Externship Project Report

AI-powered Nutrition Analyzer for Fitness Enthusiasts with Visual Recognition

Track: Artificial Intelligence

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VIT®

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(Deemed to be University under section 3 of UGC Act, 1956)

1. INTRODUCTION

1.1 Overview:

Food is essential for human life and has been the concern of many healthcare conventions. Nowadays new dietary assessment and nutrition analysis tools enable more opportunities to help people understand their daily eating habits, exploring nutrition patterns and maintain a healthy diet. Nutritional analysis is the process of determining the nutritional content of food. It is a vital part of analytical chemistry that provides information about the chemical composition, processing, quality control and contamination of food.

1.2 Purpose:

The main aim of the project is to building a model which is used for classifying the fruit depends on the different characteristics like colour, shape, texture etc. Here the user can capture the images of different fruits and then the image will be sent the trained model. The model analyses the image and detect the nutrition based on the fruits like (Sugar, Fiber, Protein, Calories, etc.).

2. LITERATURE SURVEY:

• Nutrition is vital to the growth of the human body. Nutritional analysis guarantees that the meal meets the appropriate vitamin and mineral requirements, and the examination of nutrition in food aid in understanding the fat proportion, carbohydrate dilution, proteins, fiber, sugar, and so on. Another thing to keep in mind is not to exceed our daily calorie requirements. If this limit is surpassed, we may become fat.

• An app called “Eatly” uses the user’s food photograph to grade the meal into one of three categories: “very healthy,” “it’s O.K.”, and “unhealthy.” However, rather than being done automatically by automated systems, the rating is really done manually by the app’s user base.

• DeepFood: Computer-Assisted Nutritional Assessment Using Deep Learning to Recognize Food Images – In order to solve this issue, a brand-new Convolutional Neural Network (CNN)-based food picture identification system was created, as described in this study. We utilized our suggested strategy on two sets of actual food picture data (UEC-256 and Food-101).

• Snap Meal Meal Snap for iPhone: Magical Meal Logging – This program asks the user to snap a picture, provide information such whether they are having breakfast or lunch, and add a brief text caption in order to estimate the number of calories. The accuracy of calorie prediction is inconsistent, though, and is mostly reliant on how well individuals directly input text.

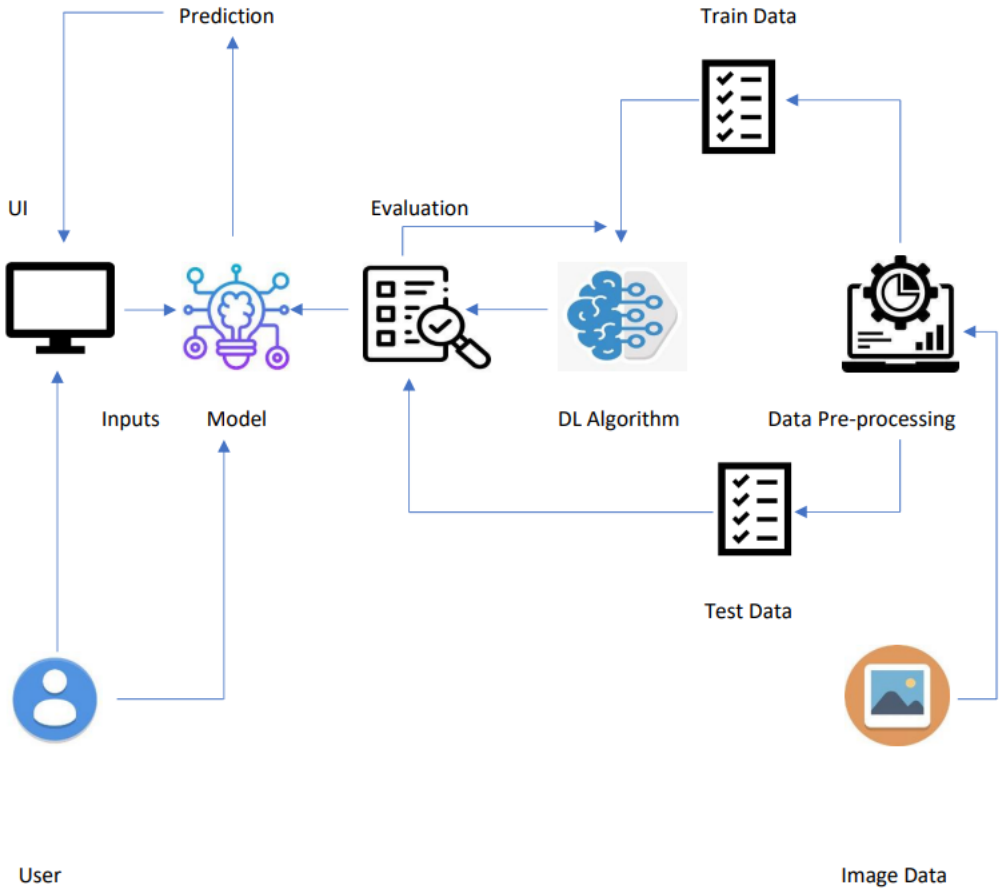
• Neutrino: Artificial Intelligence Nutrition App. As the name implies, the app provides nutrition-based analytics and data to its customers and is quickly becoming a prominent platform for offering AI fitness services. It deploys

