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Artificial intelligence-produced child sexual abuse material: Insights from Dark Web forum posts

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Content warning

This paper contains reference to artificial intelligence (AI) produced child sexual abuse material (CSAM) and includes quotes on this subject from Dark Web forum members. The information and quotes presented in the paper may cause distress to some readers. Therefore, caution is advised.

Summary

An exploratory study of Dark Web forum member chats relating to Artificial Intelligence (AI) produced child sexual abuse material (CSAM) found that:

- Dark Web forum members were active in teaching themselves how to create AI produced CSAM. Self-teaching appeared relatively easy, through accessing online tutorials and simply practising from their computer at home.
- They were also actively sharing knowledge and advice on creating AI CSAM with other forum members, in order to encourage others to produce AI CSAM.
- As part of this learning process, Dark Web forum members were sharing real CSAM for 'training' the software, and practising AI CSAM production skills.
- There was evidence that some forum members were moving from the creation of 'softcore' AI CSAM to 'hardcore'. This material was then shared with other forum members, and they were encouraged to create such material themselves.
- The research findings highlight complex challenges for law enforcement and other entities that are mandated to prevent and combat the creation and sharing of CSAM.

Introduction

As the ever-evolving world of AI¹ proves its capability to further advance society, it has also presented new dangers. One of the most significant dangers is the production and dissemination of AI produced CSAM.

Scholars have attempted to define the term 'AI produced CSAM' through two major categories: (1) AI-manipulated CSAM, where images and videos of real children are altered into sexually explicit content, and (2) AI-generated CSAM in which entirely new sexual images of children are manufactured (Krishna et al., 2024). Recent research (2023) published by the Internet Watch Foundation (IWF) found that both types of AI CSAM are

¹ Artificial intelligence, or AI, is technology that enables computers and machines to simulate human intelligence and problem-solving capabilities. See IBM (2024) What is artificial intelligence (AI)?: <https://www.ibm.com/topics/artificial-intelligence>

increasing in prevalence. The IWF (2023) research found that offenders are taking images of children, often famous children, and applying deep learning² models to create AI CSAM. According to the IWF (2023) research, many offenders have 'favourite' child victims, and are seeking to learn how to create AI CSAM of such children. Many of the offenders share their newly acquired AI CSAM 'expertise' with other participants in Dark Web³ forums (IWF, 2023). Thus, the utilisation of AI produced CSAM is expanding and exacerbating existing offender behaviours.

A 2024 report by the IWF has further highlighted the immense challenges facing governments, non-government organisations (NGOs) such as IWF, and the private sector in preventing and combating AI CSAM. These include technology companies' advances in text-to-video creation, and the emergence of offenders increasingly using LoRA models of known victims of child sexual abuse and exploitation (CSAE) to create AI CSAM (IWF, 2024).

Currently in the UK, AI manipulated or generated CSAM is criminal under the same laws as CSAM generated using real children. These laws include The Protection of Children Act 1978 (as amended by the Criminal Justice and Public Order Act 1994), which criminalises the taking, distribution and possession of an "indecent photograph or pseudo-photograph of a child", and The Coroners and Justice Act 2009, which criminalises the possession of "a prohibited image of a child" such as cartoons, drawings, and animations. Despite existing legal protections against AI generated or manipulated CSAM, there are significant difficulties for law enforcement and agencies such as IWF in determining the threshold for criminality under both acts (IWF, 2023). These difficulties stem from the increasing realism of AI manipulated or generated CSAM, which creates uncertainty regarding which legal category the material falls within. These difficulties further make removal of the content from the Internet slower and more complex than real CSAM for content moderators (IWF, 2023).

Thus, while the very small body of available literature highlights that AI produced CSAM is a rapidly increasing problem, there is much more that we need to understand in order to prevent and combat AI CSAM offences. For example, we know very little about precisely how offenders are creating AI CSAM; to what extent they are sharing AI produced CSAM; and the effect that the creation and sharing of AI CSAM is having on offender pathways and the behaviour of other Dark Web forum members. Understanding these and other related questions is critical to strengthening the ability of law enforcement and other relevant entities to understand and combat this rapidly growing issue.

Research aim and objectives

The overall aim of the research was to examine Dark Web forum posts to derive insights into Dark Web users' views and behaviour in relation to AI CSAM.

The specific research objectives were:

- To understand and document what Dark Web forum members are interested in with regards to AI produced CSAM.
- To understand how forum members are creating and sharing AI produced CSAM.

