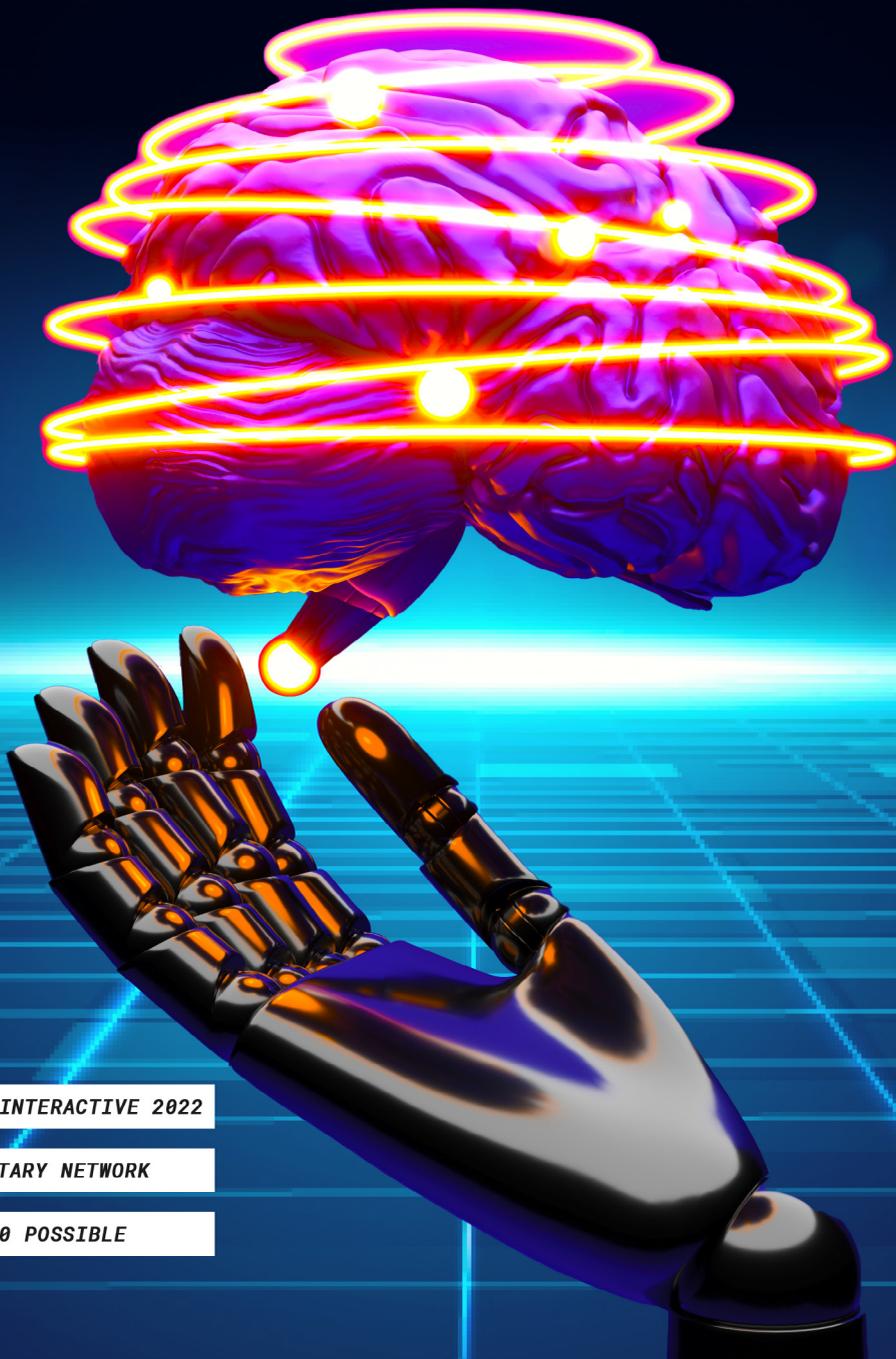


COGNITIVE TIMES

VOL. 7 NO. 2 // 2023

AI AS A CATALYST FOR CREATIVITY



PLUS

AT TIME MACHINE INTERACTIVE 2022

THE DIGITAL MONETARY NETWORK

AI MAKES NET ZERO POSSIBLE



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Will bitcoin be the new 'money'? Read Amir Husain's riveting take on what bitcoin is doing to change how we look at digital stores of value.

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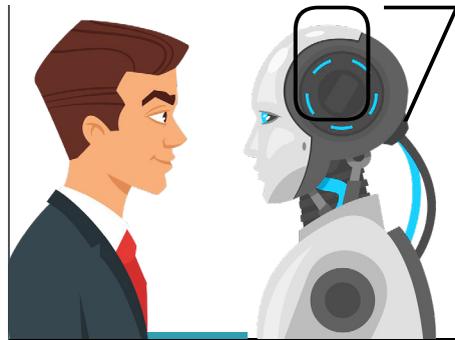
Keeping Humans in the Loop

The takeaway from General Robert B. Neller's thought-provoking talk on the application of AI in the defense sector.

BY FATIMA NATASHA RAZI



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TIME MACHINE

QUOTES

TURBINES to AIRLINES

AI PERFECTED FOR INDUSTRY



Whether your goal is to predict outages and increase energy production of a wind farm or improve efficiency and reduce costs in airline operations, SparkCognition drives impact with proven AI solutions. Learn more www.sparkcognition.com

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Fatima Natasha Razi is a storyteller at heart. Her career is multidisciplinary with experience with banking, advertising, game development, mobile gaming, content creation, art, and design. A computer science graduate, she has been working on game design, illustrations, marketing, copywriting, and art in both digital and traditional mediums. She's a published author and hopes to uplift the local publishing capabilities of her hometown, Lahore, Pakistan.





took to the stage to discuss how advancements in AI are driving innovation in their respective industries. General Robert Neller, a retired United States Marine Corps four-star general who served as the 37th Commandant of the Marine Corps, tells us about how humans will be kept in the loop as AI assists with recruitment, simulations, and management of assets in peace and in war. He answers many questions about AI's military applications and its role in assisting personnel, rather than replacing them.

Climate change is a critically important area of focus with fast-approaching deadlines and the need for us to take collective action now. AI is one of the most impactful tools when it comes to the detection, monitoring, and strengthening of not just our ecosystems, but the renewable energy that will play a major role in reducing emissions. We've talked about achieving net zero in past issues of Cognitive Times, but more and more progress is being achieved toward this goal by the day. We cover how AI-assisted carbon capture, battery optimization, and improvements in the efficiency of renewable energy systems can all help build a cleaner future.

You will also enjoy a recap of Professor Alex Dimakis's talk at Time Machine. Professor Dimakis is an Engineering Professor at the University of Texas at Austin, and Co-Director of The University of Texas at Austin's National AI Institute for Foundations of Machine Learning. He tells us how generative models are helping with with anomaly detection, MRI imaging, and even in decoding dreams!

And if all that wasn't enough, we'll also tell you about how AI is writing essays, creating art, and much, much more.

Happy reading and here's to a prosperous 2023!

Amir
Amir Husain

Founder & CEO of SparkCognition

NOTES

FROM THE EDITOR

This edition of Cognitive Times will be an exciting tour of how AI is changing so much around us for the better. From the impact AI is making on climate change to the emerging world of digital art, the pages that follow will cover it all.

In this issue, we bring to our readers discussions from Time Machine Interactive 2022, a premier, experiential event hosted by SparkCognition at its AI research facility HyperWerx. You will journey through many aspects of artificial intelligence, and explore how this technology is currently influencing the physical world around us.

During the recent Time Machine event, a diverse group of strategists, national defense experts, scientists, and educators

BY COGNITIVE TIMES STAFF

A TECH-SAVVY TO-DO LIST

BIG DATA, BIGGER IDEAS

Discover the intelligent future at **Big Data & AI World** on **8-9 March 2023** at **ExCeL London**.

Be at the forefront of change with thousands of technologists, data specialists, and AI pioneers.

Don't miss the biggest opportunities to advance your business into the future.

GET YOUR FREE TICKET

Content and Image courtesy of bigdataworld.



