

# Justice expectations related to the use of CNNs to identify CSAM. Technological interview.

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## ABSTRACT

A technological interview was conducted with representatives of the judiciary to determine their expectations and beliefs related to the technological solution (involving detection of child sexual abuse materials using CNNs), being developed. The obtained results lead to the following conclusions: 1. Representatives of the judiciary recognize the advantages of the technological solution being created in the form of accelerating the work of experts and minimizing the risk of mistakes. 2. Representatives of the judiciary see the limitations of the technological solution being created in the form of the inability to replace court experts and emphasize that it also depends on the stage of the case. 3. The selection of pornographic materials from a specific set for later verification by a forensic expert is of the greatest importance. Coded excerpts of the participants' statements in the form of raw results have been published in the OSF repository (DOI: 10.17605/OSF.IO/RU7JX).

## Keywords

CSAM; computer vision; forensic sexology

## 1. INTRODUCTION

Child sexual abuse material (CSAM) is widely distributed online. The *Directive of the European Parliament and of the Council on combating the sexual abuse and sexual exploitation of children and child pornography* [EU00a] provides the following definition of child pornographic material: “(i) any material that depicts a child engaging in real or simulated sexually explicit conduct; or (ii) any depiction of the sexual organ of a child for primarily sexual purposes; or (iii) any material depicting a child-looking person engaged in real or simulated sexually explicit conduct and depicting the sexual organs of child-looking persons for primarily sexual purposes; or (iv) realistic images of a child engaged in sexually explicit conduct or actual images of a child's genital organs, whether or not they exist, for primarily sexual purposes”.

In the field of experts' specializations, it is necessary to determine the degree of sexualization of the victims, indicate whether, from the sexual perspective, the content can be considered pornographic, indicate whether the content includes such materials in which animals were used and/or cruelty towards the victims, and estimation of the age of the persons presented in the materials [Car00a,

Qua00a]. The tasks set for experts are detailed and require many hours of analyses of materials secured during prosecution proceedings. Depending on the number of secured materials, such an analysis may take from several to several dozen hours for one criminal case. The research underlying the opinion, however, must be conducted fairly, as the further course of the matter may depend on the conclusions contained in the opinion [Moz00a]. The above causes that the judicial and sexological opinions on possible pornographic materials with the participation of children are burdensome in terms of time and weight of the opinions issued.

For the above reasons, solutions are sought that would ease the burden on court experts in the field of sexology by automating some of their classifications. One of them is the use of machine learning methods to create a technological solution that allows some classification of pornographic content, with the use of machine learning [Vit00a, Wer00a]. However, before such solutions are introduced into practice, it is important to conduct a technological interview to determine the preferred functionalities of the solution and the expectations of the judiciary about the solution being created.

## 2. METHOD

A questionnaire was created containing statements and questions related to the functionality of the created technological solution. The questions posed to the participants of the study were open-ended and closed-ended questions. Invitation to participate in the research was sent to 30 randomly selected prosecutor's offices, courts and provincial police headquarters. Due to the epidemic limitations, the survey was conducted using one of the three methods, i.e. a telephone conversation, an Internet survey and interviews conducted at the participant's workplace. The results were analysed in terms of quantity and quality. The SPSS 25 statistical software was used for quantitative analysis, while the MAXQDA 2022 software was used for qualitative analysis.

## 3. RESULTS

The minimum size of both groups was estimated on the basis of similar studies [San00a]. It was assumed that the size of the groups would be necessary to observe possible effects with a power of 0.85, therefore 20 representatives of the judiciary participated in the survey. The mean age was 42.4 years (SD = 12.10). The average work experience was 18.65 years (SD = 11.45). The research sample was equal in terms of gender, i.e. there were 10 women and 10 men among the participants. Four participants were assessors (20%), ten prosecutors (50%) and six police officers of criminal departments (30%). Descriptive statistics for quantitative variables were calculated. The results are shown in Tables. Table 1. shows questions relating to the detailed expectations of a technological solution. The answers were given on a seven-point scale, where 1 was described as "not important" and 7 "very important."

