Brain to 3D Model (Enabling tech of 3D Printers)

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Abstract: This study was planned to conduct and to bring the novel approach of thoughts into 3D into reality by using AI techniques & Methods. The study was conducted on user EEG signals and processed into pre-trained tokens of NLP and EEG signals to identify the probability of the EEG signal approach. The translation of EEG and ECoG signals into NLP level and generate a better prompting to Solve the issue hidden in Tokens of Prompting. These Prompt Techniques produce Generative Art by using Stable diffusion to create an image. That 2 Dimension image has Raw data at the background which is removed by using u2net & ModNet to introduce a more refined format as a preprocess for 3-D artwork Generation. The study focused on using different model like shape-e by OpenAI to create a more general approach but our code used it to produce for specifically 3-D avatar character for Metaverse. Using PifuHD estimation model by Facebook and lightweight human pose estimation.3-D art produced a more refined artwork as 3-D object file that can later be used in terms of producing into 3-D printed stuff and enable 3-D Printers closer to User Access as an efficient way of Technology.

Keywords: GANs, Brain Computer Interface, 3D Reconstruction, NLP

1- Introduction

The era of stable diffusion has introduced the possibility to connect the Bridge to translate EEG signals into 3D models. The challenges of building a Model from 3D has been accomplished with the 1st step of translating EEg signals into images. The study of Mind-Vis suggests accomplishing this task with help of fMRI (functional Magnetic Resonance Imaging) but that method is not the most cost effective and expensive process to perceive with.

The method of EEG and using motor imagery to study the process and activity of the brain and translate it into Text embedding and generation of Image is cost effective.

The EEG (electroencephalogram) is a low-cost method and has potential for domestic and

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household interest to facilitate the young generation to create amazing art with this method.

The proposed method is 1st trained on a large amount of EEG dataset to be precise and address the cues of any missing token during recording of signals of EEG. The study has already cleared with one thing that noise to signal ratio is so high in EEG dataset. The process involves a Stable Diffusion model that has a nosy data pair to construct an image so the model proposed in Dream Diffusion to construct implies additional CLIP supervision to align the EEG,text and image spaces. SD itself uses text encoder to generate the embedding of text.

The pre-training of model in EEG signal as proposed in DreamDifusion to utilize the EEG signals to text while doing self-supervision, and auto-encoding, to figure out similarities and dissimilarities to the object and recover the original data from the masked portion. The CLIP approach has wide acceptance in this case to be follow-up and powerful, enabling state-of-the-art-of-the-zero-shot image classification to produce multiple datasets. The goal of the research is to produce a 3-dimensional model with fine user quality.