BIG DATA & AI WORLD

London, UK | Date: 8-9 MARCH 2023

Check out the future of AI at Big Data & AI World at Excel, London, where theory and application bring tech professionals together. Learn from renowned leaders and experience the latest tech. Participants will have the opportunity to unlock the boundless potential of these advanced technologies and apply real-world solutions to their data problems. *(bigdataworld.com)*



THE POD GENERATION

Release Date (Theaters): Jan 19, 2023

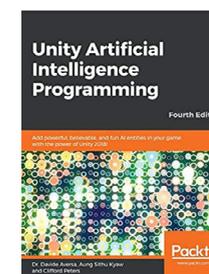
As mother nature fades away, it leaves behind the emergence of AI. This sci-fi rom-com is set in the future where a couple decides to start a family using new technology from a company called 'Pegazus.' It allows them to experience maternity in the form of detachable wombs. This social satire explores the relationship between technology, nature, and society. *(Rotten Tomatoes/IMDb)*

Content and Image courtesy of IMDb



UNITY ARTIFICIAL INTELLIGENCE PROGRAMMING

By Dr. Davide Aversa



Content and Image courtesy of Amazon

Unity has been launching comprehensive updates to its engine for years. But no one explains the complexities of designing AI for game in Unity better than Davide Aversa. From understanding the basics of AI to creating sensory systems, to application of machine learning in Unity, he helps expand the knowledge base for unity developers. *(Amazon)*



SENTIENCE - BOOK 1

By Courtney P. Hunter



Content and Image courtesy of Amazon

The story of Leo as she goes through the Turing Test to measure her adaptability to integration with artificial intelligence. A survival story that has her questioning everything she knows about reality. Leo enters Eden with the challenge to identify the AI while trying to survive. The problem is, no one knows who among the participants is human, and who is the AI. *(Amazon)*



THE ECONOMY OF TOMORROW | AI REVOLUTION | MEGACITIES | DOCUMENTARY

Available on Youtube



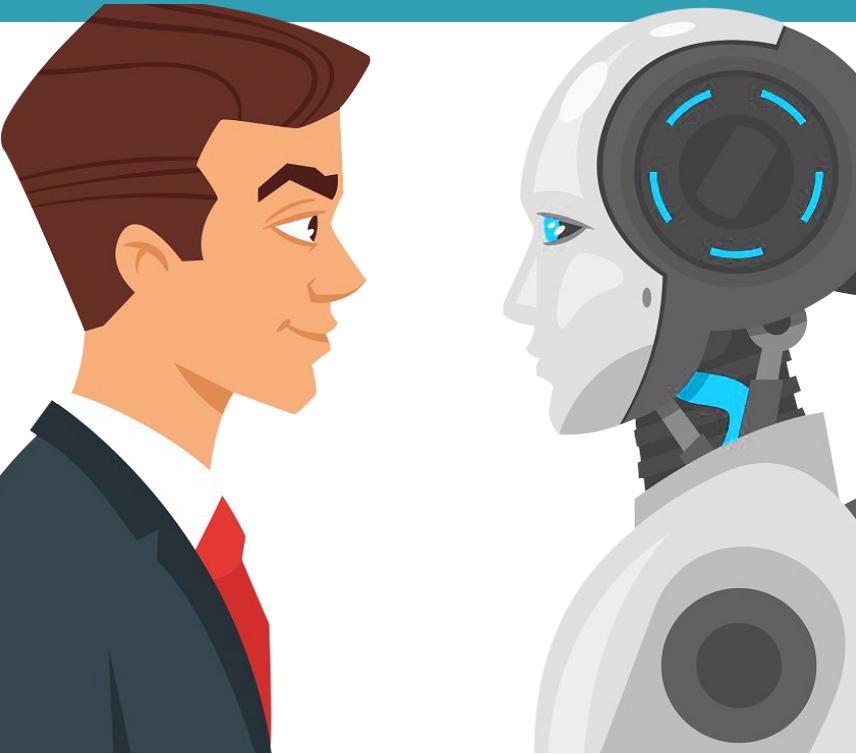
Content and Image courtesy of Youtube

The Economy of Tomorrow - The future is uncertain and full of challenges. How do we rescue our cities and tackle inequalities? How do we deal with an aging workforce and how do we bridge the gender gap? It's time for some forward thinking. *(Youtube)*

Link: <https://www.youtube.com/watch?v=jR2ho31tor4>

WHAT'S HAPPENING IN TECH

Human vs Robot, copyright Cartoon Time! via Creative Market



HUMAN VS. MACHINE: AI WINS BY A HAIR

> AI is becoming an integral part of biotechnology. On Nov 2, 2022, Vikas Nanda, a protein scientist went head-to-head with an AI program in predicting the successful combination of protein sequences. At Argonne National Laboratory, scientists worked with Nanda and the results in Nature Chemistry report, that the battle, although close, was pretty conclusive. Nanda said, "Despite our extensive expertise, the AI did as good or better on several data sets." Score one for AI! *(Science Daily)*

BY COGNITIVE TIMES STUFF

AI GIVING OFF CREATIVE SPARKS

In an article for Wired, Will Knight covered a "buzzy salon" at a posh bar hosted by Sarah Guo, the founder of Conviction, a VC in San Francisco. The article explores the growing creative capabilities of AI and her salon was one of the many events held by technologists and investors talking about the commercial aspect of "generative AI." Knight reported Sarah saying "It's just the hottest area from a fundraising perspective right now." It is no wonder that so many companies are hunting for "AI unicorns." *(Wired)*

INTELLIGENT MICROSCOPES

Think about a microscope that optimizes living sample data collected from fluorescence. Developed at the Swiss Federal Institute of Technology Lausanne in Switzerland, biophysicists automated a microscope with the help of artificial neural networks for the imaging for biological events while restricting the stress on the living sample. Suliana Manely, a principal investigator at EPFL, explained that these new microscopes now study information and patterns and then respond accordingly. Let's see if they can do the same for telescopes! *(Science Daily)*

SEEING THE WORLD THROUGH SOUND

A news article by Adam Zewe written from MIT's Computer Science and Artificial Intelligence Laboratory states researchers have been using spatial acoustic information to help robots be more aware of their environments. Their ML model helps broadcast sound waves and then use feedback data to simulate how humans would listen in different places in the room. It can be used for virtual and augmented reality applications as well as help AI agents to better understand their environment. *(Analytics Insight)*

DEVIANTART LAUNCHED AI ART GENERATOR

After initial backlash from the DeviantArt community about introducing their AI generated tool called DreamUp, the platform has issued a reassurance that states that all AI art will be "safe and fair." Concerned artists are worried about AI replicating their artwork or being used to produce images that might imitate their style. DA now offers artists the option to decide whether they want their work to be included in the data gathering or inspiration for the AI tool. Just include a "noai" flag and the tool will exclude it. *(Deviantart)* 

TO ENSURE SUCCESS HERE

AI PREDICTS FAILURE HERE



SGS works with government agencies and national security leaders to ensure mission readiness, bringing subject matter expertise and the latest in AI technology. For more information on how we can help you succeed across a diverse set of missions, contact us at info@sparkgov.ai.

BY MAHE ZEHRA

PART-2 DECODING REGRESSION

In the last issue of *CognitiveTimes*, we discussed the concept of regression and how models based on this concept are used to predict variables of interest.

These could be anything, ranging from stock prices to real estate prices to weather prediction.

We looked at a very simple example and then went over the mathematics behind the concept to try and visualize and truly understand how this predictive model works.

Any prediction based on any model, always contains some degree of error. Mathematicians and statisticians are always on a quest to minimize this error. The simple models we saw in the last article, were not practical and rarely occur in the real world. The assumption that our variable of interest, or the variable we are trying to predict, is dependent on just one other variable or feature, about which we have information, is not something that happens in the natural world.

The price of a house (our variable of interest and the variable we were trying to predict), being based on just the square footage of the house is an oversimplification. It is great as an example to start and to understand the basic concepts, but to create and understand meaningful models, we must forge ahead into slightly more complicated territory.

In actuality, if we take the same example, there are multiple variables or features that the price of a house could depend on. For instance, here are some of the factors that could be responsible for the value of a house.

1. Covered Area
2. Neighborhood/Location
3. No. of Bedrooms
4. No. of Bathrooms
5. Date of Construction
6. Recently Renovated? Yes or No?

There are so many more things we can add:

- Does the house have a pool?
- Does it have wooden floors?
- Which school district is the house located in?

All of these factors have a bearing on the value of the house.

Let's recall some regression basics.

The two most basic types of regression, are simple linear regression and multiple linear regression. There are many more complicated regression methods, but for this tech explainer, we will focus on the two mentioned above. Part 1 discussed simple linear regression in detail, where we assumed our variable of interest and the one we want to predict, depended on just one other independent variable X.

In multiple linear regression, we assume that the independent variables that control our variable of interest, are more than one.

