



Nepal Engineers' Association

TALK SHOW INVITATION

“ AI for the real world: Empowering problem solving with Artificial Intelligence ”



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<https://www.dailabs.ai/>

Date: Friday, 2nd June, 2023 (शुक्रवादि १५ गते)

Time: 4:00 PM

Venue: NEA Building, Pulchowk, Lalitpur



Profile

Subas Chhatkuli, PhD

- PostDoc @The university of Tokyo: 2007-2010
- Principal Engineer @PASCO: 2010-2018
- Senior AI Engineer and computer Vision Leader@Exawizard: 2018-2021
- Principal AI Scientist @Bodygram Japan: 2021~2023
- *co-founder @ IntHub: 2022~ to-date*
- *co-founder | CTO @ DAI Labs: 2023~ to-date*

Patents: 15 in Japan, 2 in the US

Publication: 36 publication in journal and peer reviewed proceedings



Intelligent solution for all



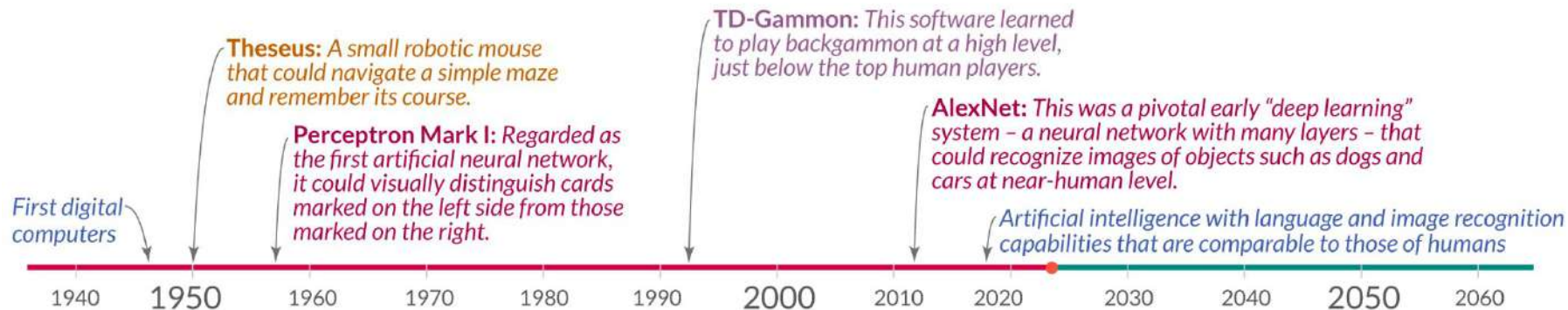
Dynamic AI Solutions,
for an Evolving World

What is AI

AI, or Artificial Intelligence, refers to the development of computer systems that can perform tasks that typically require **human intelligence**. It involves creating algorithms and models that *enable machines to learn from data, make decisions, and solve problems*...Its applications span various industries, such as healthcare, finance, and transportation, offering potential benefits and challenges for society