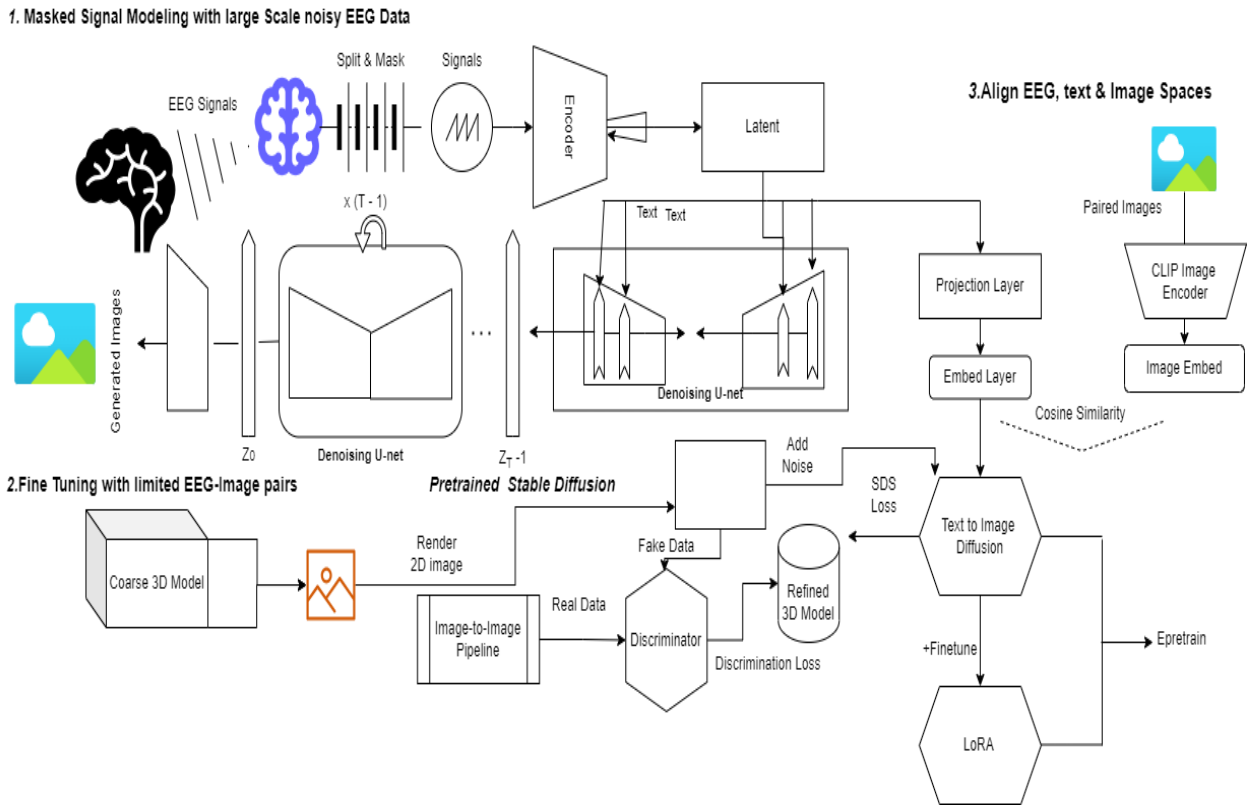


Figure 1: proposed structure of the model

1.1 Background

The Proposed bridge the intercept enhances the possibility to facilitate using DragGAN. The advancement of GANs (Generative Adversarial Network) using DragGAN which has 2 methods involving latent point level using Point Tracking & motion supervision. The interesting part is Motion supervision in our case from DragGAN.

$$L = \sum n\ i{=}0 \sum \boldsymbol{q}i \in \Omega 1\ (\ ,1)\ \|F(\boldsymbol{q}i) - F(\boldsymbol{q}i + \boldsymbol{d}i)\ \|1 + \lambda \|\ (F - F0) \cdot (1 - M)\ \|1,$$

The Feature of Pixel is as follows while using the normalizing the vector.

$$\boldsymbol{d}i = \boldsymbol{t}i{-}\boldsymbol{p}i\ \|\boldsymbol{t}i{-}\boldsymbol{p}i\ \|2$$

Using the loss of this function while doing backpropagate, the unmasked region is fixed with a reconstruction loss as the second term. The other method of point tracking has a substitute method to solve this latent code on feature maps.

$$:= \arg\min \boldsymbol{q}i \in \Omega 2\ (\boldsymbol{p}i\ ,r2)\ \|F'(\boldsymbol{q}i) - \boldsymbol{f}i\ \|1.$$

1.2 Research Objectives

The research objectives are to give the optimum solution for novel approach. Automatic 3-D content creation has been the novel approach under the Study to make it more precise. The neural Radiance Field to perceive it more accurately by techniques of supervision & backpropagation is involved in this process to enhance the possibility of 3-D mesh. The study proposed the creation of 3-D models as pre-trained over the Geometry of surface. The NeRF modeling can be improved by adding the surface rendering of a 2-D image.

Fantasia 3-D model is an automatic model to generate 3D. The study under conduct has also used the techniques to enable disentangled learning.

$$L(p, \omega) = Ld(p) + Ls(p, \omega),$$

$$Ld(p) = kd(1 - m)\ Z\ \Omega\ Li(p, \omega i)(\omega i \cdot np)d\omega i\ ,$$

$$Ls(p, \omega) = Z\ \Omega\ DF\ G\ 4(\omega \cdot np)(\omega i \cdot np)\ Li(p, \omega i)(\omega i \cdot np)d\omega i$$

1.3 Problem Statement

The pipeline of translating EEG signals and embedding them into natural language & 2-dimension Image tokens has been considered as the early process that has a more aesthetic and Faster & Economical process. This predefined process leads to use of GANs (Generative Adverse Networks) & produce high efficient images using Stable diffusion & enabled models.a 3 D reconstruction lead to produce an efficient goal of given thoughts. The final output will slve and fast process the think to reality if it is enabled to a 3D printer. The era of Nvidia innovation of high-performance GPU has facilitated the process and made it more efficient to compute the matrix of pixels.

1.4 Main Contribution

The proposed research study was focused on identifying. This is an early innovative idea to bring this innovation into reality to make it more possible but this is more persistent and long sustainable. The general Idea has been created to facilitate the use of such products and make it

accessible for the general public and support the Gaming Industry to Digital world and metaverse.

2- Literature Review

The study is more focused on Transcranial Magnetic Stimulation over the neurons and neural activity of the Brain through electroencephalography (EEG). The axon is actually provided to induce TMS that contributes to the research to accelerate the EEG signals for sensors. The study advised TMs on Faraday's law that concludes most of it' methodology to accelerate the EEG signal and it's preferred. The proposed idea is the experimental behavior of a TMS coil that induces EEG from electromagnetic behavior to accelerate it and induce EEG signal. The study observed the behavior of monophasic and biphasic pulses in an experiment with duration of 0.5 microseconds.

The study observed variations of using an EEG Amplifier to make signals more proficient and induced to follow up detect by EEG sensors to accelerate. The study advised to improve the Boundary and circuit variation to increase the noise factor sometimes. This study also added the TMS filter in Sensor to smooth the pulse from discrete to linear and making it more prominent. The TMS recharge artifacts also conclude the feed of EE signals to accelerate the pulse of EEG signals. The study is observed and these all experiments and analyzes foundation on Matlab & Simulink. The whole study concludes to the production and manufacturing of TMS-EEG techniques and their hardware manufacturing. The Study also proposed that induced artifacts cause noise if it remains in systems so it is advised to remove it in later part. The megnantic pulse would affect the signal that may cause a challenge. That filter and induced TMS is overall beneficiary of EEG signal as study has computed its performance over EEG signal but keeping that signal in system affects feed of new signal. Fieldtrip, TMS EEG, TESA, Automated aRTIfact rejection for Single-pulse TMSeEEG data (ARTIST), and EEGLAB tools used to simplify and solve the problem as the process is also discussed in the Research paper.