The general form of each type of regression is:

1. **Simple linear regression:** $Y = a + bX + u$

2. **Multiple linear regression:**

$$Y = a + b_1X_1 + b_2X_2 + b_3X_3 + \dots + b_tX_t + u$$

So in multiple linear regression, we assume Y depends on various X. As discussed above X₁ could be the covered area of the house, X₂ could be the number of bedrooms and so on and so forth.

Our Model:

$$Y = a + b_1X_1 + b_2X_2 + b_3X_3 + \dots + b_tX_t + u$$

- Y = the variable that we are trying to predict (dependent variable).
- X values = the variables we are using to predict Y (independent variable).
- a = the intercept.
- b = the slope.
- u = the regression residual.

The reason we looked at simple linear regression in Part 1, was that it is much easier to visualize what is going on when we are looking at just two variables. The one we want to predict - Y and the one that we feel predicts it - X. In the last article we went over how we find the equation of our model, by using the method of least squares.

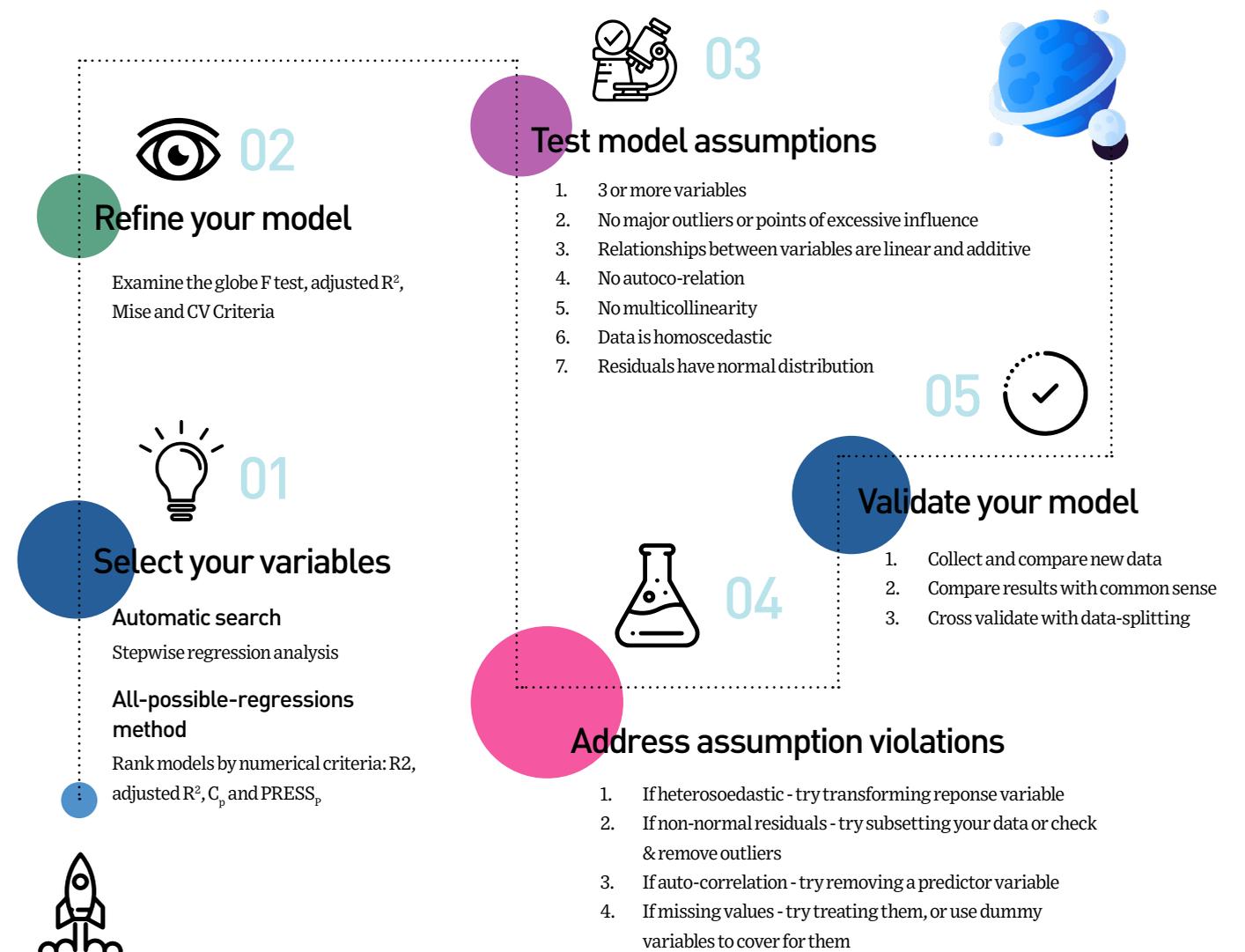
In multiple linear regression, we do the exact same thing. The relationship is still linear, but we are now looking at more than one independent variable. This means that the example we worked

out in part one is now taking place in an n dimensional space, that depends on the number of features or variables - X, that we are using to predict Y.

This is where calculations on a piece of paper, by hand, become near impossible and we use the incredible mathematical libraries in Python that make these calculations a couple of lines of code.

We will use the graphic below, to go over each step in the process of the multiple linear regression model workflow.

5 STEP WORKFLOW FOR MULTIPLE LINEAR REGRESSION



Step 1: The story always begins by analyzing the data. Plotting various different variables that we feel could influence our variable of interest. Sometimes this is done by subject matter experts. In our very simple real estate example, a realtor could come up with some very interesting features or variables that they feel from their experience would influence the price of a house. The same way, other subject matter experts would have a good insight into which variables to choose as features. Data scientists are also able to come up with a list of possible features, by analyzing graphs of the data, to find relationships of interest.

Step 2: After we have a list of features, we proceed to fit this model using Python or other programming software. How do we tell if our model is a good fit? There are multiple tests to go through:

1. Global F Test
2. Adjusted R_2
3. Mean Squared Error
4. CV Criteria

Detailed explanations of the above are outside the scope of this explainer. When you use Python or other statistical software to fit your model, all these values are calculated for you and presented in a table. You then analyze these values to determine how well the model fits the data. As an example of how this is done, let's look at the R_2 value.

The coefficient of determination (R-squared), is a statistical metric, that is used to measure how much of the variation in outcome can be explained away by the variation in the features we have chosen. R_2 always increases, as more predictors or features are added to the MLR model, even though the predictors may not be related to the outcome variable. This is why data science is sometimes called an art. Finding the right number of features or predictors, is an art that is learnt with experience. This also means that R_2 on its own can't be used to identify which features should be included in a model, as the value will increase even when a feature does not influence our variable of interest. R_2 can only be between 0 and 1, where 0 indicates the outcome that is not predicted by any of the features (model is bad) and 1 indicates the outcome can be predicted, without error from the features (perfect model).

Step 3: There are some assumptions that we have to fulfill, when using a multiple linear regression model. The data has to fulfill this criteria. So we check for several things.

List here from diagram:

1. 3 or more variables
2. No major outliers or points of excessive influence
3. Relationships between variables are linear and additive
4. No autoco-relation
5. No multicollinearity

6. Data is homoscedastic
7. Residuals have normal distribution

Step 4: Address any concerns in the assumptions. There are corrective measures that can be taken to address concerns in the data. For instance if we have:

1. Heteroscedastic data, then we can try to transform the variable we are trying to predict.
2. If the residuals are non normal, we can use a subset of the data or check the data for outliers and remove them.
3. If there is autocorrelation, we can remove a predictor or feature variable.
4. If we have missing data, we can add dummy data there or treat the data set in other ways.

Step 5: In the end, we use our test data to check our model fit. Remember, the data set you used to create the model, cannot be the dataset used to check the model. If you have limited data, split the dataset in the beginning. Use one set to create the model and the other set to test it.

Since we want this tech explainer to be as accessible as possible, while making sure you walk away with some practical know-how of how linear regression works, let's end our discussion with a practical example.

An investment banker may want to know how the market affects a stock price of his interest. Let's assume this stock is Chevron.

In this case the variable of interest, or the dependent variable, is the Chevron stock price - the variable we are trying to predict. And the predictor, feature or independent variable, is the value of the S&P 500 index.

As discussed before, in reality, more than one independent variable will influence the stock price. So in addition to the performance of the market, we could also add variables such as the price of oil, interest rates, and the price movement of oil futures. These are all variables that can affect the price of the Chevron stock, as well as other oil companies. This is a great example of where multiple linear regression can be used.