predictive analysis for personalized data compilation using mathematical and natural language processing (NLP) models. Furthermore, it shares nutrition-related data with its partners via SDK and API integration to improve its services and product offerings. It Is an Israel-based firm created in 2011 that allows pregnant women to customise their body's nutritional requirements. This software collaborated with IBM's natural language capability to provide 24-hour assistance and dietary recommendations.

• MyFitnessPal app creates a daily food diary for you by recognizing the food from photos you shoot. It is supposed to be as simple as that. You take a picture, dial in data such as whether you are eating breakfast or lunch and add a quick text label, and the app estimates the calorie content. It does a pretty good job, although its estimate can be a bit unpredictable. It also needs a network connection, which is something to think about when eating out.

3. THEORITICAL ANALYSIS:

3.1 Block Diagram:

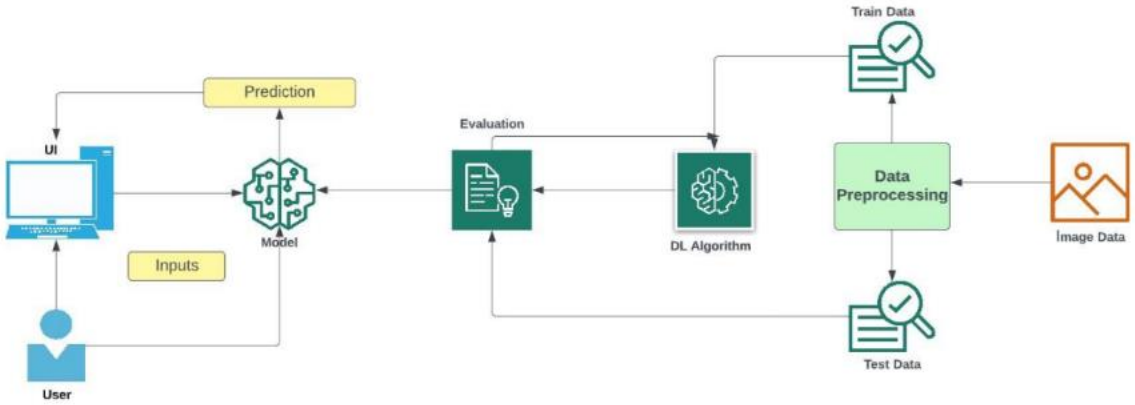


3.2 Hardware/Software Designing:

1. Application: User interacts with application for the prediction of Nutrition Python, Java, HTML,SQL,Android studio,JavaScript,ReactJS,tailwindCSS
2. Database: Data Type, Configurations and data will be stored MySQL, JavaScript
3. Cloud Database: Database Service on Cloud IBM DB2, IBM Cloudland, etc
4. File Storage: File storage requirements The storage will be based on Cloud
5. Machine Learning: Purpose of Machine Learning Model ANN, CNN, RNN
6. Notification: Notification will be sent from the server SendGrid
7. File Storage: File storage requirements IBM Block Storage or Other Storage Service or Local Filesystem
8. External API: Purpose of External API used in the application Aadhar API, Stripe
9. Machine Learning Model: Purpose of Machine Learning Model OpenCV, MATLAB
10. Infrastructure: (Server / Cloud) Application Deployment on Local System / Cloud Local Server Configuration: Cloud Server Configuration : Local, Cloud Foundry, Kubernetes, etc.