The study concluded that the toolbox is challenged to provide 2 ICA steps so it applied the TMS decay artifacts and then in the 2nd phase, it removed EEG induced Electromagnetic pulse to advise it sufficiently. The overall research discussed problems and methods of issue in recommended research Artifacts [1].

The study suggests that electroencephalography (EEG), a brain monitoring method with a long history of human and animal applications, has experienced continuous improvements in methodology and hardware. Initially, EEG signal analysis involved manual measurements on graph paper, but the introduction of programmable computers brought significant advancements. The event-related potential (ERP) technique was a major paradigm shift, enabling the investigation of brain responses to individual events and providing detailed insights into specific neural processes. Further breakthroughs allowed the detection of brain responses in single trials, leading to the development of brain-computer interface (BCI) systems and applications.

Originally focused on medical interventions, BCI applications now extend to industrial and commercial fields, driven by novel machine learning algorithms.

2.1 Deep Learning Approaches

The study concludes that the combination of programmable computers and advanced signal processing pipelines has revolutionized EEG research and allowed for more sophisticated analysis of brain activity. The use of ERP techniques and single-trial analysis has further expanded the potential applications of EEG and BCI systems beyond medical interventions, finding utility in various industries and consumer products. The study observes that EEG has a rich history, dating back almost a century, and has been used to record and analyze the postsynaptic activity of groups of neurons in the cerebral cortex.

Over time, EEG methodology has evolved from manual measurements to computer-aided analysis, providing researchers with valuable insights into brain responses and neural processes. The introduction of BCI systems, driven by machine learning algorithms, has opened up new possibilities for EEG applications beyond medical fields. Based on the historical development and recent advancements, the study proposes that EEG research holds promise for continued progress and broader applications in diverse fields, including medical, research, and consumer area [2].

The study was conducted in support of using LLMs (Large Language model) in the Medical Field. The emerging sensors and signals are now advised to convert in the form of text so it may have a great interference with LLMs. The study enforces the methodology of inference with LLMs like Bard, GPT (Generative Pre-trained Transformers) to compute the desired output in the mean of time to ease the delivery of information.

The idea of Challenging is to establish the medical area link. SignalGPT is interpretation of various physiological signals based on a system to apply the advance of LLMs to the analysis and assistance such as an electrocardiogram (ECG or EKG), scalp, implanted intracranial electrocorticography(ECoG or iEEG), electroencephalography (EEG), electrooculography (EOG), electromyogram (EMG), stereo-electroencephalography (sEEG), electroretinography (ERG), jugular venous pulse (JVP) monitoring, central venous pressure (CVP) monitoring and photoplethysmography (PPG). The signals are used to identify different trends for diagnosis. This brief observation is actually making a perfect scenario to identify the medical abnormality and trends. That study also conducted an experiment to justify its SignalGPT on type to extract information from signals and feed into BSP.

2.2 Brain Signal Approaches

The study discussed in detail the method of default BSP and variation. The fine-tuned signals are used to create a desired test and diagnosis on the basis of record and trained dataset. The study is based on ECG signals and has more accurate results after involving formulas and computation over a data set to validate it. The study concluded as endorsement of using SIgnalGPT for medical diagnosis and their advancement in this record [3].

The study is conducted in support of LLMs while using in advance Deep learning Techniques. The Large Language models, performance is way beyond limitation and promising results. The knowledge and Techniques that have been recorded over the Journals. The researchers' data engineering is implemented on information collected from authentic sources. The promising results of these journals and articles has been the collective improvement over the text to speech. The study has gone into deep understanding of computer science. And the coding level of the project as well. Study mentioned that all coding is actually in Text format and that has been a more precise way to communicate with computers.

Natural Language processing is the key foundation to develop NLP techniques to interact with Processing machines. The Study of researchers building a Large Language model is to bring that computer more power to solve the queries and art to In the past, surprise was evaluated using n-grams, but ngrams become impossible to estimate as n grows and as such they cannot quantify long-range dependencies.

Large language models have been preceded by scientists and Data Scientist to train on a task akin to quantifying surprise & the Study found that it is superior to n-grams in predicting the word probability & possibility. Differences between LLM-derived estimates and neural perception of surprise may quantify which linguistic structures, perhaps poorly represented in the statistical evidence, the brain privileges during processing. [4]

The Research Study was conducted to discuss different Artificial intelligence and Deep Learning Techniques to justify importance in EEG Signals. The study briefly discussed methods and methodology previously adopted in research area of Brain-computer interface, Motor Imagery, Classification, Deep-Learning & Image processing.