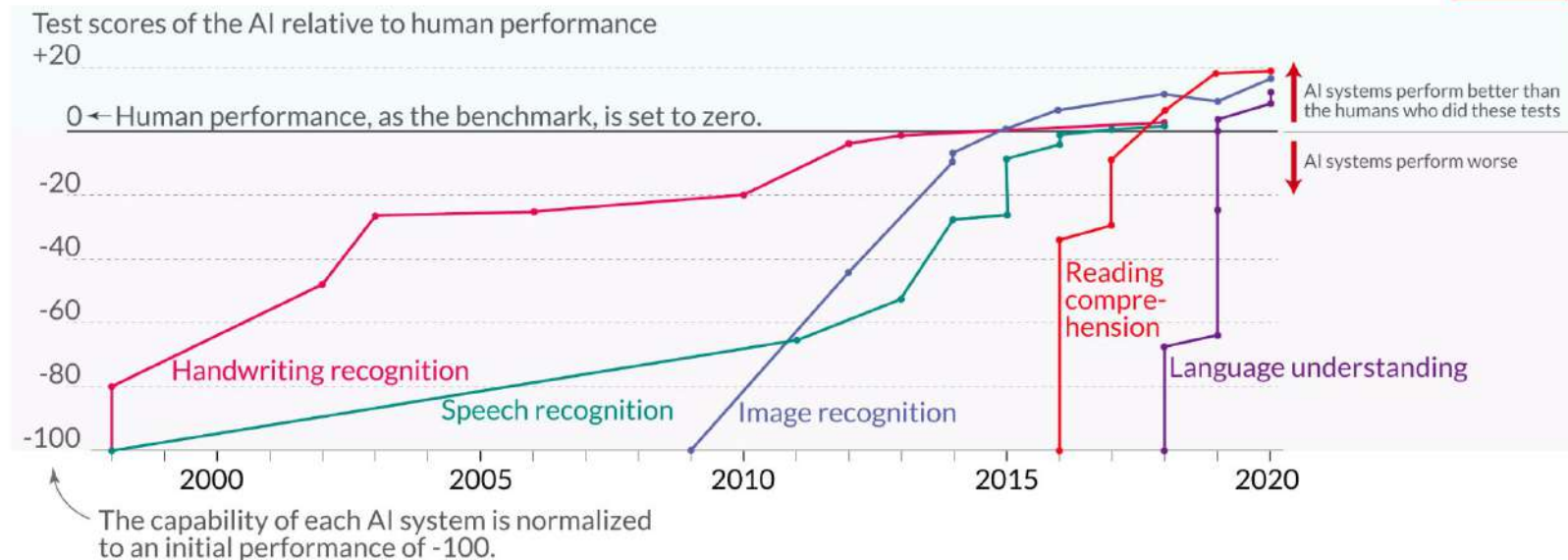
History of AI

A timeline of notable artificial intelligence systems



History of AI

Language and image recognition capabilities of AI systems have improved rapidly



Data source: Kiela et al. (2021) – Dynabench: Rethinking Benchmarking in NLP
OurWorldInData.org – Research and data to make progress against the world's largest problems.

Licensed under CC-BY by the author Max Roser

Source: <https://ourworldindata.org/brief-history-of-ai>

History of AI

Timeline of images generated by artificial intelligence

These people don't exist. All images were generated by artificial intelligence.



2014



Goodfellow et al. (2014) - Generative Adversarial Networks

2015



Balafout, Metz, and Chintala (2015) - Unsupervised Representation Learning with Deep Convolutional GANs

2016



Uso and Tuzel (2016) - Coupled GANs

2017



Karras et al. (2017) - Progressive Growing of GANs for Improved Quality, Stability and Variation

2018



Karras, Laine, and Aila (2018) - A Style-Based Generator Architecture for Generative Adversarial Networks

2019



Karras et al. (2019) - Analyzing and Improving the Image Quality of StyleGAN

2020



Pis, Jin, & Albert (2020) - Denoising Diffusion Probabilistic Models

2021



Image generated with the prompt: "A couple of people are sitting on a wood bench."

Baneth et al. (2021) - Zero-Shot Text-to-Image Generation

2022



Image generated with the prompt: "A Pomeranian is sitting on the King's throne wearing a crown. Two tiger soldiers are standing next to the throne."

Saharia et al. (2022) - Photorealistic Text-to-Image Diffusion Models with Deep Language Understanding

Explaining a Joke

I will explain these jokes:

(1) The problem with kleptomaniacs is that they always take things literally.

Explanation: This joke is wordplay. Someone who "takes things literally" is someone who doesn't fully understand social cues and context, which is a negative trait. But the definition of kleptomania is someone who literally takes things.

(2) Always borrow money from a pessimist. They'll never expect it back.

Explanation: Most people expect you to pay them back when you borrow money, however a pessimist is someone who always assumes the worst, so if you borrow money from them, they will expect that you won't pay them back anyways.

Input: I was supposed to start writing the paper at 5:00 PM. But then I started playing with this cool new language model for 10 minutes. 10 minutes later, it's suddenly 9:30 PM!

Model Output: This joke is about how time flies when you're having fun. The person was supposed to start writing a paper at 5:00 PM, but they started playing with a language model instead. They thought they were only playing with it for 10 minutes, but it was actually 4.5 hours.

Input: I was going to fly to visit my family on April 6th. My mom said "Oh great, your step dad's poetry reading is that night!" So now I'm flying in on April 7th.

Model Output: The joke is that the speaker's mother is trying to get them to go to their step dad's poetry reading, but the speaker doesn't want to go, so they are changing their flight to the day after the poetry reading.

Input: Reading "War and Peace" doesn't scare me. I once had to review the CL for my intern's whole project on his final day!