4. EXPERIMENTAL INVESTIGATIONS:

5. FLOWCHART



6. RESULT

Banana.jpg

Nutrition Analyzer Home Search Search

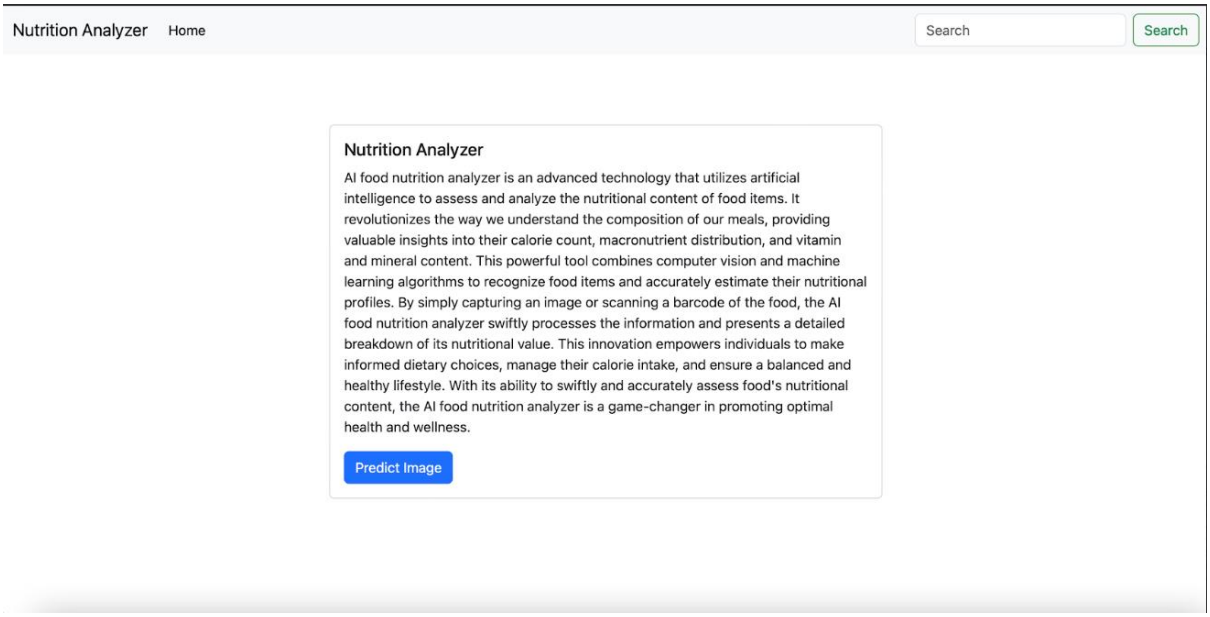
name	banana
calories	89.4
serving_size_g	100
fat_total_g	0.3
fat_saturated_g	0.1
protein_g	1.1
sodium_mg	1
potassium_mg	22
cholesterol_mg	0
carbohydrates_total_g	23.2
fiber_g	2.6
sugar_g	12.3

Nutrition Analyzer Home Search Search

Default file input example

Choose File banana.jpg

Predict



7. ADVANTAGES AND DISADVANTAGES

7.1 Advantages:

1. Clear identification of fruits and vegetables: The AI-based analyzing software can accurately identify fruits and vegetables based on their color, texture, form, and other characteristics. This allows users to easily determine the type of fruit or vegetable they are dealing with.

2. Nutritional information: Providing nutritional facts based on the identified fruits and vegetables helps users make informed decisions about their food choices. It promotes healthier eating habits and allows individuals to track their nutritional intake.

3. Fitness analysis and maintenance: The solution offers fitness analysis and maintenance features tailored to the user's body conditions. This can help individuals track their fitness goals and maintain a healthy lifestyle.

4. Analysis of daily dietary requirements: The solution provides analysis of daily dietary requirements, ensuring that users are meeting their nutritional needs. This can be particularly beneficial for individuals with specific dietary restrictions or health conditions.

5. Daily tracking of dietary consumption: The ability to track dietary consumption thoroughly allows users to monitor their food intake and make adjustments as needed. This feature promotes accountability and helps individuals stay on track with their dietary goals.

7.2 Disadvantages:

1. Accuracy limitations: While AI-based analyzing software can be highly accurate, there may still be instances where fruits and vegetables are misidentified. This could lead to incorrect nutritional information or fitness analysis, potentially impacting user decisions.