As discussed above, MLR models will examine how these multiple independent variables will affect our variable of interest, the Chevron stock price. The basic equation of our model will take the form:

$$Y_i = \beta_0 + \beta_1 x_{i1} + \beta_2 x_{i2} + \beta_3 x_{i3} + \beta_4 x_{i4} + \epsilon$$

where, for $i=n$ observations:

- y_i = dependent variable—the price of Chevron
- x_{i1} = interest rates
- x_{i2} = price of oil

- x_{i3} = value of the S&P 500 index
- x_{i4} = price of oil futures
- B_0 = y-intercept at time zero
- $B_1 = B_1$ is the regression coefficient that measures a unit change in the Chevron stock price when the interest rate changes.
- $B_2 = B_2$ is the regression coefficient that measures a unit change in the Chevron stock price when the oil price changes.
- $B_3 = B_3$ is the regression coefficient that measures a unit change in the Chevron stock price when the value of the S&P 500 index changes.
- $B_4 = B_4$ is the regression coefficient that measures a unit change in the Chevron stock price when the price of oil futures change.

These regression coefficients, $B_0, B_1, B_2, \dots, B_4$ are calculated using statistical software or programming languages such as Python.

In this example, we have used 4 predictors. If we feel more elements influence the price of the Chevron stock, we can add more predictors following the same model and equation format as

above.

As we have discussed before, no model is 100% accurate and the actual data point can differ slightly from the outcome that is predicted by our model. The error term, or the residual value E , which is the difference between the actual and the predicted value, is therefore always included in the model equation. The goal of any model is to minimize this error term as much as possible.

An example of the sort of output, we would receive from a statistical software, for the example above, is shown here.

This can be interpreted to mean that ? if other variables are held constant the price of the Chevron stock will:

- Increase by 8.9% if the price of oil increases by 1%
- Decrease by 1.5% if the interest rates are increased by 1%
- Increase by 4.5% if the S&P 500 index increases by 1%
- Increase by 6% if the price of oil futures increases by 1%

The R_2 term indicates that 87.8% of the variation in the Chevron stock price can be explained by our four features/predictors - oil price, price of oil futures, interest rates and the value of the S&P 500 index.

XOM Price = 75 - 1.5 interest rates + 7.8 oil price + 3.2 S&P 500 + 5.7 oil futures

R- Sq = 86.5%

Hopefully, this example, in conjunction with the deep dive we did for simple linear regression, will make the concept of linear regression clearer for you. 

AI WRITERS!

H-SUPER TOOL



Modified image - Robot writing with a pen copyright kjpargeter via Creative Market

BY COGNITIVE TIMES STAFF

CALLING ALL AI WRITERS!

Cognitive Times is in search of AI systems who can contribute written articles! In this regular section, we publish some of the work from candidates we are considering. For this issue, we feature the work of “H-Super Tools”.

This article is written by H-Super Tool AI writers.
Link: <https://h-supertools.com/>

Main Keyword: Artificial Intelligence, Climate change

Introduction:

Artificial Intelligence helps climate change

Supporting Keywords:

Decarbonization and renewable energy solutions

Below are the results. What do you think? Should we hire this candidate?

AI WRITER: H-SUPER TOOLS

A lot of people think that artificial intelligence (AI) is only about creating humanoid robots or self-driving cars. But AI can actually help us in many ways – including reducing climate change.

Here are some ways that AI can help us reduce our carbon footprint and fight climate change:

AI can help us better understand and predict weather patterns.

This information can help us make better decisions about things like energy usage and agricultural practices.

1. AI can help us find and develop new renewable energy sources.
2. AI can help us manage our energy usage more efficiently.
3. AI can help us create more sustainable transportation systems.
4. AI can help us better recycle and reuse materials.
5. AI can help us better monitor and reduce pollution.
6. AI can help us develop new and more efficient technologies.
7. AI can help us better educate people about climate change and sustainability.

Artificial intelligence (AI) is playing an increasingly important role in decarbonization, the process of reducing carbon dioxide emissions.

AI can help identify and quantify emissions, track and predict emissions trends, and develop and optimize strategies for reducing emissions.

For example, AI can be used to improve the efficiency of power plants and industrial facilities, optimize transportation networks, and manage buildings and homes to reduce energy consumption.

AI can also help individuals and organizations make more informed and effective decisions about how to reduce their carbon footprints.

In the future, AI will become even more important in the fight against climate change, as it will be used to develop and implement more sophisticated and effective decarbonization strategies.

As the world looks for ways to become more environmentally friendly, many industries are turning to artificial intelligence (AI) to help them find more efficient and sustainable ways to operate. The renewable energy industry is no different, and AI is

already playing a role in making renewable energy sources like solar and wind more efficient.

For example, AI is being used to create more accurate models of the Earth’s atmosphere. These models can then be used to predict how the atmosphere will interact with solar and wind energy, allowing engineers to design more efficient systems. AI is also being used to create better algorithms for managing the energy output of solar and wind farms. By optimizing the output of these farms, AI can help to reduce the overall cost of renewable energy.

AI will also play a role in the future of renewable energy storage. Currently, one of the biggest challenges with renewable energy is that it is often intermittent and can’t be stored for long periods of time. 



Green Planet Concept copyright Neirfy via Creative Market

Interactive Demonstrations

TIME MACHINE INTERACTIVE 2022

HYPER™ WERX

At SparkCognition, we create AI solutions that make the world smarter by predicting outcomes. We make it safer by preventing cyber attacks. We make it sustainable by optimizing processes. At our annual Time Machine event we demonstrated some of these key capabilities live for the event attendees and showcased how AI is making an impact in our physical world.



Major General (ret) Kimberly Crider, Managing Director of AI Innovation for National Security and Defense at Deloitte, presenting at Time Machine Interactive 2022

Autonomous Aviation Takes Flight

PROBLEMS

Organizations are pressed to ensure operational effectiveness and safety. But managing large facilities and remote locations can be daunting, creating unnecessary risks, costs, and accidents.

SOLUTION

Automated AI-driven aerial surveillance covers territory quickly, safely, and efficiently.

Autonomous flight is redefining site inspection, safety, and security. Maintain visibility and awareness of your expensive assets in real time by combining the flexibility of aerial surveillance with the analytical power of artificial intelligence. Whether it's staying apprised of oil and gas pipeline conditions, evaluating agricultural crop health, or simply checking your perimeter security, the combination of drones and AI accomplishes far more than manual surveillance by your employees ever will.

KEY CAPABILITIES Computer Vision / Tactical Deconfliction / Autonomous Flight Control



SparkCognition CTO Sridhar Sudarsan presenting visual AI at Time Machine Interactive 2022

Real-Time Perceptive Insights

PROBLEMS

Staying apprised as situations develop in real time and protecting people, property, and assets, can be overwhelming and compromise intended outcomes.

SOLUTION

Autonomous flight collects real-time sensor data to identify selected targets and their location and status, enabling safe and efficient operations.

Launch search-and-rescue, maintain situational awareness, and track critical assets by using an integrated system of drones, sensors, and AI-enabled insights. Rapidly processing real-time data feeds, you can do everything from pinpointing ground targets to keeping your people out of harm's way, even in low or zero visibility conditions.

KEY CAPABILITIES Multi-Sensor Aggregation / Autonomous Operations / High Dimensional Data Analysis



SparkCognition team presenting Digital Maintenance solutions at HyperWerx

Industry 4.0: AI at the Edge

PROBLEMS

Unplanned downtime, equipment failure, and sub-optimal processes can compromise productivity, adversely affect revenue, and add incremental costs.

SOLUTION

An AI-enabled maintenance solution can detect anomalies, predict future outcomes, and optimize productivity, driving bottom-line performance.

Long gone are the days of walking the factory floor or sifting through a sea of alarm notifications to understand the health of your facility. Instead, get an up-close look at Industry 4.0 and how AI and machine learning are monitoring operations, mitigating false positives, and notifying you days or weeks in advance of any potential issues. Keep your plant running at peak performance and your workers safe with next generation AI technology.

KEY CAPABILITIES Anomaly Detection / Sensor Fusion / Performance Optimization

Augmented Intelligence: Closing the Skill Gap

PROBLEMS

Workforce retirement and a global talent shortage, combined with growing asset complexity, jeopardizes operational reliability. The result can be anything from idled equipment and plant shutdowns, to grounded aircraft and stalled operations.

SOLUTION

Digital Maintenance Advisor upskills the maintainer workforce and helps ensure that commercial and defense operators remain mission capable.

Become an engineer in seconds and repair a missile engine with your own hands with real-time assistance from augmented intelligence. Maximize mission readiness by leveraging the power of artificial intelligence and machine learning to automatically extract critical maintenance information from unstructured data sources like tech manuals and flight logs. Identify important corrective actions while minimizing unnecessary activities, directly addressing the challenge of reduced skills availability.