² Deep learning is a subset of machine learning that uses multilayered neural networks, called deep neural networks, to simulate the complex decision-making power of the human brain. Some form of deep learning powers most of the artificial intelligence (AI) applications in our lives today. See IBM (2024) What is deep learning? <https://www.ibm.com/topics/deep-learning>

³ The Dark Web refers to an area of the internet that can only be accessed through particular software. See The Children's Society (2020) Online safeguarding: The Dark Web: <https://www.childrensociety.org.uk/information/professionals/resources/what-is-the-dark-web>

- To understand the extent to which forum members are promoting AI produced CSAM, and the effects of this on other forum members.
- To understand the challenges that forum members are facing with regards to creating AI produced CSAM, and how they are overcoming them.
- To understand forum members' aspirations for the future of AI CSAM.

Method

The study received ethical approval from Anglia Ruskin University Faculty of Arts, Humanities and Social Sciences ethics committee in January 2024. The study was conducted under IPPPRI's program of research work on CSAE, funded by the Dawes Trust.

Data (Dark Web forum member chats) were collected through Voyager⁴, an open-source intelligence (OSINT) platform that collects, stores and structures content from publicly accessible online sources including Dark Web forums where CSAM related discussions take place. Data collection was conducted on 25 January 2024 through a key word search in the 'Atlas' dataset of Dark Web child sexual exploitation (CSE) forums in Voyager. The text-only dataset contains no images or videos.

The researchers applied the search terms "AI" OR "Artificial intelligence", and the search date range 2023 (12 months). The search was limited to English language only results. This search resulted in 19,951 results. This included 9,675 hyperlinks; 9,238 posts; 1,021 threads; and 17 forum profiles. While AI CSAM was discussed on ten Dark Web forums, most of the discussion (n=7,262 results) occurred on only one Dark Web forum.

For context, there were a total of 719,358 English-only posts and 59,805 threads about CSAE on these forums in 2023. Thus, discussion of AI produced CSAM appears to represent a small but nonetheless important portion of forum users' discussion on the wider subject of CSAE.

Researchers at IPPPRI are currently using natural language processing to analyse all 19,951 search results; however, we also wanted to do some initial exploratory analysis of the data. Thus, we took a small sample (n=600) of the search results and used thematic analysis to explore forum members' attitudes and behaviours regarding AI CSAM. Search results were extracted from the Atlas dataset to Excel, then a sample was transferred to Microsoft Word and into NVivo for qualitative data analysis purposes.

Data were analysed using thematic analysis, which is a flexible approach that can provide a detailed and complex account of qualitative data (Braun and Clarke, 2022).

Quotes presented in this paper are unedited apart from the removal of forum usernames and reference to identifiable individuals (e.g. public figures, actors and their onscreen characters), and offensive language. Quotes were retrieved from the top four of ten Dark Web forums that are currently discussing AI CSAM. All quotes were attributable to different usernames.

⁴ Developed by Web-IQ, a Dutch company that provides OSINT solutions to Law Enforcement Agencies, public services and compliance platforms. Web-IQ is also an "active private sector partner of the Virtual Global Taskforce: the international collaboration of law enforcement agencies, non-governmental organisations and industry partners to protect children from online and offline sexual exploitation" (Web-IQ, 2024). <https://www.web-iq.com/>

Findings

There is appreciation of AI produced CSAM amongst forum members

Analysis of Dark Web forum members' chats showed that forum members were, overall, appreciative of AI produced CSAM, and that there was an appetite for more of this material.

As illustrated by the quote below, the chats showed clearly that one of the key reasons that forum participants are interested in viewing AI produced CSAM is because they appreciate the 'beauty' of the images of children that are being created:

'I wish I was clever enough to make some AI pics like these - what a wonderful collection.... and I don't care if they ARE made by a machine intelligence, they are still beautiful.'

Forum members seemed particularly interested in AI produced images of famous children, particularly child actors from well-known movies:

'I would love to live in a world where [names of actors and characters that they played removed], and so many more never aged beyond their most cutefulness.'

However, AI CSAM does not appeal to all forum members

It is important to note, however, that not all Dark Web forum posts were positive about AI produced CSAM. Some forum members criticised AI CSAM because the images are not 'real'. Because they are not 'real' children, some forum members found less, or even no sexual interest in the children depicted in the images:

'Really, it's (AI produced CSAM) pathetic.'

Forum members also expressed frustration that in some cases they could not tell whether the images that they were looking at were real or AI produced. This confusion was unsettling for some forum members, who wanted to know that the material that they were viewing was 'real' CSAM. As the quote below illustrates, they experienced disappointment and loss of sexual interest when they scrutinised an image, only to discover that it was AI CSAM:

'Getting back to AI images: I was fooled initially by one and then once I learned it was AI generated I zoomed in, looked carefully, etc and then of course I noticed the fake features that were otherwise very subtle (skin too smooth, teeth too perfect etc). And my attraction or horny-ness if you like dropped like a hammer.'