The use of traditional MI-EEG signal modification observed. Study the Frequency on PSD (Power Spectral Density). Using method of Fourier Transform (FFT). Short-time Fourier Frequency Transform (STFT) and wavelet Transform (WT). The Experiment also Conducted in observation of study using Common Spatial (CSP) methods. Filter Bank of Common spatial patterns (FBCSPs) to frequent the and smooth signal. The EEG signal has very less ratio of Signal to noise that makes this signal as major concern of Filter process. The Study found out a very successful conclusion after using Deep learning method over EEG Signals to justify the Results. The Study of Experiment revealed that using Deep Learning Techniques over the EEG signal give promising result more that MI-EEG or Traditional way. This method eliminates the Use of Time-consuming Pre-processing, decision parameters, Feature Extraction and Classification process. The Deep Learning method and Machine learning Method is Already way more accurate than the previous one.

3- Models and Techniques

The Deep Learning method of Convolutional neural network is 10% - 15% more accurate than Artificial Neural Network. Using the activation function of ReLU for the smoothing process

of signal, 65% way more accuracy is obtained but using ELU gets way more 5 % accuracy than ReLU which comprises a study to use Exponential Linear unit [5].

The study is proposed to use the Framework of Instruct2Act in python. This study foundation is using the Large Language model in processing of different tasks t instruct to computer to perform. The study mentioned as the recent success of OpenAI tools of ChatGPT & LLaMa. The study is focused are in robotic filed & application of LARGE Language model to guide the robot. That study conducted for General Purpose Robotic system. Flexible modality inputs. Strong zero-shot performance with minimal code overhead.

Instruct2Act framework is used under the experiment of study. The researchers of this experiment conducted in the 2 variations of model. Segment Any-thing Model (SAM) and CLIP model. The API keys called by using process of SAM () and CLIPRetrieval(). The Experiment involved the use of Prompt engineering by using zero-shot method to guide robotic arm to perform given task. The study found that use of Large Language model and advancement of prompt engineering to guide and develop such accurate code in this purpose.

The Prototype of this project has limitations and discussed as well. The computation cost is way higher that leads to still under privilege term of this project. This project is limited to just do some basic action to Robot and still found high chance of Error using VIMABench. The research concluded that using LLMs and Instruct2Act framework is new key of future. The extensive prompt engineering and fine-tuning leads to a flexible Robotic programming [6]

For brain-computer interfaces (BCIs), this study proposes a sequential top-two Thompson sampling (STTS) technique that eliminates the need for physical keyboards. The BCI system transmits and processes brain signals to retrieve meaningful commands and characters under many stimulus presentation paradigms.

Despite ignoring the innate links between characters or words, the P300 speller is one of the known BCI systems that uses fixed and established stimulus presentations. By adapting stimuli in order to increase sampling efficiency, a linguistic model is presented. A sequential best-arm identification formulation and a STTS algorithm are presented in this paper that effectively use past knowledge to improve sampling. The algorithm shows notable advancements over base algorithms that don't take into account prior knowledge. The STTS algorithm sequentially calls the language model depending on the prior distribution of the conditional mean reward to create an informative prior.

Both fixed-confidence and fixed-budget STTS settings are investigated in the study. The Chertoff stopping rule is used in fixed confidence, while a predetermined budget determines the stopping rule in fixed budget. The performance of STTS is validated using numerical tests, and it is compared to the other top-two Thompson sampling methods.

Results demonstrate that STTS outperforms competing algorithms, requiring fewer stimulus flashes overall while preserving accuracy. Additionally, STTS-Oracle outperforms rival methods

in terms of average accuracy while STTS outperforms them in terms of 0–1 accuracy while using a cheaper budget.

3.1 Dataset Description

In conclusion, the study demonstrates that the proposed STTS algorithm enhances the efficiency of brain-computer interfaces by adaptively designing stimuli based on prior information from language models. The algorithm achieves promising results, offering improvements over existing approaches and opening the door to further apply [7].

The research presents DreamDiffusion, a novel approach for producing high-quality visuals directly from brain electroencephalogram (EEG) inputs. Electrodes on the scalp are used to measure and record EEG signals, which represent the electrical activities of the brain. Researchers are investigating the idea of producing images directly from brain activity, without the need to convert thoughts into text first, as image generation has substantially advanced.

The proposed method makes use of unsupervised techniques using vast volumes of EEG data instead of the fMRI-image paired data used by conventional methods for creating images from brain signals. Based on contextual clues, the researchers forecast missing tokens in EEG data using masked signal modeling.

The method uses additional CLIP supervision to match EEG, text, and image spaces, increasing the accuracy of the images that are produced. Pre-training the EEG encoder with large-scale EEG data allows for effective and robust EEG representations. By fine-tuning the Stable Diffusion model with a cross-attention mechanism, the system can generate high-quality and realistic images from EEG signals alone.

The study shows that DreamDiffusion generates much superior quality generated images when compared to a traditional generative model called Brain2Image. Studies on ablation demonstrate the value of pre-training using extensive EEG data as well as the influence of CLIP alignment on the caliber of generated images.

The study does, however, acknowledge several limitations. For instance, because EEG data only provides coarse-grained information at the category level, some categories are mapped to others in the created images that have similar forms or colors.

To sum up, DreamDiffusion offers a method that has promise for creating images directly from EEG signals, overcoming difficulties in EEG-based image production. The method closes the gap between brain impulses and the creation of visual art, opening up new opportunities for portable and affordable "thoughts-to-images" applications [8].