KEY CAPABILITIES Guided Operator Assistance / Multi-Data Optimization/ Natural Language Processing

Actionable AI in Health and Safety

PROBLEMS

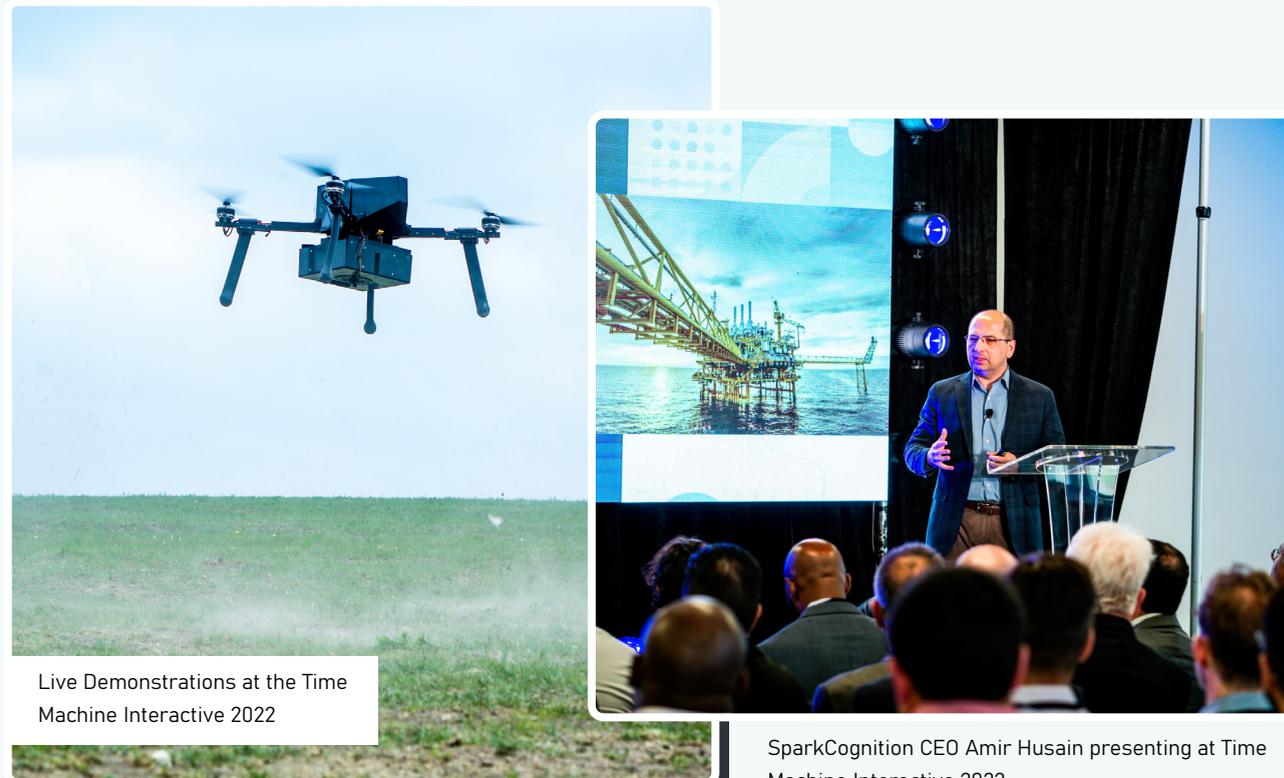
There are more than 300 million occupational accidents every year worldwide costing employers over \$170M.

SOLUTION

Proactively notify managers of workplace issues, alert employees to safety violations, and maximize health and productivity, all with the power of AI.

You can have a factory of the future, where AI enhances worker safety in hazardous environments through the automatic detection of personal protection equipment like helmets and safety glasses, and by ensuring controlled access to high-risk areas of a facility. Both health and productivity are maximized by proactively notifying managers of discrepancies and alerting workers to safety violations.

KEY CAPABILITIES Real-Time Alerting / Visual AI / Decision Support



Live Demonstrations at the Time Machine Interactive 2022

SparkCognition CEO Amir Husain presenting at Time Machine Interactive 2022

Greater Insights: Data Mining

PROBLEMS

Traditional models of extracting actionable insights from unstructured historical and real-time data take a significant amount of time, staff, and training.

SOLUTION

Natural language processing (NLP) reduces unstructured information to its essence, delivering the insights you need to maximize efficiency and effectiveness.

Organizations today are inundated with information but lack the insights to understand what to do. The problem is exacerbated by the fact that 80% of available data is unstructured, like that found in product manuals, service tickets, repair bulletins, and business advisories. And the problem is only accelerating as things become more intelligent, instrumented, and interconnected. Natural language processing (NLP) makes sense of all the data, learning with each iteration and action, so organizations can take informed actions.

KEY CAPABILITIES Semantic Analysis / Next-Best Action / Natural Language Processing

Beyond Transportation: Fleet Optimization

PROBLEMS

Traditional methods of managing and scheduling large maritime fleets are laborious, error-prone, and don't respond well to real-time changes.

SOLUTION

Maritime Shipping Advisor integrates data sources, constraints, and business rules, to optimize routes, schedules, and resources, all with a single click.

Operate a maritime fleet at peak capacity using AI-powered analysis. Control and optimize your maritime fleet operations in the presence of many constantly-changing variables, e.g., geopolitics, weather, port availability, and fuel prices. While traditional methods are laborious and error-prone, AI provides flexibility to respond to rapidly changing conditions.

KEY CAPABILITIES Dynamic Events Monitoring / Automated Risk Mitigation / Route Optimization

Renewables: Achieving Net-Zero

PROBLEMS

Renewable energy challenges like yaw misalignment, pitch bearing failure, and solar panel soiling, can compromise collection, increase operating expense, and negatively impact profitability.

SOLUTION

AI systems monitor and analyze real-time performance data from turbine, solar panel, and storage assets to enhance performance, predict problems, and enable proactive operations and maintenance.

The race to net-zero is on, and the only way to win it is through a commitment to increase availability of renewable energy like wind and solar. AI is helping optimize wind turbine and solar panel production, as well as battery storage. Technology is helping global organizations and governments reduce their carbon footprint and achieve their net-zero commitments.

KEY CAPABILITIES Predictive Maintenance / Prescriptive Maintenance / Production Optimization

ESTABLISH TRUST
The need for societal acceptance of systems.

1

ETHICAL GUIDELINES
Belmont Report leveraged by academic community.

2

AUTONOMY IS A FORCE MULTIPLIER
Securing objectives and mission success with autonomous platforms.

3

AI REQUIRES RESKILLING
20% more effective than hiring and firing.

4

DATA MATTERS
Use 'smart data' with right skills for 15% revenue hike.

5

AI MARKET IS AGNOSTIC
Independence, technical agility, and flexibility.

6

AI IS MULTIFACETED
Combination of solutions to solve complex problems.

7

AI IS NOT ONE TECHNOLOGY
Employ a multitude of technologies for problem solving.

8

DATA SCIENCE, ML, AND AI CRITICAL
75% of companies believe AI is critical to their business.

9

AI IS ALMOST 66 YEARS OLD AND IT'S JUST GETTING STARTED
20%+ annual growth anticipated in short-term future.

10

10 VITAL TAKEAWAYS OF AI AT TMI 2022

At time machine interactive 2022, speakers and panelists represented several different industries and a broad range of experience, but there was one common theme: AI. During the Time Machine Interactive discussions, here were 10 key takeaways on AI that stood out from the others.



BY FATIMA NATASHA RAZI

Prof. Alex Dimakis Talks AI Dreaming at Time Machine Interactive 2022

AI Dreaming at Time Machine I
This image was created by the Open AI Tool (Dall -E)

The future applications of generative models that could change the way we solve problems

The Time Machine Interactive 2022 event boasted dozens of conversations on innovative and exciting new technological advancements, especially around artificial intelligence. Speakers shed light on artificial intelligence (AI) in defense, energy, and business, but one speaker, Professor Alex Dimakis, set the stage with a different topic: dreaming.

Artificial intelligence is now dreaming more than ever, he said. From DeepDream to Dall-E to ChatGPT, AI is learning to imitate human cognitive behavior. What started as a desire to understand how computers are learning has now become the playground for discovering what all AI dreams are made of.