2. Data collection challenges: Expanding the data collection using user input data requires a large and diverse dataset. Collecting and maintaining such data can be a challenge, especially if there is limited user participation or availability of reliable data sources.

3. Storage requirements: Storing and managing data for a wide range of fruits and vegetables, along with their nutritional information, can require significant storage capacity. This may pose scalability challenges, especially if the solution aims to include a comprehensive food database.

4. User interface complexity: While the solution aims to be user-friendly, designing an intuitive and easy-to-use interface that accommodates different user needs and preferences can be challenging. Ensuring a seamless user experience requires careful design and testing.

5. Expertise and consultation limitations: Relying on consultation with trainers and nutritionists for personalized plans may limit accessibility for users who don't have easy access to such experts or cannot afford their services. This can result in a less personalized experience for certain individuals.

8. APPLICATIONS

1. Food Logging and Calorie Tracking: Fitness enthusiasts can use the AI-powered Nutrition Analyzer to accurately log and track their food intake. By simply taking a photo or video of their meals, the system can identify the foods and provide nutritional information, including calorie counts. This helps users monitor their calorie intake and make informed decisions about their diet.

2. Macro and Micronutrient Analysis: The Nutrition Analyzer can analyze the composition of the food and provide detailed information about the macro and micronutrients present. Fitness enthusiasts can track their protein, carbohydrate, and fat intake, as well as essential vitamins and minerals. This information is valuable for individuals following specific dietary plans or aiming to achieve certain fitness goals.

3. Meal Planning and Recipe Suggestions: Based on the identified foods and their nutritional content, the AI-powered system can suggest personalized meal plans and recipes tailored to the fitness enthusiast's goals and dietary preferences. It can provide recommendations for balanced meals that meet specific nutrient requirements, helping users optimize their nutrition for fitness and performance.

4. Allergen and Ingredient Detection: The Visual Recognition capability of the AI system can identify specific ingredients and detect potential allergens in foods. This is particularly useful for fitness enthusiasts with dietary restrictions or allergies, allowing them to avoid ingredients that may negatively impact their health or fitness goals.

5. Nutritional Guidance and Recommendations: The AI-powered Nutrition Analyzer can provide real-time guidance and recommendations based on the user's current nutrition and fitness data. It can suggest adjustments to their diet to optimize their nutrient intake, improve performance, or support specific fitness goals such as muscle gain or weight loss.

9. CONCLUSION

• This model will be useful for every category people irrespective of age and gender.
• Using this model we'll know the exact amount of nutritional content in the food we have which is very useful as it is very important to take care of one's health.
• It takes input as image and uses machine learning and deep learning algorithms to analyze the nutritional content in the food and calories in it.

10. FUTURE SCOPE

1. Enhanced Accuracy and Food Recognition: As AI algorithms continue to improve, the accuracy of food recognition and nutritional analysis will likely increase. AI models can be trained on larger and more diverse datasets, leading to better recognition of various foods, ingredients, and portion sizes. This will result in more precise nutritional information for users.

2. Personalized Recommendations: Future iterations of AI-powered Nutrition Analyzers can provide even more personalized recommendations based on individual goals, preferences, and health conditions. The system can leverage machine learning techniques to understand each user's unique needs and offer tailored meal plans, recipe suggestions, and nutritional guidance.

3. Integration with Smart Kitchen Appliances: With the rise of smart home technology, AI-powered Nutrition Analyzers can integrate with smart kitchen

appliances such as smart scales, food processors, and connected cooktops. This integration can enable seamless tracking of ingredients, portion sizes, and cooking methods, providing users with real-time nutritional analysis as they prepare their meals.

4. Real-time Monitoring and Feedback: Future Nutrition Analyzers can offer real-time monitoring and feedback during meals. For example, using computer vision technology, the system can analyze eating speed, portion control, and meal composition, providing instant feedback and suggestions for healthier choices or adjustments to optimize nutrition.

5. Behavioral Insights and Habit Formation: AI algorithms can analyze user behavior patterns and provide insights on eating habits, emotional eating triggers, and meal planning consistency. This information can help users identify areas for improvement, establish healthy eating habits, and sustain long-term dietary changes.