The study suggests a brand-new Takagi-Sugeno-Kang (TSK) fuzzy system that is driven by both general and specialized knowledge, known as CSK-TSK-FS. The objective is to improve the expert system's accuracy and interpretability for usage in applications such as the recognition

of epileptic EEG data. By incorporating common information into the fuzzy rules' parameters, the suggested approach enables more precise clinical diagnosis determination.

As opposed to the traditional one-order TSK fuzzy system, the CSK-TSK-FS fuzzy system takes into account both common and specialized information. The special information is unique to each fuzzy rule, whereas the common knowledge is represented by parameters shared by all fuzzy rules. The suggested system provides a more comprehensible and effective result by utilizing both forms of information.

The study reveals a relationship between CSK-TSK-FS and Gaussian Mixture Model (GMM) with a certain constraint. GMM is known for approximating any probability distribution with arbitrary accuracy and serves as a high-efficiency approximator in this context.

The article offers an LLM-based rapid learning method for effectively training CSK-TSK-FS. This approach is appropriate for huge datasets since it lowers the computational cost. On the UCI and KEEL datasets, the proposed system is assessed and compared with other benchmarking systems, revealing its superior classification capacity and effectiveness, particularly for medium- to large-scale datasets.

The work also demonstrates the use of CSK-TSK-FS for epileptic EEG recognition. By incorporating general information, the system's interpretability is enhanced, facilitating better clinical judgment. The CSK-TSK-FS is flexible and interpretable since it can be quickly converted into a fuzzy neural network and back.

As a novel fuzzy system that combines both common and special knowledge to increase accuracy and interpretability, the study's conclusion introduces CSK-TSK-FS.It introduces a quick learning approach for quick training and shows how well the system performs in tasks like recognizing epileptic EEG and other classification tasks. Fuzzy systems and shared knowledge integration bring up new possibilities for improved expert systems and intelligent applications. [9].

A method for person identification utilizing parametric spectrum analysis of EEG signals is suggested in the paper. The goal is to create a link between a person's EEG and genetically unique data in order to create a person identification tool that can replace conventional techniques like fingerprinting or retinal scanning.

The study focuses on healthy individuals and looks for objective correspondences between a person's genetic invariance and specific EEG parameters. Based on the features retrieved, the study uses neural network classifiers to categorize unknown EEGs. EEG recordings of patients at rest with their eyes closed were used to collect the data for the studies. A bandpass filter was used to preserve the alpha rhythm. In the studies, an LVQ neural network was used.

The experimental outcomes showed that the suggested strategy for identifying people is effective. The tests' positive classification results showed the method's potential for accurate classification and showed that individuals could be successfully classified into finite sets of known individuals.

The study's findings support the use of parametric spectral estimate of EEG signals for individual identification based on genetic data. The genetic code of a person can be learned from the EEG recordings, which is useful information that can be used for precise identification. The suggested technique appears promising and may offer an effective substitute for conventional identification techniques [10].

In order to improve the classification performance of single-trial EEG signals in brain-computer interface (BCI) systems, the study suggests two variations of linear dynamic models (LDMs). The continuous dynamics of EEG signals are better modeled using LDMs, and parameter estimation is carried out using the expectation-maximization approach and the maximum-likelihood criterion.

The impact of various covariance modeling techniques on the classification accuracy of single-trial event-related potentials (ERPs) is examined by the researchers. The Local Level Model (LLM) and the TVAR State-space Model are two models that are introduced. From brief EEG signal windows, the LLM calculates D-dimensional feature vectors while taking additive Gaussian noise and a hidden, slowly shifting trend component observations into account. The TVAR State-space Model, on the other hand, expands the LLM by assuming the observation model as a time-varying autoregressive process.

When both the model and the state parameters are unknown, the Kalman filter is used to compute mean and covariance, and the expectation maximization (EM) technique is used to determine maximum likelihood. The EM algorithm guarantees that the likelihood increases monotonically and that it will eventually reach a local maximum.

The suggested LDMs are tested using a specific dataset on EEG-based motor imagery categorization tasks. In terms of classification accuracy, the results show that LDMs outperform traditional Hidden Markov Models (HMMs). The best-performing LDM variant outperformed the HMM baseline, especially when utilizing a full matrix for both Q and R covariance models.

Finally, the investigation reveals that the proposed LDMs, notably the best form with full covariance matrices, are effective. These models can enhance the accuracy and effectiveness of BCI systems for various applications, including motor imagery classification [11].

To increase the quality of synthesized audio, this work introduces MixGAN-TTS, a non-autoregressive model for speech synthesis. The paper uses a linguistic encoder with pitch and energy information and a soft-level phoneme, hard-level word alignment approach to handle the hard-level phoneme alignment problem. MixGAN-TTS integrates and improves structures from the PortaSpeech and DiffGAN-TTS models.

The baseline for comparison was FastSpeech2, an autoregressive TTS model. Diffusion models employing GAN to represent denoising distributions have yielded encouraging results, and MixGAN-TTS's main structure includes a language encoder based on a mixture alignment mechanism, a diffusion decoder, and a discriminator.

