Hackathon Project

Project Title: CoutureAI: Clothing Image Generator Using Stable Diffusion Pipeline

Team Name: PathPavers

Team Members:

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Phase-1: Brainstorming & Ideation

Objective:

- Identify the problem statement.
- Define the purpose and impact of the project.

Key Points:

1. **Problem Statement:**
   - Traditional online shopping platforms lack the ability to offer customized visual representations of user-defined clothing styles, limiting the shopper's experience and satisfaction.
   - Users often struggle to find clothing that matches their imagination.
2. **Proposed Solution:**
   - CoutureAI integrates Diffusers' Stable Diffusion Pipeline with a user-friendly Streamlit interface to generate realistic images of clothing based on text descriptions(customized).
   - The people who can't go to a fashion designer ,can design their own outfit according to their imagination and they can check whether it looks good on them or not.
   - Text-to-Image Generation according to customer imaginations of their desired dress.

3. **Target Users:**
   - Fashion enthusiasts
   - Designers
   - Online shoppers
   - Tailors
4. **Expected Outcome:**
   - Provide users with realistic visualizations of their clothing ideas, enhancing the shopping experience and bridging the gap between imagination and reality.

Phase-2: Requirement Analysis

Objective:

- Define technical and functional requirements.

Key Points:

1. **Technical Requirements:**
   - Programming Languages: Python
   - Frameworks & Libraries: Gradio, PyTorch, Diffusers, Transformers, Accelerate, PIL
   - AI Model: Stable Diffusion (stability ai/stable-diffusion-2-1)
   - Hardware: GPU-accelerated computing
2. **Functional Requirements:**
   - User input customization for clothing (color, size, fabric, etc.).
   - AI-generated image output with various backgrounds and angles.
   - Additional AI-powered fashion suggestions and descriptions.
   - Option to save and share generated designs.
3. **Constraints & Challenges:**
   - Optimizing AI model for faster image generation.
   - Ensuring accurate rendering of fashion descriptions.
   - Performance limitations due to GPU requirements.

Phase-2: Requirement Analysis

Objective:

- Define technical and functional requirements.

Key Points:

1. **Technical Requirements:**
   - Programming Languages: Python
   - Frameworks & Libraries: Gradio, Diffusers, Transformers, Accelerate, Torch, PIL, Random
   - AI Model: Stable Diffusion (stability ai/stable-diffusion-2-1), runs on CUDA(compute unified device architecture) for high-performance text-to-image conversion.
   - Hardware: GPU-accelerated computing
2. **Functional Requirements:**
   - User customization for dress features: Type, Color, Fabric, Fit, etc.
   - View Angles: Front, Side, Back.
   - Backgrounds: Plain, Model, Runway.
   - AI-generated fashion suggestions and outfit descriptions.
   - Option to save and share generated designs.
3. **Constraints & Challenges:**
   - Optimizing AI model for faster image generation.
   - Ensuring accurate rendering of fashion descriptions.
   - Performance limitations due to GPU requirements.

Phase-3: Project Design

Objective:

- Create the architecture and user flow.

Key Points:

1. **System Architecture:**
   - User selects customization options -> AI model processes input -> Generates high-quality image -> Displays output in Gradio.
2. **User Flow:**
   - User selects dress attributes (Type, Color, Fabric, etc.), View Angle, and Background -> Clicks *Generate Dress Image* -> AI creates and displays dress image -> User can refine, get AI suggestions, and download.
3. **UI/UX Considerations:**

- ○ Clean and minimalistic web interface with Gradio.
- ○ Interactive UI elements: Textbox, Dropdowns, Radio Buttons.
- ○ Buttons: *Generate Dress Image | Get AI Suggestions.*

Phase-4: Project Planning (Agile Methodologies)

Objective:

- Break down tasks using Agile methodologies.

Key Points:

1. **Sprint Planning:**
   - ○ Sprint 1: Research & Ideation
   - ○ Sprint 2: Model Integration & Backend Development
   - ○ Sprint 3: Gradio UI Development
   - ○ Sprint 4: Testing & Refinements
2. **Task Allocation:**
   - ○ AI Model Integration - (Team Member 1)
   - ○ Gradio UI Development - (Team Member 2)
   - ○ Backend Optimization - (Team Member 3)
   - ○ Testing & UI Enhancements - (Team Member 4)
3. **Timeline & Milestones:**
   - ○ Week 1: Research and Setup
   - ○ Week 2-3: Development
   - ○ Week 4: Testing and Deployment

Phase-5: Project Development

Objective:

- Implement and integrate all components.

Key Points:

1. **Technology Stack Used:**
   - ○ Python, Gradio, Diffusers, Transformers, Accelerate, Torch, PIL
2. **Core Functions:**
   - ○ `generate_image()` → Creates & saves dress images.
   - ○ `fashion_suggestions()` → AI-powered styling ideas.
   - ○ `fashion_description()` → Generates outfit descriptions.

3. **Development Process:**
   - Implement Stable Diffusion model for fashion design.
   - Develop an interactive web UI using Gradio.
   - Integrate AI-generated fashion suggestions and descriptions.
   - Optimize image generation performance.
4. **Styling & Deployment:**
   - Custom CSS (soft colors, rounded buttons, shadows) + `demo.launch()` for deployment.
5. **Challenges & Fixes:**
   - Initial latency issues -> Optimized GPU utilization.
   - Refining prompts for better AI output -> Improved NLP techniques.

Phase-6: Functional & Performance Testing

Objective:

- Ensure accuracy and efficiency of the project.

Key Points:

1. **Test Cases Executed:**
   - Input various clothing attributes to test AI-generated accuracy.
   - Validate UI performance across different devices.
2. **Bug Fixes & Improvements:**
   - Enhanced image clarity and resolution.
   - Improved model efficiency for faster processing.
3. **Final Validation:**
   - Ensured AI-generated images align with user preferences.
4. **Deployment:**
   - Hosted on a cloud platform for accessibility.