11. BIBLIOGRAPHY

• Snap Meal Snap for iPhone: Magical Meal Logging: https://apps.apple.com/us/app/mealsnap-photo-food-diary/id1431522193

• AI-Powered Nutrition Apps That Help Fitness Enthusiasts with Their Calorie Intake: https://analyticsindiamag.com/5-ai-powered-nutrition-apps-thathelp-fitness-enthusiasts-with-their-calorie-intake/

• Watch what you eat, using your phone: https://www.deccanherald.com/content/384169/watch-you-eat-usingyour.html

• Neutrino- Artificial Intelligence Nutrition App: https://www.nutrinohealth.com/

https://www.fitnessai.com/

APPENDIX A

Home.html:

```
<!DOCTYPE html>
<html lang="en">
  <head>
    <meta charset="utf-8" />
    <meta name="viewport" content="width=device-width, initial-scale=1" />
    <title>analyzer</title>
    <link
      href="https://cdn.jsdelivr.net/npm/bootstrap@5.3.0/dist/css/bootstrap.min.css"
      rel="stylesheet"
      integrity="sha384-9ndCyUaIbzAi2FUVXJi0CjmCapSmO7SnpJef0486qhLnuZ2cdeRhO02iuK6FUUVM"
      crossorigin="anonymous"
    />
  </head>
  <body>
    <nav class="navbar navbar-expand-lg bg-body-tertiary">
      <div class="container-fluid">
        <a class="navbar-brand" href="#">Nutrition Analyzer</a>
        <button
          class="navbar-toggler"
          type="button"
          data-bs-toggle="collapse"
          data-bs-target="#navbarSupportedContent"
          aria-controls="navbarSupportedContent"
          aria-expanded="false"
          aria-label="Toggle navigation"
        >
          <span class="navbar-toggler-icon"></span>
        </button>
```

```
        <div class="collapse navbar-collapse" id="navbarSupportedContent">
          <ul class="navbar-nav me-auto mb-2 mb-lg-0">
            <li class="nav-item">
              <a class="nav-link active" aria-current="page" href="/">Home</a>
            </li>
          </ul>
          <form class="d-flex" role="search">
            <input
              class="form-control me-2"
              type="search"
              placeholder="Search"
              aria-label="Search"
            />
            <button class="btn btn-outline-success" type="submit">
              Search
            </button>
          </form>
        </div>
      </div>
    </nav>

    <div
      class="card position-absolute top-50 start-50 translate-middle"
      style="width: 40rem"
    >
      <div class="card-body">
        <h5 class="card-title">Nutrition Analyzer</h5>
        <p class="card-text">
```

```
          <p class="card-text">
            AI food nutrition analyzer is an advanced technology that utilizes
            artificial intelligence to assess and analyze the nutritional content
            of food items. It revolutionizes the way we understand the composition
            of our meals, providing valuable insights into their calorie count,
            macronutrient distribution, and vitamin and mineral content. This
            powerful tool combines computer vision and machine learning algorithms
            to recognize food items and accurately estimate their nutritional
            profiles. By simply capturing an image or scanning a barcode of the
            food, the AI food nutrition analyzer swiftly processes the information
            and presents a detailed breakdown of its nutritional value. This
            innovation empowers individuals to make informed dietary choices,
            manage their calorie intake, and ensure a balanced and healthy
            lifestyle. With its ability to swiftly and accurately assess food's
            nutritional content, the AI food nutrition analyzer is a game-changer
            in promoting optimal health and wellness.
          </p>
          <a href="/image" class="btn btn-primary">Predict Image</a>
        </div>
      </div>

      <script
        src="https://cdn.jsdelivr.net/npm/bootstrap@5.3.0/dist/js/bootstrap.bundle.min.js"
        integrity="sha384-geWF76RCwLtnZ8qwWowPQNguL3RmwHVBC9FhGdlKrxdiJJigb/j/68SIy3Te4Bkz"
        crossorigin="anonymous"
      ></script>
    </body>
  </html>
```

Image.html:

```html
<!DOCTYPE html>
<html lang="en">
  <head>
    <meta charset="utf-8" />
    <meta name="viewport" content="width=device-width, initial-scale=1" />
    <title>analyzer</title>
    <link
      href="https://cdn.jsdelivr.net/npm/bootstrap@5.3.0/dist/css/bootstrap.min.css"
      rel="stylesheet"
      integrity="sha384-9ndCyUaIbzAi2FUVXJi0CjmCapSmO7SnpJef0486qhLnuZ2cdeRhO02iuK6FUUVM"
      crossorigin="anonymous"
    />
  </head>
  <body>
    <nav class="navbar navbar-expand-lg bg-body-tertiary">
      <div class="container-fluid">
        <a class="navbar-brand" href="#">Nutrition Analyzer</a>
        <button
          class="navbar-toggler"
          type="button"
          data-bs-toggle="collapse"
          data-bs-target="#navbarSupportedContent"
          aria-controls="navbarSupportedContent"
          aria-expanded="false"
          aria-label="Toggle navigation"
        >
          <span class="navbar-toggler-icon"></span>
        </button>
```