Experiments were carried out to compare the performance of MixGAN-TTS with FastSpeech2, PortaSpeech, DiffGAN-TTS (T = 4), DiffGAN-TTS (two-stage), and MixGAN-TTS.

For evaluation, the AISHELL3 dataset comprising Chinese audio recordings and accompanying text transcripts was employed. For objective and subjective evaluation, metrics such as structural similarity index (SSIM), mel-cepstral distortion (MCD), F0 root mean squared error (F0 RMSE), mean opinion score (MOS), and real-time factor (RTF) were used.

The results reveal that MixGAN-TTS performs well in terms of alignment information between phoneme sequences and mel-spectrograms. It considerably reduces the number of parameters and achieves audio quality comparable to PortaSpeech. The benefit of MixGAN-TTS in predicting mel-spectrogram details in frequency bins between two neighboring harmonics is revealed by feature prediction comparison, resulting in improved phoneme sequence alignment with mel-spectrogram maps.

Ablation studies confirm the effectiveness of the diffusion decoder module in MixGAN-TTS, with T = 4 denoising steps giving the best results. Overall, MixGAN-TTS enhances audio quality, reduces phoneme boundary ambiguity, and achieves improved mel-spectrogram reconstruction, making it a promising non-autoregressive model for speech synthesis. [12]

Using an upgraded convolutional neural network (CNN), the paper provides a method for accurately building 3D body models based on 2D photos. The goal is to construct parametric models of genuine human bodies that may be used in domains like ergonomics, apparel design, biomechanics, and computer graphics.

The researchers record front and side shots with a digital camera to obtain human body outlines from 2D images. To separate the human body from the background, the Background Difference Method (BDM) method is used. The Canny detection operator is then applied to the retrieved body pictures for edge detection. PCA is a statistical analysis method that is used to reduce the dimensionality of high-dimensional data to a low-dimensional space.

A convolutional neural network model, similar to GoogLeNet, is used in the study to learn a global mapping from contour photos and recreate the human model. To obtain low-dimensional parametric models, the model is trained using the SCAPE database. The GoogleNet network was improved by adding RELU activation functions and batch normalization after each convolutional layer, as well as deleting the auxiliary processing layer.

The results show that the suggested method reconstructs 3D models that accurately match the source 2D photos. The silhouette variation is used to calculate the degree of similarity between the built 3D models and the original photographs, with a lower number suggesting a better match.

In conclusion, the study suggests that the proposed method, which combines contour extraction, PCA, and an improved CNN, can effectively construct 3D body models from 2D images. The approach holds promise for various applications, including human body modeling for different fields. [13]

The article offers Self-Supervision Text-to-Image Generative Adversarial Networks (SS-TiGAN), a revolutionary text-to-image synthesis technique. To address issues in low-data regimes and improve the quality and diversity of synthesized images, the technique combines self-supervision and a bi-level GAN architecture. The researchers also present augmentation approaches, such as feature matching, L1 distance loss, and one-sided label smoothing, to address concerns frequent during GANs training, such as mode collapse and discriminator overconfidence.

To generate high-quality images from textual descriptions, the SS-TiGAN model employs Generative Adversarial Networks. It has a conditioning augmentation function that converts high-dimensional text characteristics into smaller latent embeddings for GANs training. The network design is made up of two stacked generators and two discriminators, which allows the model to simulate bi-scale image distributions.

To evaluate the proposed method, the researchers compare it to existing algorithms using two popular text-to-image synthesis datasets, the Oxford102 and CUB datasets. In terms of image quality, object distinctness, and semantic consistency, the results reveal that SS-TiGAN beats most existing approaches.

It outperforms previous works by synthesizing smaller images and has the lowest Fréchet Inception Distance score, demonstrating high similarity with genuine images. An ablation study is carried out to assess the important parameters that contribute to the success of SS-TiGAN. According to the findings, each component, including self-supervision, improvement approaches, and two-stage design, plays an important role in increasing the model's performance. However, because to restricted computational resources, the SS-TiGAN model has several restrictions, such as a maximum output resolution of 128 by 128 pixels and the lack of a more complex text encoder. Despite these limitations, SSTiGAN outperforms existing techniques in text-to-image synthesis, producing coherent and diversified visuals based on textual descriptions [14].

A blind text picture deblurring technique based on Laplacian pyramid multi-scale fusion and sparse priors is proposed in the paper. The goal is to recover clean text images from fuzzy ones, which is a difficult problem to solve because there are more unknown variables than

known conditions. To address this, the researchers use text image sparsity priors and high-frequency wavelet coefficients to improve accuracy. They also handle the estimate of blur kernels, which is critical for deblurring, by adjusting brightness information via multiscale fusion. To maximize the blur kernel and latent clean picture, the proposed technique employs a joint sparsity prior and multi-scale fusion model. It leverages the half quadratic splitting method to solve the optimization problem and incorporates single-level wavelet decomposition to compute high-frequency wavelet coefficients.