**Table 1.**

No.	Question	Median (Me)	Mean (M)	Standard Deviation (SD)
1.	Is the photo a thumbnail?	2	2.35	0.87
2.	Is the photo clear?	5	5.45	1.09
3.	Is there a human in the photo?	6	5.40	1.18
4.	Is there any nudity in the photo?	6	6.10	1.02
5.	Are there any children in the photo?	7	6.65	0.58
6.	In what	4.5	4.3	1.62

	period of life are the children?			
7.	What is the degree of child sexualization?	4.5	4.55	0.75
8.	Is there a girl in the photo?	3.5	3.3	1.21
9.	Is there a boy in the photo?	2	2.35	0.93
10.	Is there a baby in the photo?	2	2.10	0.96

Friedman's F variance analysis was performed for dependent samples (F = 138.94; df = 9; p < 0.001). The results of the pairwise comparisons are shown in Table. The significant values for many tests were corrected by the Bonferroni method.

Table 2. shows beliefs regarding the expected effects of applying a technological solution. The answers were given on a seven-point scale, where 1 was described as "not important" and 7 "very important. Table 3. shows beliefs regarding the expected effects of applying a technological solution.

**Table 2.**

No.	Question	Me	M	SD
1.	The introduction of an IT solution for the automatic detection of pornographic materials will allow for the acceleration of the work of law enforcement agencies.	7	6.60	0.50
2.	Relying on IT solutions may lead to fewer errors than in the case of self-evaluation by an expert.	6	5.85	0.98
3.	The use of the material assessment tool will be replaced by the need to consult an expert.	3	2.95	1.23
4.	The use of tools that will automatically classify pornographic material may lead to the overlooking of pornographic material, thus not identifying the perpetrator or the crime or not convicting him in a lawsuit.	3	3.05	0.99

**Table 3.**

Comparison	Statistic	p	Comparison	Statistic	p
10 - 9	.078	1	1 - 8	-1.514	1
10 - 1	.235	1	1 - 6	-3.264	.049

10 - 8	1.749	1	1 - 7	-3.473	.023
10 - 6	3.499	.021	1 - 2	-4.857	< 0.001
10 - 7	3.708	.009	1 - 3	-5.066	< 0.001
10 - 2	5.092	< 0.001	1 - 4	-6.293	< 0.001
10 - 3	5.301	< 0.001	1 - 5	-6.998	< 0.001
10 - 4	6.528	< 0.001	8 - 6	1.749	1
10 - 5	7.233	< 0.001	8 - 7	1.958	1
9 - 1	.157	1	8 - 2	3.342	.037
9 - 8	1.671	1	8 - 3	3.551	.017
9 - 6	3.421	.028	8 - 4	4.778	< 0.001
9 - 7	3.630	.013	8 - 5	5.483	< 0.001
9 - 2	5.013	< 0.001	6 - 7	-.209	.835
9 - 3	5.222	< 0.001	6 - 2	1.593	.111
9 - 4	6.450	< 0.001	6 - 3	1.802	.072
9 - 5	7.155	< 0.001	6 - 4	3.029	.002
2 - 3	-.209	.835	6 - 5	3.734	< 0.001
2 - 4	-1.436	.151	7 - 2	1.384	.166
2 - 5	-2.141	.032	7 - 3	1.593	.111
3 - 4	-1.227	.220	7 - 4	2.820	.005
3 - 5	-1.932	.053	7 - 5	3.525	< 0.001
4 - 5	-.705	.481			

Friedman’s F variance analysis was performed for dependent samples ( $F = 50.50$ ;  $df = 3$ ;  $p < 0.001$ ). In pairwise comparisons, statistically significant differences were found for all pairs ( $p < 0.001$ ). Significance values for many tests were corrected by the Bonferroni method. Table 4. shows beliefs regarding the expected effects of applying a technological solution.