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```html
        <div class="collapse navbar-collapse" id="navbarSupportedContent">
          <ul class="navbar-nav me-auto mb-2 mb-lg-0">
            <li class="nav-item">
              <a class="nav-link active" aria-current="page" href="/">Home</a>
            </li>
          </ul>
          <form class="d-flex" role="search">
            <input
              class="form-control me-2"
              type="search"
              placeholder="Search"
              aria-label="Search"
            />
            <button class="btn btn-outline-success" type="submit">
              Search
            </button>
          </form>
        </div>
      </div>
    </nav>

    <div
      class="position-absolute top-50 start-50 translate-middle"
      style="width: 40rem"
    >
      <form methord="POST">
        <div class="mb-3">
          <label for="formFile" class="form-label"
```

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```
          </form>
        </div>
      </div>
    </nav>

    <div
      class="position-absolute top-50 start-50 translate-middle"
      style="width: 40rem"
    >
      <form methord="POST">
        <div class="mb-3">
          <label for="formFile" class="form-label"
            >Default file input example</label
          >
          <input class="form-control" type="file" id="formFile" />
        </div>
        <a href="/predict" class="btn btn-primary">Predict</a>
      </form>
    </div>

    <script
      src="https://cdn.jsdelivr.net/npm/bootstrap@5.3.0/dist/js/bootstrap.bundle.min.js"
      integrity="sha384-geWF76RCwLtnZ8qwWowPQNguL3RmwHVBC9FhGdlKrxdiJJigb/j/68SIy3Te4Bkz"
      crossorigin="anonymous"
    ></script>
  </body>
</html>
```

ted Mode ⊗ 0 ⚠ 0 Ln 23, Col 27 Spaces: 2 UTF-8

Empty.html:

```
<!DOCTYPE html>
<html lang="en">
  <head>
    <meta charset="utf-8" />
    <meta name="viewport" content="width=device-width, initial-scale=1" />
    <title>analyzer</title>
    <link
      href="https://cdn.jsdelivr.net/npm/bootstrap@5.3.0/dist/css/bootstrap.min.css"
      rel="stylesheet"
      integrity="sha384-9ndCyUaIbzAi2FUVXJi0CjmCapSmO7SnpJef0486qhLnuZ2cdeRhO02iuK6FUUVM"
      crossorigin="anonymous"
    />
  </head>
  <body>
    <nav class="navbar navbar-expand-lg bg-body-tertiary">
      <div class="container-fluid">
        <a class="navbar-brand" href="#">Nutrition Analyzer</a>
        <button
          class="navbar-toggler"
          type="button"
          data-bs-toggle="collapse"
          data-bs-target="#navbarSupportedContent"
          aria-controls="navbarSupportedContent"
          aria-expanded="false"
          aria-label="Toggle navigation"
        >
          <span class="navbar-toggler-icon"></span>
        </button>
```

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```
        <div class="collapse navbar-collapse" id="navbarSupportedContent">
          <ul class="navbar-nav me-auto mb-2 mb-lg-0">
            <li class="nav-item">
              <a class="nav-link active" aria-current="page" href="/">Home</a>
            </li>
          </ul>
          <form class="d-flex" role="search">
            <input
              class="form-control me-2"
              type="search"
              placeholder="Search"
              aria-label="Search"
            />
            <button class="btn btn-outline-success" type="submit">
              Search
            </button>
          </form>
        </div>
      </div>
    </nav>

    <script
      src="https://cdn.jsdelivr.net/npm/bootstrap@5.3.0/dist/js/bootstrap.bundle.min.js"
      integrity="sha384-geWF76RCwLtnZ8qwWowPQNguL3RmwHVBC9FhGdlKrxdiJJigb/j/68SIy3Te4Bkz"
      crossorigin="anonymous"
    ></script>
  </body>
</html>
```

ed Mode ⊗ 0 ⚠ 0 Ln 1, Col 1 Spaces: 2 UTF-8