Experiments on both synthetic and actual picture datasets show that the proposed approach outperforms previous comparable algorithms in terms of peak signal-to-noise ratio (PSNR) and structural similarity ratio (SSIM). In complicated backdrop text images, the method efficiently eliminates visual artifacts and ringing effects while retaining more detailed information. However, the proposed algorithm needs to be improved in terms of running time, as it falls behind other comparative approaches in this regard. According to the study, choosing proper input parameters can increase the deblurring effect, and parameter selection has a substantial impact on the algorithm's performance.

Finally, by using sparsity priors and multi-scale fusion, the proposed approach presents a potential solution to blind text picture deblurring. It enhances deblurred text picture accuracy and outperforms existing approaches in terms of visual quality and image restoration measures. However, for practical applications, additional improvements in running time are required. [15]

3.2 Proposed Methodology

The study proposed 2 methodologies to transform the Brain signals translation into actionable results. By Using EEG signals the translation of thoughts into images is possible as the combined effort is observed in the technology of Mindviz and Stable Diffusion. The other study was conducted on the basis of electrocorticography (ECoG). In that study preprocess and array chips is implanted on patients due to to noise. Multiple Noise filters has applied in the research conducted in UC San Francisco. The rtNSR (python software package) is used to cancel the effect noise and is used to do the best of above all to solve the problem using the multiple python techniques to classify the filter into a range of 70-150 Hz. This method has also involved the Scipy , Numpy, PyTorch, scikit learn, NLTK and pandas. The ensemble pipeline has to use and classify these tokens and data we have received from our participants. That was conducted on GPU V100 and multiple hardware components to resolve the issue. This received words and trained on the basis of 26 Alphabets of English of participants and then it has to challenge into a statement of the Participant. In this study, they used GPT-2 to classify the data and thoughts of a person into text. While using EEG Signals we have seen the Study of Dream Diffusion creates a picture on the basis of the same guess and method to be proposed. [16] The next phase of our study is to produce the Image from text and Prompt. There are words that have to be inserted as built-in code to classify as negative prompts. The model has to use proper guidelines and ways. We have investigated both and found out the way of creating [17].

Prompts into 3D models. So by using prompting, we have used Stable diffusion v-1.5. there are opportunities to use stable diffusion v 2.1 model but it consumes more GPU and computation power so we had to use stable diffusion 1.5. The prompt creates image by user input that has been induced by the participant thoughts and that method has a ideal scenario to achieve this technology for basic purpose to get from BCI into 3D printed work. There are 2 directions has to follow up one is using openai , Shape-e method of creating a 3-D model from text directly but there is another prompting method we proposed to create an AI avatar [18-19]. The study of Pose estimation method has to follow up the research of Facebook pifuhd & light-weight human pose estimation.

Prompt	"dystopian style Shadow Play, Fujifilm X100 . bleak, post-apocalyptic, somber, dramatic, highly detailed, detailed face, masterpiece picture of a young woman, Petite, toned, body, Modest Proportions breast, Crop top, Ripped skinny jeans, studded leather jacket, band t-shirt, combat boots, spiked choker, capturing the spirit of exploration, Derelict Office Lobby, Extreme wide-angle"
Negative Prompt	"ugly, deformed, noisy, blurry, low contrast, cheerful, optimistic, vibrant, colorful, blurry eyes, two heads, two faces, plastic, Deformed, blurry, bad anatomy, bad eyes, crossed eyes, poorly drawn face, mutation, mutated, extra limb, ugly, poorly drawn hands, missing limb, blurry, floating limbs, disconnected limbs, malformed hands, blur, out of focus, long neck, long body, mutated hands and fingers, out of frame, blender, doll, cropped, low-res, close-up, poorly-drawn face, out of frame double, blurred, ugly, disfigured, too many fingers, deformed, repetitive, grainy, extra limbs, bad anatomy, airbrush, zoomed, deformed, extra limbs, extra fingers, mutated hands, bad anatomy, bad proportions, blind, bad eyes, ugly eyes, dead eyes, vignette, out of shot, out of focus, gaussian, closeup, monochrome, grainy, noisy, text, writing, watermark, logo, over saturation, over shadow, negatveXL, unaestheticXLv1"

The 2-D image is generated through prompt and text of user as defined by the BCI of participants' thoughts. The classifier must be chosen to fill the broken token of Signals to generate a full sentence of text. The positional embedding is used to identify the text in pipeline of prompting. The study is conducted on basis of code to receive the Generative AI or using GPT-3.5 to fill the prompt and identify te broken tokens of the sentence. This will not only just make this prompt is well classified but also easy to put in pre-trained stable Diffusion model.