Model Output: "War and Peace" is a very long book, so reading it is a daunting task. However, the speaker is saying they had to review the code for their intern's project on their final day, which is even more daunting.

Input: I think I understand why me and my partner are such a good match. I get excited when I smell food and become super alert when the doorbell rings. My girlfriend Shelley becomes ecstatic when she sees a person who she just saw 5 hours ago.

Model Output: This joke is about dogs. Dogs get excited when they smell food and when the doorbell rings. The girlfriend is excited to see someone she just saw 5 hours ago, which is a trait of dogs.

Input: I tried 10,000 random restarts of my neural network, but I was accused of overfitting. I guess no good seed goes unpunished.

Model Output: This joke is a pun. A neural network is a computer program that can learn from data. A "seed" is a number that is used to initialize a random number generator. A "good seed" is a number that produces a good random number generator. The phrase "no good deed goes unpunished" means that if you do something good, you will be punished for it.

Input: What's the difference between a zebra and an umbrella? One is a striped animal related to horses, another is a device you use to stop the rain from falling on you.

Model Output: This joke is an anti-joke. The joke is that the answer is obvious, and the joke is that you were expecting a funny answer.

AI can provide amazing solutions for many industries...

Energy



Finance



Health Care



Manufacturing



AI / Machine Learning Techniques
(Deep Neural Networks, Transformers, Convolutional Neural Network, etc)

Demand Prediction
Dynamic Pricing
Optimize Energy Grids
Energy Trading

Personalized Banking
Process Automation
Fraud Detection
Risk Management
Credit Scoring

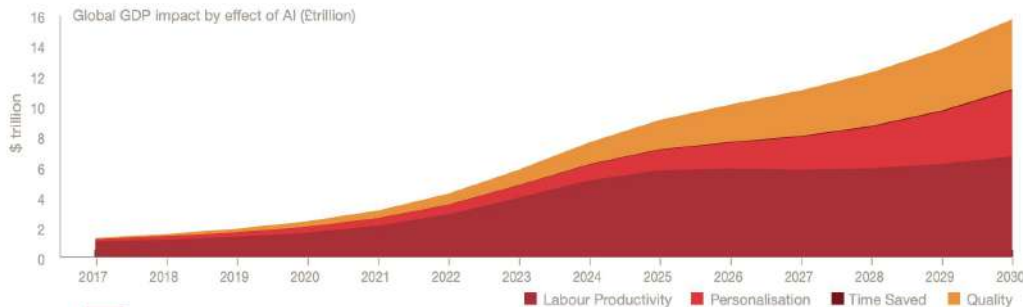
Patient Diagnosis
Drug Discovery
Patient Communication
Document Transcription
Remote Treatment

Defect Inspection
Inventory Management
Product Assembly
Predictive Maintenance
Task Automation

Market size: AI will contribute \$15.7T to the global economy

AI is estimated to contribute \$15.7T to the global economy by 2030, and a boost of 26% to local GDP.

Source: [PwC Sizing the Prize](#)



The economic impact of AI is driven by:

- 1) Productivity gains from businesses automating processes (including use of robots and autonomous vehicles)
- 2) Productivity gains from businesses augmenting their existing labour force with AI technologies (assisted and augmented intelligence)
- 3) Increased consumer demand resulting from the availability of personalised and/or higher-quality AI-enhanced products and services

Many industries can benefit from AI

Sector	Example AI Tasks	AI Impact (1-5)*
Health Care	Identify patterns in patient data, insurance	3.7
Automotive	Engine monitoring, predictive maintenance	3.7
Finance	Detect fraud, risk management, prediction models	3.3
Transportation	Optimize logistics, improve routing, reduce fuel consumption	3.2
Sports and entertainment	Motion tracking and analytics, generative art	3.1
Retail	Personalized shopping, product recommendations, pricing	3.0
Manufacturing	Optimize processes, improve quality, reduce downtime	2.2
Energy	Demand prediction, energy grid optimization	2.2

*Source: [PwC Sizing the Prize](#)

Our mission: Improve efficiency for all, with customized AI

AI and Deep Learning perform better than traditional algorithms...