Some forum members disliked AI produced CSAM to the point that they questioned whether such material should be prohibited from Dark Web forums, and, equally, discussion regarding AI produced CSAM banned:

'What's management's view on having AI on this site? Are we going to start seeing this stuff in the content sections? It seems that the stuff is showing up on image boards with greater and greater frequency. I'm not sure why.'

Forum members are teaching themselves how to create AI CSAM

Our analysis showed that Dark Web forum members are active in teaching themselves how

to create AI CSAM, and that there were three main methods they used to help them achieve this. The first method involved forum members accessing guides, manuals, and tutorial videos on how to create AI CSAM; these resources appear to be widely available and shared in Dark Web forums:

'You can train AI using your own properly prepared images. You can find some guides and information on how to train AI yourself. I watched a few instructional videos on YouTube, and it doesn't seem very complicated, but it will require precision from you in preparing the models for learning and the time of the AI learning process itself. But you can do it yourself at home.'

The second method involved requesting tips from other members of Dark Web forums on where to begin with understanding and using the software required to create AI CSAM. Those who are in the early stages of learning how to create AI CSAM will often seek assistance from those with experience. As illustrated by the quote below, this is often done by reaching out directly to those forum members who have already shared AI CSAM, and asking if they can start a forum thread to share and discuss tips on AI CSAM production:

'I'll start a thread in AI technical with example images next week to demonstrate; maybe you can offer advice. You are a pioneer. Thank you.'

The third method was to engage with other forum members who have experience in creating AI produced CSAM to understand how to overcome some of the common challenges that they faced in the production of AI CSAM:

'I'll start by saying I though I was a pretty technical person. But this AI stuff has overtaken me. I'm trying to even get familiar with the terminology - Loras, Stability, Stable Diffusion, ... My goal: I have a bunch of images of a girl from her Instagram, maybe 20-30. I want to create CP [child pornography] of her, using her face as a training model. I don't have a clue where to start - I installed InvokeAi - but cant work out how to feed it a bunch of images for training. And then to create decent CP from it. Maybe another software? Please help, baby steps.'

Forum members use CSAM already in their possession, and request new images to create AI CSAM

Analysis further showed that forum members often had a ready supply of images and videos already at their disposal to facilitate their AI CSAM self-training. They simply used CSAM already in their possession to learn how to create AI produced CSAM:

'I have a question about AI image generation. If it doesnt belong here, please remove. i have recorded a video of a really hot boy showering (years ago) and he has a really nice face, body.. i also have non nude pictures of his face, and 2 short jerking videos he sent. i have always wanted to create more of him, but not sure if it can be done. i wanted to make a virtual character of that boy to view in 3d, but i have no knowledge of that.'

Less commonly forum members also requested images and videos from other forum members that they could use for enhancing their skills in the creation of AI CSAM:

'Can you provide some clear high quality images of her? That way, those of us that have free time and use AI, can use the images you provide as a starting point.'

Some forum members move from the production of 'softcore' to 'hardcore' AI CSAM

Analysis showed that some forum members who were producing AI CSAM also moved from the production of 'softcore' materials to 'hardcore'. Some forum members experienced a waning in their sexual interest in AI CSAM over time, and, as the quote below illustrates, sought to produce more hardcore AI CSAM to reinvigorate their sexual desire:

'Now that Halolike 3 is finalized, I found myself looking at an area I haven't looked at before - hardcore. Most of my stuff is softcore and I wondered if I could take the stable model I'd created for Halolike 3 and get it to reliably turn out hardcore. After all, the mods have just introduced a new Hardcore subforum to the AI sections! Here's a first attempt. It's certainly hornier - with little to no prompting the girls will be naked and exposing everything.'

Forum members are learning how to overcome technological challenges

While analysis revealed that some of the more technologically savvy forum members have succeeded in using software to create AI produced CSAM, others faced challenges in understanding how to use the technology:

'How are you guys running invoke AI? I tried installing it on tails but couldn't get it to work. I can only get it to work on my windows computer so obviously I'm wary of downloading on topic models for it. Do you all just use a linux machine or do you use a virtual machine in windows?'

Common problems in creating AI CSAM, as reported by the forum members, were that the images were not 'perfect': the children in the AI produced CSAM had too many limbs or digits, or their face and other features were deformed:

'I have been trying to get it more and more realistic, sometime the result will have some growths or extra limbs and stuff.'