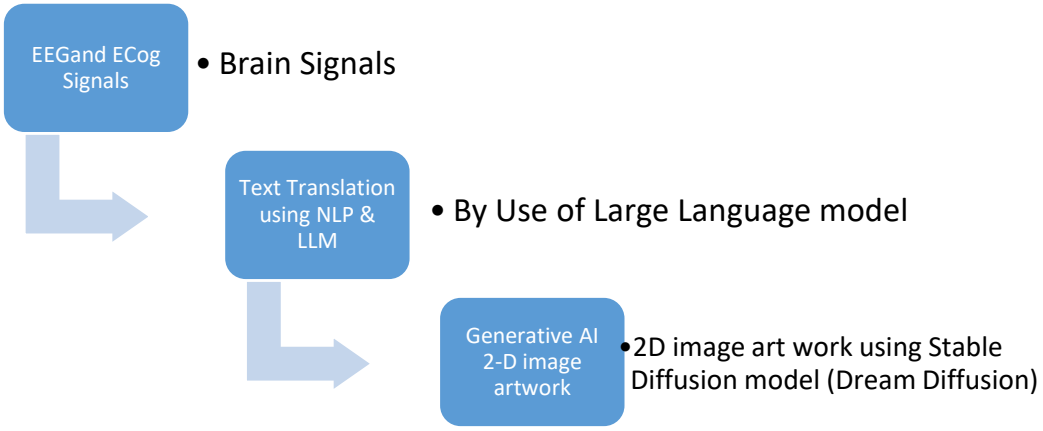
The negative prompt is built-in code while prompt is defined by user brain and classified and refined after the process of GPT-2 onward to generate [20].

Here we aim to produce a 3-D Avatar using technology of AI. There are few ideal scenarios to testify the image but this project aim for Gaming Industry and precisely for Meta-verse.

Figure 2: Output

This image has created through art of Generative AI and Stable Diffusion.There's another research Study is Conducted on basis of DragGAN which is aimed to change and edit the generative AI images. By position interpolation and pixel movement [21-22].

After a satisfying and desired pose of user defined through this technique. We have to remove the Background of User-defined person or model. We can possible use the u2net and MOD-Net to remove the background of model.



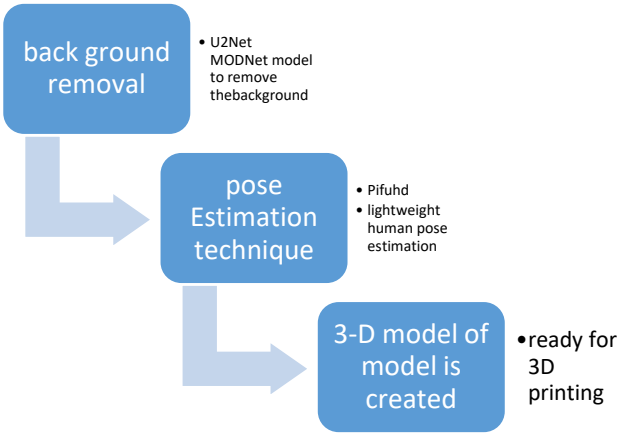


Figure 3: Proposed Approach

That PNG file is used to process into 3-D body of model. Using pifuhd model with checkpoints of iteration at 37000. The research proposed and identified as best to transform the model into 3-D model. At the next stage of by iteration we have observed the by using such techniques we can easily reform a 3D model using BCI from a person thought to generation of 3-D avatar model. The study is optimistic about the research in future will be more refined in this area to contribute the future technology tech stack.

4- Result Analysis and Discussion

The final output of the model is constructed into 3-D model of user-defined output. The results of this study and proposed ensemble techniques of multiple technique pipelines show the possibility of model. The model proposed using Shape-e by OpenAI has also constructive approach to produce the operation from text to 3D file but using that pose estimation method gives access to the user. The defined input by the user using their brain signals and prompting has a built-in method to support the result and enable a 3-D avatar. The development of such assets in Meta-verse Word can also link up to the basic foundation of 3-D printing. This Advancement can be linked to 3-D printers and may advance the future & and build a novel approach to thinking and it’s done.

Figure 4: Final outcomes from model

5- Conclusion

The study's findings emphasize the innovative work that has been done to convert EEG data into 3D models by fusing 3D printing, AI, and neuroscience. With this method, 3D models may be easily and affordably created, opening up great possibilities for technical advancements in the fields of design and art. The study's effectiveness in matching EEG, text, and image spaces and turning EEG signals into NLP tokens is a significant advancement in the area. The production of 3D models now has dynamic possibilities because to the usage of GANs, notably DragGAN.

Future research should concentrate on improving EEG data denoising methods and growing datasets to improve model generalization. As this technology develops, ethical issues including privacy and responsible use must be taken into account. The incorporation of 3D avatars may be improved by cooperation with metaverse platforms, offering realistic virtual experiences.

Through the creative combination of AI methods, EEG data, and 3D printing technology, the research effectively proved the conversion of EEG impulses into 3D models. Generative art was made possible by the transformation of EEG data into NLP tokens, providing a fresh means of creative expression. High-quality 3D models were produced by aligning EEG, text, and picture spaces utilizing stable diffusion, CLIP, and Dream Diffusion models.

DragGAN, a particular GAN, brought dynamic motion supervision and promised interactive 3D objects. The accuracy of the development of the 3D model was enhanced using neural radiance fields and NeRF modeling. The pipeline for converting EEG data into tokens of 2D picture and plain language was quick and easy to use.

The study might have an effect on a variety of fields, including art, design, gaming, and the metaverse. Thoughts may be instantly translated into 3D artwork by artists and producers, and lifelike 3D avatars are advantageous to the game business. This research establishes itself as a key tool for influencing the future of digital experiences as the metaverse keeps growing. This study's findings show the transformational power of turning brain impulses into real-world, three-dimensional objects, opening up intriguing new avenues for creative expression and technical advancement in a range of industries.

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