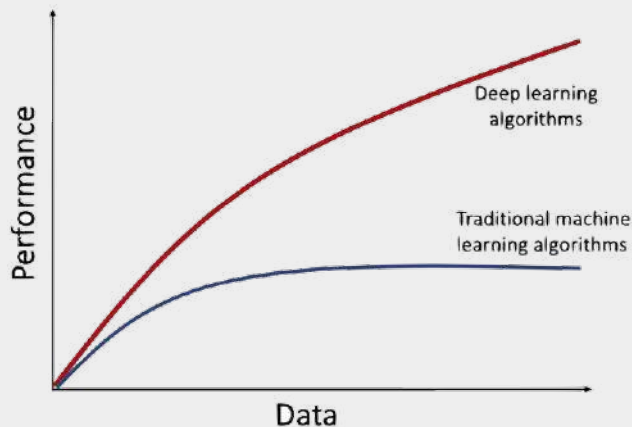


Image: abyssal.eu

And customized AI performs better than off-the-shelf AI, but takes expertise to create...



Advantages of Custom AI

- Tailored to your business
- You can update the custom AI software over time to meet future needs and integrate new features as they become available
- Greater efficiency and effectiveness
- No one has access to your custom AI solution but you

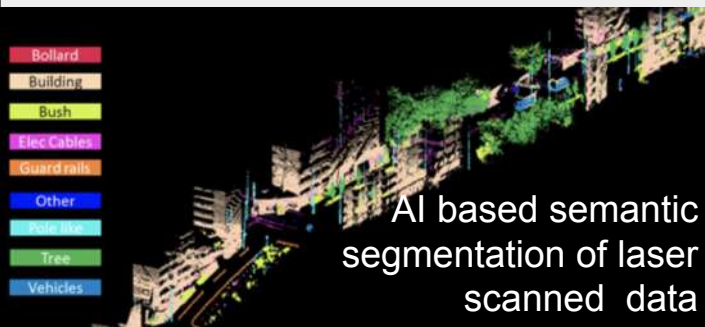
Source: <https://integrio.net/blog/custom-vs-of-the-shelf-artificial-intelligence>

AI and their practical use cases

Applications

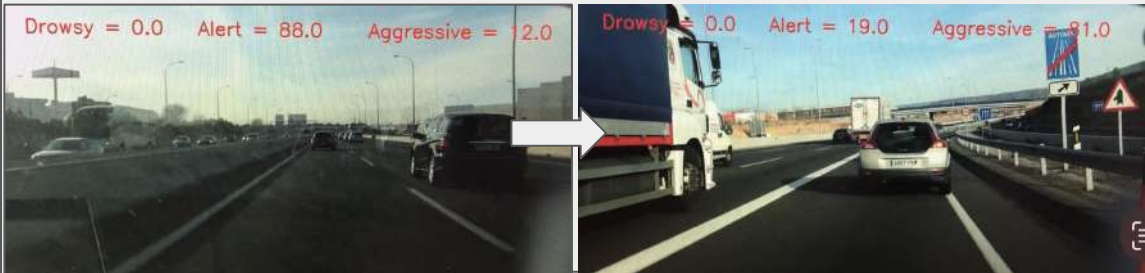
AI for 3D city/Infrastructure management

High fidelity 3D object detection and recognition from 3D meshes/laser scanned data for large scale asset management & planning (Use Case, Japan)



AI for video analytics

AI algorithms to increase insights by detecting, analyzing and interpreting actions from videos offline and also in real time. (use case, Europe)

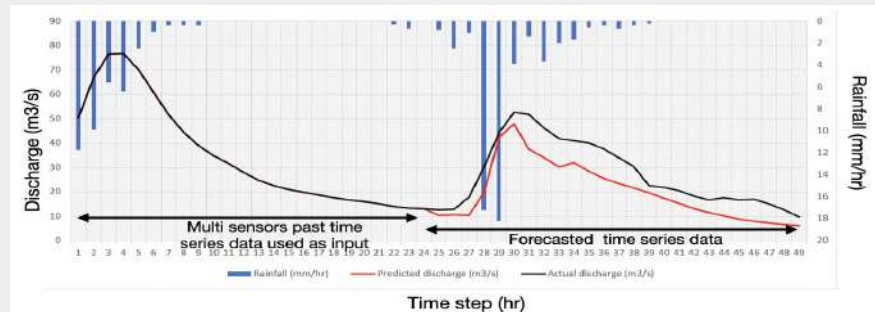


Multimodal AI based driving pattern analysis from video, radar and accelerometer data

