Stable Diffusion: A New Frontier for Text-to-Image Paradigm

Abstract:

This session will introduce attendees to Stable Diffusion, a new text-to-image generation model that is more stable and efficient than previous models. Stable Diffusion is able to generate high-quality images from text descriptions, and it is well-suited for a variety of applications, such as creative content generation, product design, and marketing.

Learning Outcomes:
By the end of this session, attendees will be able to:
- Understand the basics of Stable Diffusion and how it works.
- Know whole landscape of tools and libraries for Stable Diffusion domain.
- Generate images from text descriptions using Stable Diffusion.
- Apply Stable Diffusion to their own projects and workflows.
- Understand the process of fine-tuing open source models to achieve tasks at hand.

This session is relevant to practitioners in a variety of industries, including:
Creative industries: Stable Diffusion can be used to generate images for marketing materials, product designs, and other creative projects.
Technology industries: Stable Diffusion can be used to develop new applications for text-to-image generation, such as chatbots and virtual assistants.
Research industries: Stable Diffusion can be used to conduct research on text-to-image generation and its applications.

Session Outline:

Module 1: Embark on an Exciting Journey with Generative AI
This section is to bootstrap your interest in Generative AI and mentally orient yourself in the landscape of Stable Diffusion.

- Revisit the Prerequisites: DL, ML, Optimization fundamentals needed.
- What is Generative AI: Introduction, Landscape, Domains, Sub-Fields.
- Why Generative AI: Why it matters, How to augment it, How to Capitalize on it.
- History of Generative AI: Short but Significant history, Milestones, Ahha moments.
- Why should you care about the history of Stable Diffusion: Professional Impact, Societal Implications, Technology Reshaping Information Exchange.
- Applications of Generative AI: An Umbrella look at the Concrete applied Use Cases.
- Gauging the State of Art in Stable Diffusion: What is the forefront and Who is at the forefront.

Module 2: Fundamentals of Diffusion Models
This module will be most important in terms of low level understandings of Stable Diffusion and offers an in-depth comprehension of Diffusion Methods. This module will be extremely hands-on and It encompasses:
-Explanation of Diffusion Models and their purpose.
-Acquire the Intuition behind Stable Diffusion Model.
-Paper Review: Fergus & Zeiler :Visualizing and Understanding CNNs Gradients
-Paper Review: CLIP (Contrastive Language–Image Pre-training)
-Understanding Text and Image Embeddings and Their Mutual Relation.
-Tokens as Embedding: Understanding Nuances.
-Detailed analysis of the inner workings of Diffusion Models. Understand Math and how it looks into the code.
-Setup the Stable Diffusion Development Environment and attaining GPU/vCPU stage.
-Understand the training Paradigm of Stable Diffusions.
-Hugging Face's Diffusers library, Setup of Hugging Face Spaces and API Key.

Sandeep Singh

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Title

**Head of Applied AI/Computer Vision |
Beans.ai**

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VIEW FULL SCHEDULE

-Quick overview of Google Colab for Stable Diffusion.

-How to Generate Images using State of Art Stable DIffusion Model. Code and Exercise.

Module 3: Stable Diffusion in Practice, Industrial Methods

This module takes us through the applications, which are created using Stable Diffusion and How can we create our own applications using Stable Diffusion methods and solutions. This Module includes:

- How Do We Train Stable Diffusion at Scale.

- Paper Review: Progressive Distillation for Fast Sampling of Diffusion Models

- Paper Review: On Distillation of Guided Diffusion Models

- Ethical Implications of Training a Stable Diffusion Models.

- Biggest Player contributing to Open Source Gen AI.

- How to Capitalize and Contribute to Open Source Stable Diffusion.

- Should you train Stable Diffusion from Scratch? Yes and No!

- What is considered valuable in Stable Diffusion Domain.

- Stability.ai: OpenAI, but a better and much more supporting approach.

- DreamStudio and StableStudio: Blessings of Stable Diffusion.

- Stable Diffusion WebUI Introduction and Purpose.

- Running Automatic1111 WebUI on Kaggle or any GPU Environment.

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