Low Dropout Voltage Regulator

Implications of A.I Generated Art

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On my honor as a University student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments.

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The Implications of A.I Generated Art

Overview:

A.I generators are causing a massive paradigm shift in technology. The rise of artificial intelligence and deep learning is bound to disrupt multiple white-collar industries. In the case of my technical project, multi-objective optimization problems in respect to printed circuit board routing, part placement, and circuit design in general have become a target of A.I research. This paper aims to use discourse analysis to show how the current landscape surrounding A.I generated art is evolving by analyzing literature on the topic from research papers, government documents such as laws and regulations, studies, articles, and social media posts. Specifically, how privacy and copyright laws have or will be affected. Lastly, how some common A.I models (such as convolutional neural networks) work is briefly discussed.

Problematization:

A.I has exploded on to the market with tools such as ChatGPT and Dalle-2 and have raised uncertainty in many things such as privacy, creativity, who gets credit, and more. In respect to art, one of the largest controversies concerns who gets to take credit for the tool's output (the prompt designer or the A.I). Likewise, "training" models have raised massive concerns for privacy and copyright because of the massive amounts of data required for machine learning algorithms. These tools elicit many philosophical questions on what defines the creative process. Lastly, this technology might have the potential to be very disruptive in creative industries as the tools are becoming robust enough to create works on par with field professionals.

Guiding Question:

The main outcome of this project is to use discourse analysis via a literature review to compare the language of those in power, such as law makers and large corporations, to those who are not in respect to copyright and privacy regarding A.I generated art. What is important to artists and those most affected by this technology and how can current privacy and copyright laws be improved or renovated to reflect the values of artists?

Projected Outcomes:

Recently, A.I has raised massive concerns over its use in the creative space. This research wishes to highlight the current language being used by those who are affected the most by these tools. Such controversies only highlight the outdated language in current laws in respect to digital privacy that need to be addressed sooner rather than later. This project aims to show who's words matter more in respect to the creation of privacy and copyright laws.

Technical Project Description:

One of the most fundamental integrated circuit components is the operational amplifier. However, peering into the black box shows that the internals are very complicated. This project consisted of creating a linear and low dropout (LDO) voltage regulator which consisted of an

operational amplifier (made from MOSFETs**)** actuating an output transistor to produce a constant output voltage given that the input voltage is above the dropout voltage of the regulator. The op-amp is a three-terminal device (a differential input with a single output). To start off, a simple differential pair was created for the two inputs, then the differential pair was recombined using a current mirror. This produces an amplifier with high input impedance and relatively low output impedance. However, loading issues arose when the load being driven was much less than the output impedance of the op-amp which significantly lowered the gain. To remedy this, a source follower was used to drive the load of the op-amp. One of the biggest challenges throughout the project was figuring out how to properly bias each amplifier stage and ensure that headroom requirements were met (the sum of the voltage drops across each transistor in a stage added up to the source). Likewise, figuring out how to properly optimize and trade certain things off to reach the desired output proved to be extremely time consuming. The challenges created by this project seem like a perfect candidate for deep learning research to bypass the tedium in finding configurations that result in the most desirable outcome. For example, one of the most common trade offs in analog design is to trade of gain for bandwidth. Given the power of recent A.I models, it is likely that specialized models will be created to optimize current electronic design past human ingenuity.

Preliminary Literature Review & Findings:

Given how recently this topic has developed, a lot of current research has focused on running studies on groups of people to gauge their opinions about various aspects of A.I art. For example, the article from 2022 “Who made the paintings: Artists or artificial intelligence? The effects of identity on liking and purchase intention”, by Li Gu details a study in which people who regularly purchase art view A.I generated art. The main outcome was that a piece being A.I generated had no significant influence on a given participants desire to purchase it. Likewise, studies were run on groups in which the author of a piece was hidden, and the piece was judged by participants. While each individual study seemed reliable looking at it by itself, viewing a lot of these articles shows that many of them have contradictory outcomes. From an STS perspective, researchers seem concerned with value sensitive design as deep learning makes mapping design values to the designers of the models complicated. For example, Steven Umbrello in the paper from 2021, “Mapping Value Sensitive Design onto AI for Social Good Principles”. In the paper, he explains that since these models “learn” over time, they could acquire undesired values some point in their life cycle. Given that models “learn” in a similar fashion to how humans learn, how can the values of the designers be extracted from the finished model? Another common topic concerns copyright laws and the outdated language of current laws which highlights the government’s involvement in the future landscape of this technology. Likewise, many articles aimed to really define what it means to be creative and whether machines are even capable of being creative at all. Lastly, many articles explored the potential of A.I and human collaboration in respect to creative work. Many of these studies showed that A.I assisted work was perceived better than solely human or solely A.I generated work.