Applications

Forecasting based on time series data analysis

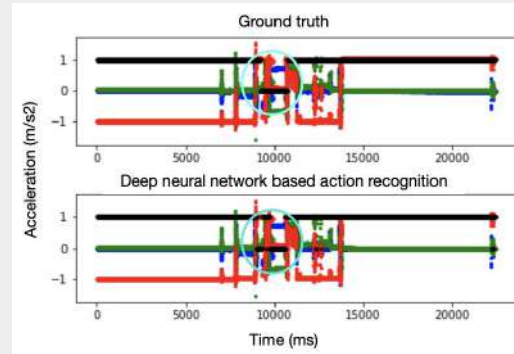
Water inflow prediction for hydropower planning (Use case, Japan)



Hourly streamflow prediction for hydropower generation planning

Action recognition from wearable motion detector

This technique will help in supervision of kids at child care, patients at hospitals, or elderly at care homes.



Prediction of sleep motion vs awoken motion for a toddler based on accelerometer sensor. Blue, green and red indicates body acceleration in X, Y and Z direction. Black indicates action classification where '0' is sleep motion and 1 is other motion

Applications

Using A.I. to Detect Breast Cancer That Doctors Miss



Dr. Éva Ambrózy, a radiologist at Bács-Kiskun County Hospital with more than two decades of experience, has been using A.I. software to help look for signs of cancer that doctors may have missed. Akos Stiller for The New York Times

Source:

<https://www.nytimes.com/2023/03/05/technology/artificial-intelligence-breast-cancer-detection.html>

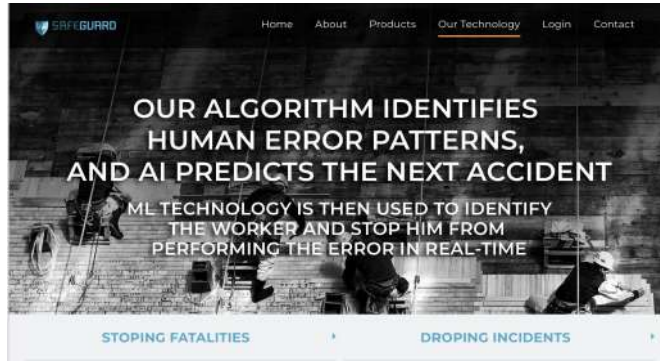
- In Hungary on more than 275,000 breast cancer cases, Kheiron [reported](#) that its A.I. software matched the performance of human radiologists when acting as the second reader of mammography scans
- It also cut down on radiologists' workloads by at least 30 percent because it reduced the number of X-rays they needed to read
- the technology increased the cancer detection rate by 13 percent because more malignancies were identified

Applications



- Buildots' technology automatically analyzes data captured at the site via helmet-mounted 360-degree cameras.
- By embracing Buildots smart technology, they're able to use AI and 3D model vision to efficiently track build progress compared with design and schedule to help ensure they remain on course

Use case: UK



Source:

<https://www.israel21c.org/israeli-ai-construction-technology-helps-build-uk-hospital/>

Applications



Source:
<https://constructionmanagement.co.uk/barhale-ai-excavator-safety/>

- **Construction group Barhale is using artificial intelligence (AI) on its excavators to reduce health and safety risks.**
- Subsidiary BCS has installed human form recognition cameras and a 'digital thumbs up system' on six of its new excavators and ten diggers.
- The tech then produces an audible alert to the person in the unsafe zone and also to the driver.
- Barhale said that the system has the capacity to report incidents by type and frequency. This data can be used to help improve safety behaviours on site.

Applications



AI will automatically calculate the most convenient route and vehicle to pick you up from the bus stop you choose. This is a shared ride service so the vehicle may pick up other passengers on the way to your destination.

Source: https://www.alpico.co.jp/en/news_promo/post/hakuba-night-demand-taxi-app/



Now, Dubai taxis will get automatically directed to demand hotspot

AI will analyse big data to automatically direct taxis to the highest demand spots as indicated by the demand forecast system. The project will reduce the consumption of fuel and increase the number of journeys per vehicle.

Source:
<https://gulfnews.com/amp/uae/now-dubai-taxis-will-get-automatically-directed-to-demand-hotspots-1.90661644>

Applications

AI for agriculture: How Indian farmers are harnessing emerging technologies to sustainably increase productivity



- The AI for Agriculture Innovation initiative is transforming the agriculture sector in India by promoting the use of artificial intelligence and other technologies.
- Over 7,000 farmers are using the technology to monitor the health of their crops, perform quality control and test soil.