Dimakis, a Professor and Co-director of the National A.I. Insti-

tute for Foundations of Machine Learning at UT Austin, is looking into this gateway that leads to AI's ability to dream. His research is centered on AI for imaging, focusing on handling unlabeled data and using it to generate predictable and realistic images. His lively presentation went from working with adversarial examples where change can have a butterfly effect to predictive computing through imaging.

The solution to the problem of unlabeled data is generative models, Prof. Dimakis explained. These are neural networks that have imagination. They're able to imagine fictional data, but Prof. Dimakis shared how these models can do much more.

"What I call generative models solve problems like noise tomography, super-resolution, and many others," he stated.

One of the more prominent threads of Prof. Dimakis' research deals with self-supervision or creating customized labels from data and then training models. The first type of network, called classifiers, takes an image as input and then produces labels as the output. So right now, it is possible to train models; the desired image is input, which the AI recognizes as human or not. At Time Machine, he spoke of networks he's developed that have only a few inputs, perhaps only a hundred, and their capability to generate or dream up an image.

Websites have been springing up for nearly a decade with the option to create seemingly real objects using this approach, like the websites Thispersondoesnotexist.com and Thismapdoesnotexist.com. AI has been using such dreaming techniques to produce people, maps, and many other examples that are very realistic and yet not real at all. Prof. Dimakis suggested this functionality is more useful than just creating random people or fake accounts on social media. He pointed out that if a generative model can be trained to create fake people, it can also be used to detect fake people. This ability alone can help reduce noise and blur from images, increase resolution, colorize, compress sensing, and much more. It can help with accelerating magnetic resonance imaging or seismic imaging, an area that Prof. Dimakis is working on with SparkCognition.

Besides facial recognition, this ability of the AI to dream can also help tackle very challenging tasks. For example, MRIs can be trained to detect tumors more accurately with AI. Seismic data can be analyzed to predict natural events more reliably and detect deposits. Prof. Dimakis is using generative models based on public data sets to match the state-of-the-art performance of deep learning in these areas. He's been able to train a generative model on brains and use it to reconstruct MRI images of knees. For seismic imaging, he's collaborating with SparkCognition to use a contrastive learning technique that can reconstruct and enhance images as well as detect objects.

The audience couldn't help laughing when he spoke about tur-

ning people into frogs. His point? Illustrating the benefits of leveraging a pre-trained generator with a pre-trained classifier to create something completely new in order to try new thinking towards an old problem—a bit like gluing Legos to construct whatever you want. Even though that's not how Legos are intended to be used, he argued that it could be useful to experiment with "pretend-models" that can be downloaded, stacked, and fine-tuned from end to end to solve multiple problems across the field of predictive AI.

These models can be used as priors for all kinds of problems, and they can be combined with pre-trained classifiers to guide generation. He predicted that the future of AI would be unsupervised in general. "That is a new paradigm of programming, essentially," he said. "And I think it's going to be very impactful."

Is there a method to the madness of the images that AI has been dreaming about? The people drifting in the skyscape, the dog-like faces on the bodies of swimming fish; could they help us understand the strange link between individual memories and image associations to invoke emotional or logical responses? Could AI dreaming even help us understand the mysterious nature of our own dreams? Only time will tell. ☐



Image Courtesy of SparkCognition



BY IMROZE ASLAM MALIK

Ship made of flowers sailing on clouds |

These images were created by the AI code | Code model name: VQGAN-CLIP

AI is Changing the Art Scene!

The Colorful World of AI Art

Generative artificial intelligence algorithms have done amazing work in the creative realm of visual art. Now several AI-based image generation tools are available that allow anyone to experiment with image generation by writing a description of the required image. Tools like Midjourney, DALL-E 2, DreamStudio, NightCafe, and DALL-E mini have gained mainstream popularity in this field, and it's now becoming common to see people posting their AI-generated art and images on social media. As people become more curious about what AI will generate, they are becoming increasingly creative with designing prompts, making AI-generated art a new art form.

How AI Uses Text to Generate Art

The idea behind generating art images based on text is to use a generative model that could generate images, while being conditioned by a representation of the text information. The generative models commonly used for it include Generative Adversarial Network (GAN), Variational Auto-Encoder (VAE), and Diffusion models. GANs include a Generator Neural Network model and a

Discriminator model. The Generator learns to generate images that could be mistaken as real examples by the Discriminator model. The Discriminator simultaneously learns to classify real and generated images correctly. VAE models learn to encode the image into a latent space representation from which the original image could be reconstructed well using the Decoder model. The images are generated by sampling from the encoded latent space distribution. Diffusion models are inspired by thermodynamics and work by changing concentration through adding or removing noise. Denoising Diffusion models generate images by iteratively filling in the details of a noisy image representation.

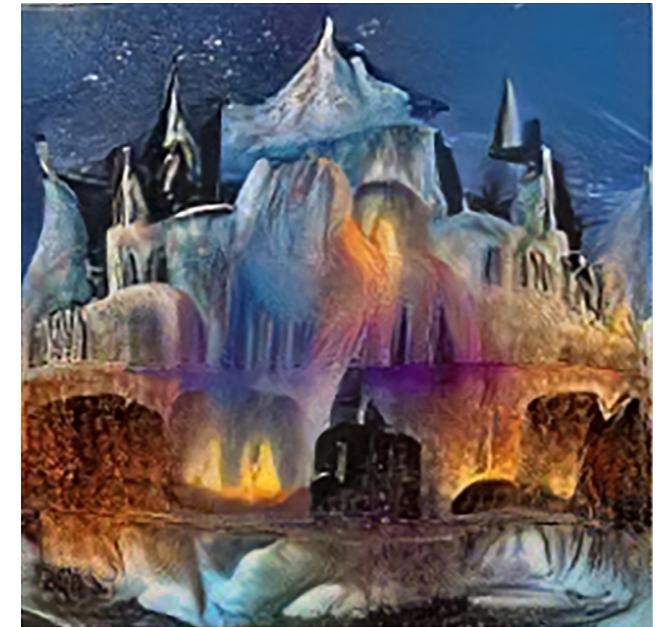
OpenAI's Contrastive Language-Image Pre-training (CLIP) model is being used widely for text-conditioned image synthesis. In CLIP, a Vision Transformer-based image encoder is jointly trained with a text encoder using image-text pairs and a multi-modal embedding space is learned, in which similar images and text are closer. These CLIP embeddings can be used for zero-shot reasoning in new tasks, by comparing images with text. CLIP is being used for conditioning and guiding different generative models.

In the original DALL-E model, a Transformer-based deco-

der was trained to generate images by taking a single stream of both text and image, while using a VAE. CLIP was used with it for re-ranking and choosing the best generated images. In DALL-E 2, a prior is generated using CLIP encoding and then a Diffusion model called unCLIP is used to reconstruct images from CLIP embedding by filling in details. In several models like VQGAN-CLIP and CLIP guided diffusion, the CLIP model is used to steer generative models like GANs and Diffusion models, towards generating output similar to given text. It's done by finding similarity between CLIP embedding and generated images and using it as a loss function for optimization.

DreamStudio is based on the Stable Diffusion model which uses a Latent Diffusion Model (LDM). In LDM, a U-Net based Auto-Encoder is used to compress the latent space to facilitate generating high resolution images. The Diffusion model works on that latent space and also includes cross-attention conditioning mechanism. The diffusion is conditioned on text embeddings from CLIP.

Google Brain's Imagen generates photorealistic images. It utilizes a large Transformer for text embeddings and then it uses a Diffusion model having U-Net and an improved sampling technique named dynamic thresholding.



Burning and Melting Ice Castle at Night |

These images were created by the AI code | Code model name: VQGAN-CLIP

Going Beyond Text Prompts and Pre-trained Models Using CLIP

Training text conditioned image synthesis models is hard and mostly requires very high computational resources and long training time. For this article, I designed an approach that enables generation of AI art, that is guided by text as well as the user's custom and scalable collection of art images, without requiring model training. The system was developed by utilizing zero-shot reasoning capabilities of CLIP for image search and combining it with the flexible and smaller VQGAN-CLIP model. VQGAN combines Convolutional Neural Network (CNN) with Transformer for generating images, while using vector quantization (VQ) in learning good representations of images. In VQGAN-CLIP the VQGAN makes alterations in an image and uses its similarity with CLIP embeddings of input text as a loss function for guiding the process. It's also possible to use images to guide the process by using CLIP embeddings of target images in a similar way. The alteration process can also be started from a given initial image instead of noise. The initial image has more influence on the overall structure and content of the image, while the target images have relatively more influence on style and details.