STS Project Proposal:

STS is fundamentally the study of the intersection between society and technology. Being such an open-ended topic, finding proper methods to analyze these relationships is challenging. The use of this new technology highlights this relationship largely because of how it could completely change the balance of technology in day-to-day life. If A.I ends up being as impactful as the internet for example, this could mark a major turning point in our history. Given the deeply uncertain effect this technology could have on the future, it is critical to start thinking about who is and is not involved or affected by this technology to prevent potential harm or mishaps. The goal of this project is to gather information on the topic with varying authors and intended audiences, analyze the language used in the gathered information while noting patterns and common phrases, then use the findings to suggest ways in which current privacy and copyright laws can be improved.

In respect to A.I generated art, the largest concerns fall under ethics and values. One of the biggest concerns right now is essentially data privacy. In 2021, Jenny Quang, author of "Does Training AI Violate Copyright Law", quoted "Copyright law presents a potential barrier for AI growth when machine learning models are trained using expressive data" (27). This quote suggests that training models to produce "expressive" work faces a gray area in respect to copyright laws. The article "A Legal Anatomy of AI-generated Art: Part I" goes into detail about copyright laws as well. Additionally, I want to explore how this technology could change what it means to be creative. I want to analyze the controversies surrounding credit for A.I generated works as seen in "Who Gets Credit for AI-Generated Art?" which debates whether A.I models are even capable of being creative at all. A similar debate can be seen in "Who (or What) Is an AI Artist?" by Kieran Browne. I want to address how perception of art changes when the human aspect is removed. Kobe Millets "Defending humankind: Anthropocentric bias in the appreciation of AI art", explores this concept by running a study to find if the author of certain art forms (A.I or Human) has any impact on people's opinions on the work. As this technology improves, what it means to be creative may fundamentally change. In respect to copyright law, nailing down this definition is critical for the policy to be consistent.

Given that this is an extremely impactful technology, a close eye should be kept on the values of the designers of these A.I models. For example, Steven Umbrello author of "Mapping value sensitive design onto AI for social good principles" quotes in respect to the challenges in finding the values of A.I designers "First, it may be not at all clear (to humans) how an AI system has learned certain things. The inherent opacity of AI systems requires paying attention to values such as transparency, explainability, and accountability. Second, AI systems may adapt themselves in ways that 'disembody' the values embedded in them by VSD designers" (12). The main framework that will be used is discourse analysis. This will be accomplished by looking at the language used by artists and observing how the landscape and narrative around A.I evolves. This can be used to judge how much influence that artists, those who are most affected by this, have on the narrative surrounding this technology. There are many news articles which compile the opinions of a few artists which will prove useful such as the article from the New York Times in 2022 by Kevin Roose, "An A.I.-Generated Picture Won an Art Prize. Artists Aren't Happy". Lastly, current and proposed laws in respect to digital copyright and privacy will be analyzed to see how the language and narratives manifests itself into policy.

Given the rather volatile landscape of this topic, I want to mainly focus on a literature review to capture how people, especially those in the creative space, react to this in real time. This could be an easy way to analyze the opinions of those affected by this. Likewise, interviewing artists on their personal experience with this can prove beneficial.

Barriers & Boons

One of the biggest barriers to this project is the fact that there is very little research available simply because of how recent it is. The opinions and consensus on this topic are extremely volatile. I could remedy this by making a prediction on future opinions on this technology given how the consensus on previous groundbreaking technologies changed over time. Another limitation is that I am not well versed in the digital art space. I have never really attempted to create or distribute any digital art form. Since this is the case, I need to address this by consulting the opinions of those who are in this space. Lastly, in respect to discourse analysis it is important to keep an open mind and avoid the trap of confirmation bias.

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