Source:

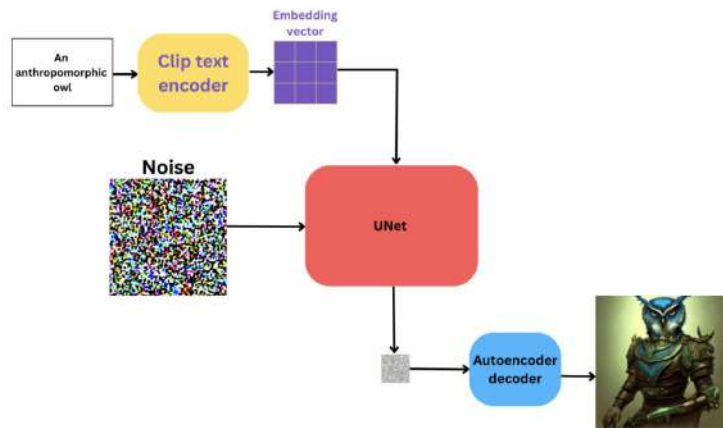
<https://www.weforum.org/impact/ai-for-agriculture-in-india/>

Generative AI

Generative AI is a branch of artificial intelligence that can autonomously produce new content. It learns from vast amounts of data and generates output similar to the training examples. *It can create images, generate text, compose music, and more.*

Stable diffusion

- Stable Diffusion is a deep learning, text-to-image model released in 2022.
- It can also be applied to other tasks such as inpainting, outpainting, and generating image-to-image translations guided by a text prompt.
- It was developed by the start-up Stability AI in collaboration with a number of academic researchers and non-profit organizations (Source: Wikipedia)



Stable diffusion during inference process.

source: <https://learnopencv.com/stable-diffusion-generative-ai/>

Stable diffusion

Stable Diffusion 2.1 Demo

Stable Diffusion 2.1 is the latest text-to-image model from StabilityAI. [Access Stable Diffusion 1 Space here](#)

For faster generation and API access you can try [DreamStudio Beta](#).

Enter your prompt

Enter a negative prompt

Generate image



View of mount fuji from a garden during a day time

Enter a negative prompt

Generate image



Stable diffusion

Stable Diffusion 2.1 Demo

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Enter your prompt

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Generate image



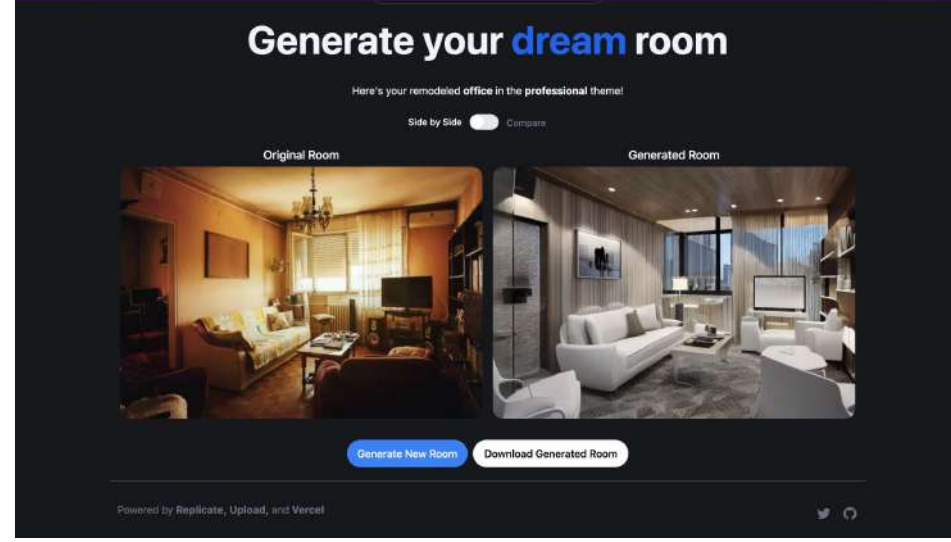
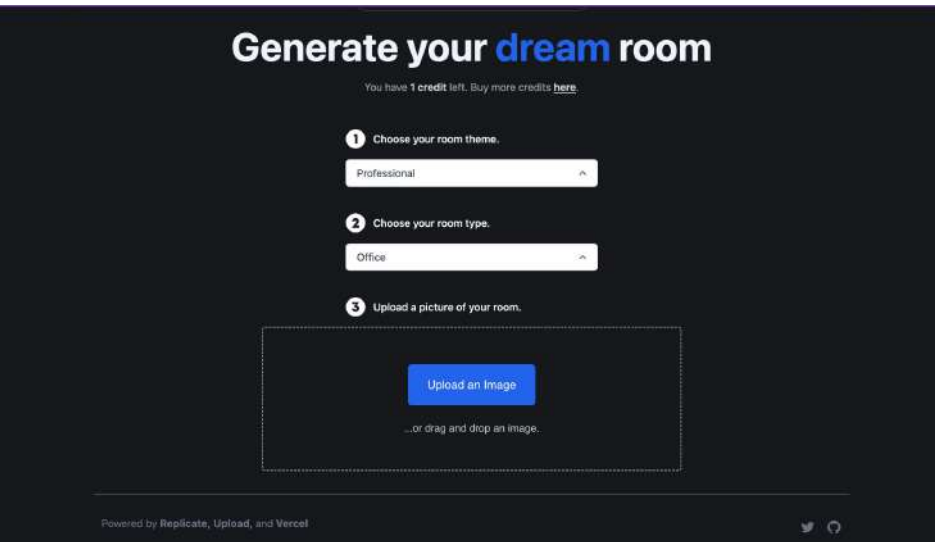
View of mount fuji from a garden during a day time