Many individuals who were creating AI produced CSAM appeared to be overcoming these challenges themselves, through trial and error, as well as applying knowledge and skills shared by other forum members:

'Thanks for the correction - was trying to use the link protection tool to create link buttons, but I can't seem to get the syntax right, and the editor garbled everything up. Just changed it to the basic links instead. I'm experimenting with a way to get that virtual photoshoot too. Some of the posing tools may make it possible. In the collection there are a few shots where she's slightly reposed, or where I've used img2img at around 0.80 to 0.85. I'm making another post about it. My aim is to create a schoolgirl set where she slowly strips.'

Forum members are sharing AI produced CSAM to encourage others to learn

Analysis also showed that some forum members who had taught themselves how to create AI CSAM encouraged others to do the same:

'A thread where I'll post both my work and my musings! ((name removed) photographed at exactly the right age) I've now been working on creating AI lovelies for a few weeks and thought I should share what I've created and what I've learned.'

They shared not only the images that they have created, but also tips on how to create AI produced CSAM:

'Good day lads, I am here to encourage more of you to try to make your own artificial intelligence child girlies, so here I would first like to present to you my archive of AI generated art... You can generate these type of pictures as well, do some googling around and you will find tutorials. Look into Automatic1111's webui github project, this will allow you to run stable diffusion models locally on your GPU.'

This sharing of CSAM in order to encourage others to do the same appeared to be effective. As reflected in the quote below, upon accessing the AI images and videos, other forum members became motivated to try manipulating the images and videos themselves:

'Thanks for these! Downloading now! I may decide to have some fun with her and generating AI images of her!'

Forum members have specific aspirations for future AI CSAM

Analysis showed that Dark Web forum members have high hopes for the future of AI produced CSAM. First, that the technology would continue to evolve so that increasingly 'beautiful' images of children could be generated or manipulated:

'If the future will involve us being dominated by artificial intelligence, I say bring it on if it can create stuff like these. Many thanks for your efforts.'

Second, some forum members expressed a hope that, in the future, those who are creating AI produced CSAM move towards the development of more 'hardcore' material:

'I would like to suggest that perhaps it's time to add a 'hardcore' AI section here. I think this would be useful to create a separation between the 'GJST; AI i.e. 'girls just standing there' vs on-topic actual sexual interaction. My hope would be that artists would, on any given set, focus in one direction or the other. I know that some artists are striving for their peak achievements in trying to reach the goal of more and more realistic images. For them, I would say to use the regular AI section. But the hardcore section would be more for artists that want to flex their muscles in the area of: -multi partner interactions -facial expressions that match the sexual activity (not to offend anyone, but I think it's time to move past the [offensive language removed] and her facial expression is just blank') -spending more time working on feel, emotion and passion than pixel perfection.'

Third, forum members were hopeful that AI would develop to the point that they are no longer able to tell whether an image is a 'real' image or an AI produced one:

'Have you seen some of the images you can produce with those new artificial intelligence apps? In the near future it will be hard to tell if a picture is legit or fake.'

Finally, they hoped that technology would quickly evolve so that interactive videos and bots that they can speak to, and instruct to perform sexual acts can be developed:

'Are we not moving in the direction of some enterprising pedo making a real working AI boy, with a cute face, a hot ass, a [offensive language removed] and a desire to please both the soul and the sexual imagination? Could it be a stand-alone application (one would hope, free of malware and phone-home code) that acts like a pedo version of Sims combined with real AI

conversational and interactive capabilities? Could we not have made-to-order virtual boys to talk with like a real boy, share thoughts and ideas, perhaps play games, some sexual, some not, and do all sorts of things in a virtual world, perhaps in AR/VR with a fine-tuned appearance and personality to our liking?’

Conclusion

This IPPPRI Insights Paper has provided insights into Dark Web forum members' views and behaviour in relation to AI produced CSAM. The paper highlights that, overall, forum members were pleased with the evolution of technology that allows them to produce generated or manipulated sexual images of children. Many forum members have successfully taught themselves how to create AI produced CSAM, and utilised Dark Web forums to share their AI produced images, nous on creating the images, and methods for overcoming challenges that they have faced in producing AI CSAM. Importantly, they also actively encouraged other forum members to create AI produced CSAM.

This paper highlights many areas of concern for law enforcement, and agencies such as IWF that are mandated to identify and appropriately code AI produced CSAM and apprehend offenders. The first area of concern is that forum members are seemingly able to learn how to use technology to create AI generated or manipulated images. Second, forum members are sourcing images of children from other forum members in order to manipulate images. Third, forum members are moving from the creation of 'softcore' AI produced CSAM to 'hardcore' material. Finally, forum members are extensively sharing AI produced CSAM, and encouraging others on Dark Web forums to create and share their own images and videos, thus contributing to the significant escalation and expansion of offending in this area.

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