Next.js pages can call them and fetch the recommended content! It's like going on a treasure hunt, discovering hidden gems meant just for you!

***\*7. Enhancing User Experience with Real-Time Recommendations: Real-Time Magic\****

Ah, imagine experiencing real-time magic! We'll implement WebSocket, a spell that enables instant communication between the web app and the server!

\*7.1 Implementing WebSocket for Real-Time Interaction: The Alien Messenger Dove\*

WebSocket acts like a alien messenger dove, carrying messages back and forth without the need for page refreshes! It ensures you get real-time updates and recommendations as you interact with the application!

\*7.2 Updating Recommendations in Real-Time: The Living Recommendations\*

When you give feedback or interact with the app, our AI recommendation system, like our oracle, uses WebSocket to update recommendations instantly! It's like having the recommendations come alive and respond to your every move!

***\*8. Handling Security and Privacy: The Lock and Key\****

Of course, as responsible AVENGERS, we need to ensure security and privacy! We'll use supernatural encryption techniques, like alien locks and keys, to protect your sensitive data! 🔐🔒

\*8.2 User Consent and Data Handling Policies: The Alien Agreement\*

We'll also implement consent mechanisms, like an alien agreement between us and the users! It ensures we handle their data with respect and care, just like trusted friends!

***\*9. Testing and Debugging: The Alien Wand of Reliability***\*

In the realm of web development, proper testing and debugging are like our trusty wands! They ensure our potions work as expected and fix any mischief that might arise!

\*9.1 Unit Testing and Test-Driven Development (TDD): The Alien Trials\*

We'll create unit tests to test every potion—oops, I mean component, API routes, and the recommendation system! It's like taking our Alien creations to trials to prove their worthiness!

\*9.2 Debugging Next.js Applications: The Magnifying Glass\*

When we encounter issues, fear not! Next.js provides us with an magnifying glass to spot the disgusting bugs and zap them away!

***\*10. Deployment and Scaling: The Grand Alien Show\****

It's showtime, folks! We'll deploy our web application and AI recommendation system to production like a grand Alien show, dazzling users worldwide!

\*10.2 Scaling the AI Recommendation System: More Alien potion, More Users\*

As our user base grows, our recommendation system may feel the pressure! But fear not, we'll discuss scaling strategies to keep the magic flowing even under high user traffic! 🌟📈

***\*11. Performance Optimization: The Speed Potion\****

Optimizing performance is like using a speed potion! We'll use code splitting and lazy loading to ensure our web app loads with speed and caching to serve recommendations faster than a lightning bolt!

***\*12. Monitoring and Analytics: The All-Seeing Eyes\****

With our all-seeing eye—oops, I mean monitoring tools—we'll keep an eye on the web app's performance and user interactions! It's like having a magical oracle guiding us to perfection!

***\*13. Future Improvements and Enhancements: The Never-Ending Quest\****

In the ever-changing world of technology, our adventure never ends! We'll explore advanced AI algorithms, deeper personalization, and even social media integration! It's like an infinite quest for better and more alien experiences!

***\*14. Conclusion: The Grand Finale\****

*In the end, our AI-powered web application with Next.js is a tale of adventure, where alien meets technology to create personalized experiences that users will love! It's like weaving an alien spell that keeps users coming back for more!*

*So, fellow AVENGERS, go forth and continue building web applications with AI recommendation systems, creating delightful experiences for users far and wide! 🚀🌈 May the Alien Sorcery never fade, and the adventure never end! Enjoy coding! 🎉✨*

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