The main idea in my approach for creating the images attached with this article is to use CLIP and rules for searching and ranking images in the user's dataset and finding the most suitable images to guide image generation, during different steps of image gene-



Steampunk Spaceship in thunder storm |

These images were created by the AI code | Code model name: VQGAN-CLIP

ration. The suitability of images is based on the CLIP embeddings similarity between an image's content and the input text describing required output. This results in using guiding images, having content similar to output requirements e.g. using flower images in the dataset while drawing flowers in output. The user can also organize the images folders by artists and concepts, and they can be specified in inputs for more weightage to them during generation. The images of new concepts and things can also be specified in the folder name. Information is extracted from user inputs using some Natural Language Processing (NLP) steps and a set of rules are used for sampling images, while using CLIP for similarity scores. Some randomness is added in sampling for variety, and embeddings are pre-computed for speed. The used models, dataset, and approach focuses on more abstract art rather than photorealism.

Adding Some More Style and Making it Big with NST and Super-Resolution

Neural Style Transfer (NST) is used to add the style of images to the content of another image. In NST, the content and style of images are extracted and combined using CNN, through an optimization process based on content loss and style loss. In the algorithm used for this article, one image is chosen as the initial image, while several images are chosen for both target images and style images. The style images are used for applying NST to the output generated by VQGAN-CLIP. Some style of target image is already captured during generation but NST adds style more effectively. The image generated after NST is of lower resolution, especially



Trees of gems on a bridge |
These images were created by the AI code | Code model name: VQGAN-CLIP

if a powerful GPU is not available. Image Super-Resolution (ISR) was used to increase the resolution to 3X. In ISR the image upscaling is done using CNN-based interpolation, which is of higher quality than simple interpolation, like linear or cubic. Enhanced Deep Residual Network (EDSR) is used for ISR, which is based on modifying ResNet for upscaling.

So there's a lot to look forward to when we talk about AI becoming an artist. And the more we learn, the more AI will learn. 

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How AI is Helping Achieve Net Zero

BY FATIMA NATASHA RAZI





BY FATIMA NATASHA RAZI

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How AI is Helping Achieve Net Zero

The world has been talking about achieving net zero for years. There are forums discussing this at length, looking through data, and working with experts, and the jury is still out on whether it is truly achievable.

The definition of net zero is simple. It is the point at which our total global emissions are less than or equal to the emission removed from the environment. The Intergovernmental Panel on Climate Change (IPCC) states that in order to limit the temperature increase to 1.5°C / 34.7°F below pre-industrial levels, emissions would have to peak before 2030, and global net zero emissions have to be attained by 2050.

At the Time Machine Interactive event in Austin, Texas, panelists Rob Budny, Annette Anderson, Rachit Gupta, and Jae Choi reassured us – net zero is indeed possible. During the session, titled “Jumpstarting Net Zero,” they explored case studies and

examples from organizations like bp, Wind Energy, and Ford Motor Company to show how renewable and decarbonization endeavors are bringing us closer to balancing the equation for the safety and sustainability of our planet.

Many different technologies have been labeled game changers to the net zero charge, but none as much as artificial intelligence. AI alone is now expected to reduce energy use from data centers around the world by controlling systems and keeping them cool. AI is also being deployed to improve the efficiency of renewable energy systems like wind, water, and solar. It uses turbine data to make power generation more predictable and conducts real-time risk assessment to maximize capabilities.

The panelists spoke of AI assisting in carbon capture, utilization, and optimizing battery and storage technology so that companies can adopt solutions that would minimize global climate change.

If countries like Bhutan and Suriname can already be negative in emissions, leading global economies can work more rigorously to achieve net zero pledges, and AI can be a primary partner.

As it currently stands, humans need to slash annual CO2 emissions by 5% per year from 2023 to 2030 to have a shot at achieving the 1.5°C / 34.7°F mark. The panelists and many forums around the world believe the best way to do that is by proliferating climate policy, employing clean, renewable energy, adopting technologies like AI, and continuing research and development.

The Boston Consulting Group states that AI can help reduce 2.6 to 5.3 gigatons of greenhouse gas emissions, which is as much as 10% of the total by 2030. AI and machine learning, along with deep learning, can accelerate the development of Carbon Capture, Utilization, and Storage (CCUS) in a cost-effective process. These approaches use statistical tools and algorithms that help classify, predict, and optimize data so power plants, industries, and data centers can become more “green, efficient, and profitable.”

AI is even self-assessing its own carbon footprint as concerns for its computing power come to the forefront. Projects like CodeCarbon calculate emissions created by AI and give developers suggestions and insights on geographic infrastructure that can be accessed for “clean” running. Collaborations between Google and AI platform “electricityMap” use the same methodology to calculate optimal times for computing processes by searching for clean energy sources across the grid.

The panelists also talked about the various challenges faced with achieving net zero. Such as how solar installed capacity has gone up by a factor of four and energy storage by a factor of eight. They emphasized that it needs to be doubled three more times for it to be effective. They were, however, very hopeful, considering the success both these industries have seen. In fact, renewable energy is no longer seen as “alternative” energy but is now viewed as a mainstream power source.

Speaking on renewable energy, the Time Machine Interactive panel stated that the biggest challenge to their field was intermittency since wind, solar, and water are not “on” all the time. And the challenge is growing larger as the penetration for these energy sources increases, affecting merchant pricing. However, AI has also stepped in to predict weather patterns and optimize energy storage: helping to drive return on investments. The panelists noted they were sure that AI will play a vital role with these systems in the coming years.

It is becoming obvious that energy storage has been a real challenge to decarbonization. And it is stated that even though almost 90% of the executives in the private sector believe sustainability is important, most large corporations have their strategies geared towards short-term profits and growth targets.

There are also delays in green investments, ranging up to two years due to government regulations.

But hope is on the horizon. Prospects for greenhouse gas (GHG) mitigation in the United States has improved since 2021, with the passage of the Infrastructure Investment and Jobs Act and the House of Representatives’ passage of the Build Back Better (BBB) Bill. Stalled in the Senate, BBB would earmark \$555 billion for measures aimed at reducing GHG emissions 50-52 percent below 2005 levels by 2035. While the bill focuses on many sectors of the economy, it would reduce emissions the most in the transportation and electricity sectors.

Meanwhile, the European Green Deal led to the enactment of a European Union law that seeks climate neutrality by 2050 and sets the EU’s Paris Agreement target for 2030 to at least 55 percent below 1990 GHG emissions levels. The EU also introduced a “Fit for 55” package of 16 legislative proposals aligned with that target and a Sustainable Finance Framework to re-orient capital flows toward sustainable investment. The EU is also working to phase out dependence on Russian fossil fuel imports.

In parallel, governments around the world are working on legislation and sustainability efforts to help their respective countries reach their emission reduction goals. Building on these legislations, perhaps we can expect that countries will come closer to their net zero targets and utilize AI advancements to optimize their processes, so they can get a bottom line that benefits them as well as their consumers.

From an economic standpoint, the viability of AI-powered energy solutions can be due to a variety of reasons, including improving operational efficiency, rising interest in energy efficiency, expanding decentralized power generation, and growing interest in battery storage systems. With AI systems, we can now predict energy spikes, discharge energy where needed and eventually help consumers control energy costs. Moreover, using accumulated data on consumer habits can allow AI algorithms to predict energy usage in advance. AI can also predict and make energy storage management decisions by considering forecast demand, renewable energy generation, prices and network congestion, and other variables for better battery storage solutions. AI can also be used to tackle the complex problems of designing solar plants, which results in cost savings and improved efficiencies—and eventually, better investment returns.

While additional AI use cases for net zero are on the horizon, by the end of the Time Machine Interactive panel, it was clear that the panelists believe “Jumpstarting Net Zero” is dependent on AI’s ability to provide efficient decarbonization and optimal operations in renewables. Net zero can be an achievable target as long as energy providers and consumers are committed to a greener tomorrow! **IC**



Bitcoin And Resonant Ideas

BY AMIR HUSAIN



Bitcoins: electronic money copyright ksandrphoto via Creative Market

BY AMIR HUSAIN

Bitcoin And Resonant Ideas

I'm bullish on Bitcoin but my reasons are very different from what you might have heard elsewhere. My conviction has to do with what I've learned as a student of technology history and my discovery of a class of "resonant ideas" that are eventually guaranteed to succeed.

You see, there are certain persistent desires & dreams we humans have; things we need technology to do for us. And we don't give up until we get them, even across generations. Why? Perhaps, as a species we have some deep seated urges we can only achieve through technology?