Red leaves and flowers

Generate Image



Applications



<https://www.roomgpt.io/> utilizes ML model called ControlNet to generate variations of rooms
Take a picture of your room and see how your room looks in different themes.

LLMs (ChatGPT)

- ChatGPT is a generative AI designed to generate responses in natural language based on the input it receives.
- In the case of ChatGPT, the Transformer network is used to generate responses based on the input it receives from users.
- During training, the model learns to predict the next word in a sentence given the context of the previous words. This is done using a deep learning architecture called the Transformer network.

ChatGPT involves additional techniques and modifications to make it suitable for conversational AI. This includes using [reinforcement learning from human feedback](#) and a two-step process of pretraining and fine-tuning to improve the model's performance.

Custom chatbot and large language models (LLaMa, ChatGPT)

- Human like chatbot that understands customers query and make an appropriate response in a human like conversation which will significantly improve customer service and brand recognition
- Automated reply to customer by using details from customer's email
- Make an alert for certain topics
- Language model trained on enterprise data for internal and external query

Applications

ChatGPT: Example of customizing ChatGPT on enterprise data

DAI Labs trained custom AI Chatbot

Enter your text

Who is Subas Chhatkuli. Explain as if you are a 5 years old child.

Clear

Submit

output

Subas Chhatkuli is a man who was born on 13 September 1978 in Kathmandu, Nepal. He is a very smart person who studied a lot and got a Certificate of Merit from an International Conference on Modeling, Simulation and Control in 2009. He also got a scholarship from the Japanese Government to study for his Masters and PhD. He also got 8 patents in Japan and 2 patents in America. He is now the Chief Technology Officer at DAI Labs.

Flag

Applications

ChatGPT: Example of customizing ChatGPT on enterprise data

DAI Labs trained custom AI Chatbot

Enter your text

Who is Subas Chhatkuli. Explain as if you are a professor.

Clear

Submit

output

Subas Chhatkuli is a male born on 13 September 1978 in Kathmandu, Nepal. He is currently the Chief Technology Officer (CTO) of DAI Labs. He completed his PhD in numerical simulation from Ehime University in 2007 and then joined The University of Tokyo as a PostDoc researcher. At The University of Tokyo, he conducted research on numerical modeling techniques for the dynamic tracking of lung and tumor during breathing to apply in future pinpoint radiation therapy systems. After working for over two years at The University of Tokyo, he then joined PASCO CORPORA.

Flag

International practices

- Big and small enterprises already have high literacy on AI
- Big manufacturing, IT, Fintech companies already invest on different AI startups
- Small/medium companies pair up with AI ventures for speedy development of AI solution
- Collaborative effort between academia and industries
- Universities send interns to AI companies for gaining practical experiences
- Government is actually promoting use cases and now establishing regulation so that privacy and fairness is maintained
- Companies are using AI for improving efficiency and cost reduction

Open discussion



Dynamic AI Solutions,
for an Evolving World

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