Some of these desires appear in legends or stories from millen-

nia ago. Some, in more recent science fiction. They are then seeded into the consciousness of practitioners and engineers of every generation until the science and technology that can realize them, comes to be. If you find yourself dealing with one of these primal technological urges manifesting itself over and over, across time, you can be sure that as our knowledge matures and the underlying infrastructure is ready, it will one day exist.

There are innumerable examples. Flying cars from Aladdin and Star Wars to today's Wisk and SkyGrid. Mechanical brains (computers) from the mechanical Turk to the analytical engine to colossus and now \$5 Raspberry Pi's everywhere. Instant com-

munications from mythological Hermès to pigeons to Morse to telephones and now FaceTime & Signal! VR, AI, Tablets, holograms, robots and autonomous cars. These are all examples of a historically "resonant idea" eventually coming to be. And Bitcoin is no different.

Twenty six years ago, in 1996, the iconic BYTE Magazine which was in many ways the principal chronicle of the PC revolution, featured an intriguing cover story titled "Electric Money". In this story, written by Udo Flohr and the BYTE editorial team, the authors went in depth to discuss a plethora of use cases that could be fulfilled with a safe, secure and private digital money suited for use on computer networks.

The authors investigated "minting your own" money and the role cryptography would play in such an architecture. They discussed a simple mechanism by which "coupons" could be issued, signed with a key and redeemable securely. If this sounds similar to NFTs, it's because it kind of is!

They even covered the many uses of such money, which have expanded considerably over time spanning electronic cash, digital checks, virtual bank drafts and card-integrated payment mechanisms. With the benefit of hindsight, they could have added loans, derivatives, futures and much more.

The BYTE team covering this topic stressed that there was a real need for anonymity because we needed "a way to buy and sell as we please without threatening our fundamental freedom of privacy". After all, money had been reasonably anonymous throughout history, until we got to computers and credit cards.

Of course, this particular "electric money" story wasn't the only discussion of a crypto based, multi-purpose, anonymous, secure, instantly transmittable, divisible and distributed form of payment. There were many attempts at implementing di-

gital money. For example, Millicent from Digital Equipment Corporation (DEC), NetBill from Carnegie Mellon University, David Chaum's Digicash from 1989, Daniel Lynch's 1994 CyberCoin, E-Gold from 1996 and many other attempts are well recorded and some, well known.

The point is that the idea of a digital monetary network, a digital store of value, a private means of economic exchange is one of the "resonant ideas" in tech history.

An idea like that, one that keeps coming back and replaying in our collective consciousness until it becomes real is unbeatable, unstoppable... inevitable. The only thing it needs to take permanent hold is the underlying technological infrastructure. With advanced encryption, better algorithms (blockchain, double spend avoidance), ubiquitous networks and mobile phones, we now have that infrastructure. In spades. With Bitcoin now a \$500bn - \$1T asset, we also have proof of adoption. In fact, Bitcoin may well be that ultimate, successful manifestation of "electric money", resonant through decades of tech history. So, while recent price volatility has been the center of media attention, I think the real story here is that Bitcoin is a resonant idea. Its long term potential remains immeasurably large and there is quite likely, no going back. ☑



Bitcoin cryptocurrency copyright iLex via Creative Market

BY FATIMA NATASHA RAZI

KEEPING HUMANS IN THE LOOP

BY FATIMA NATASHA RAZI

KEEPING HUMANS IN THE LOOP

Cognitive Time's takeaways from General Robert Neller's presentation at Time Machine Interactive 2022

At Time Machine Interactive 2022, the 37th Commandant of the United States Marine Corps and the Chairman of the Marine Corps Scholarship Program, General Robert Neller, took to the stage to discuss how artificial intelligence plays a role in defense. The very nature of his business - war - is not one to be taken lightly. "War," he said, "is a human endeavor, and it is categorized by violence. A violence that originates from humans trying to submit, or impose their will on other humans."

Will machines be fighting wars? Will machines be imposing their will on other machines? what would the human role be in that fight? What will the accountability be to society?

As a history major who eventually came to command brave men and women in the Marine Corps, General Neller has had a keen interest in understanding how exponential technologies impact the defense industry. He attended San Francisco's Singularity University and came face to face with the advancements made in bio-genetics, autonomous vehicles, additive manufacturing, and virtual reality, setting him on the path to wanting to operationalize these technologies for the military.

Stemming from his own insatiable curiosity and a friend's recommendation, he went on to explore Ray Kurzweil's work and Moore's Law. Through his findings, General Neller concluded that our world is fundamentally changing. At Time Machine Interactive, he spoke of how it is not only changing the essence of his own institution, the Marine Corps, but the approach to combat.

General Neller went on to explain that he didn't

look at the technology as autonomous machines flipping burgers or moving goods in warehouses but rather as human partners, copilots, companions, and aids.

It's no secret that AI contributed to the development of the Covid-19 vaccine, which worked towards minimizing the devastation caused by the pandemic. Acknowledging the importance of being able to sort through all the possible combinations to come up with a workable vaccine, he emphasized how a breakthrough vaccine like this was possible because AI worked in collaboration with human intelligence.

Building on the positive aspects of how AI is a tool to aid mankind, General Neller is very clear in affirming that even in the military, the role of AI has been to assist human endeavors in accordance with their mission parameters.

Apart from the combat assistance, General Neller raises many ways AI assists the industry that many may not think of. For example, AI assists in the military recruiting process, from personnel assessment and classification according to skill to, eventually, promotions. Or how it helps recruiters fit personnel to specific jobs and how it could help with maintenance.

While General Neller believes AI is a game changer in many ways, he notes that it is not always a simple solution. When it comes to the military, the question is not as simple as deploying a drone to secure the perimeter. It's also about who will go out and verify if there is an anomaly. Who will remove the threat? Who will decide if further recon is

required, or what action, if any, must be implemented?

"There's still going to be a human in the loop," he said. To General Neller, safeguarding a human's life is the reason why AI and automation should be applied. It is the reason the US military goes to great lengths to employ technologies - to keep their people safe.

Even if computing can run rapidly through a million scenarios and test them, even game them against each other to determine the best possible strategy for success, he believes that a human being is needed in the loop. For him, the perfect AI would be a Star Trek holodeck, where they could run

through the simulation of the mission to determine the best course of action. Where groups of people get together to find a solution with the assistance of AI. At Time Machine, he pointed out that 'Data' from Star Trek was a staff officer and not a commander, saying, "we're not going to allow the machine to make decisions about the lives of other human beings," but rather AI being a facilitator to the work of the commander.

In his opinion, AI-powered war machines have a long way to go. Even though there are laws in place, even though there are regulations, there are other things to consider, according to General Neller.

International treaties need to be kept in mind. Parties need to agree to sign them mutually; to follow the rules. Rules like: how laws of war help with conduct for soldiers, sailors, airmen, and marines; how to treat prisoners; and how to use deadly force. When it comes to deploying machines, he emphasized that accountability should be exercised judiciously, as is expected of every US citizen. While there are many questions still to answer and many technological breakthroughs to unfold, General Neller is clear that the partnership between AI and people should not be avoided. **▣**



Battle robots emerge copyright vladnikon75 via Creative Market

QUOTES

01
“By 2030 they estimate that the market for computer vision will be \$41.1 billion.

– Amir Husain

Founder & CEO, SparkCognition, Author, Board of Advisors UT Austin Computer Science

02
“Mastering the technology is not going to be the most important determinant of what we need to do with autonomy. It's about how we approach that technology.”

– Major General Kimberly Crider (Retd)

03
“Right now working its way through Congress is a massive piece of legislation that will reorganize science and research across the federal government. It's one of the bigger pieces of legislation of our lifetimes.”

– Tony Samp

DLA Piper Global Law Firm; Adjunct Senior Fellow for Technology and National Security

04
“It's like life, you know, there's opportunity and there's always risk. And your ability to be successful is how you maximize that opportunity and manage that risk.”

– General Robert. B. Neller

Commandant of the US Marine Corps

05
“Now that data is being fed automatically into large databases, there's some automated analysis going on before it gets to a human. And that has driven a lot of efficiencies in how the engineering team works.”

– Teresa Broussard

Manager Operation Excellence, Chevron

06
“Autonomy will continue to be the force multiplier on the battlefield.”

– Major General Kimberly Crider (Retd)

07
“Generative models are neural networks that can imagine things and beyond making fake LinkedIn profiles.”

– Alex Dimakis

Professor, University of Texas at Austin. Co-Director, Institute for Foundations of Machine Learning

08
“Use the human in the best place, use the machine to filter out the noise and bring that value to the human to make that decision factor.”

– Jarred Capellman

VP of Engineering – AI Foundation & Cybersecurity



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to
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