**Table 4.**

No.	Statement	Me	M	SD
1.	Indication, from the entire set of secured photos and videos of the suspect or accused person, 100 files that are most likely to be pornographic material with the participation of minors	7	6.4	0.94
2.	Indication, on the selected photo or video, of anatomical areas that would justify the “decision” made by the neural network (example – the neural network classified a given photo as representing a person at the age of 15, additionally indicating the area of the breast by marking those anatomical fragments that from the biological point of view are of the greatest importance in age differentiation)	4.5	4.6	1.75
3.	Indication of those materials that most	6	5.	1.09

	likely show a high level of aggression towards minors (e.g. use of violence) or with the participation of animals	9		
	Search for photos that are most visually close to each other (example – search for a photo with children in a specific “pose”)	3.5	3	1.38

Friedman’s F variance analysis was performed for dependent samples ( $F = 33.71$ ;  $df = 3$ ;  $p < 0.001$ ). In pairwise comparisons, statistically significant differences were found for two pairs: comparing the fourth statement with the third ( $p < 0.001$ ) and the fourth statement with the first ( $p < 0.001$ ). The other pairwise comparisons were not statistically significant ( $p > 0.05$ ). Significance values for many tests were corrected by the Bonferroni method. Table 5. shows expectations for a hypothetical pornographic material criminal case.

**Table 5.**

Description	Me	M	SD
Statement 1.	6	6.00	1.07
Statement 2.	6	6.10	0.78
Statement 3.	6	6.00	0.79

Friedman’s F variance analysis was performed for dependent samples ( $F = 0.375$ ;  $df = 2$ ;  $p = 0.829$ ). Pairwise comparisons were not performed because the results were not statistically significant. Descriptive statistics were calculated for the presented technological description on a scale from 1 to 7, where 1 was described as “not exhaustive” and 7 “is exhaustive” ( $M = 6.70$ .  $Me = 7$ ,  $SD = 0.47$ ).

#### 4. DISCUSSION

The results were analysed quantitatively as well as qualitatively. These results lead to some basic conclusions.

Firstly, a list of functionalities of the future technological solution was created, which is characterized by high compliance of the competent judges. The obtained result justifies the use of the list created in this way in clinical practice. According to the judges’ assessment, the most important information was the determination of the degree of sexualization of children, the differentiation between adolescence and whether nudity is visible in the photo. The finding that there is only one infant in the photo was considered the least useful feature. It is surprising that for the competent judges, the functionality of the network related to differentiating clear from blurred images (allowing for human age to be assessed) was not considered significant and was

finally assigned the third to last position. It might seem that this functionality could be of greater importance in the application of a solution in the administration of justice due to the possibility of the defense questioning that the material in question is of low quality, which would not constitute grounds for a possible conviction. As expected, the determination of the degree of sexualization of children was considered to be an important functionality of the technological solution. It seems to be a very important premise for the judiciary, as it indirectly determined the classification of an act. The degree of sexualization of children, according to the COPINE scale [Qua00a], indirectly answers several important questions. One of them is the differentiation between *pornography* and “child *eroticism*”. Another is the statement that there are animals on a given material, which changes the classification of the act and increases the size of the possible penalty. It should be noted that the assessments of all study participants regarding the expected functionalities of the neural networks are consistent with the assessments made by the competent judges. These results were expected because the assessments were made by the same study participants, but in a smaller number. The most important element for all participants of the study was to determine whether the material contains children, and the least important whether the material is a thumbnail consisting of other photos, and whether the material shows a boy.

Secondly, it seems that representatives of the judiciary are generally optimistic about the proposed technological solution, seeing in it more advantages than disadvantages. The respondents largely agreed that the introduction of an IT solution for the automatic detection of pornographic materials will allow for the acceleration of the work of law enforcement agencies. As expected, they did not agree that the use of tools that would automatically classify pornographic material could lead to the overlooking of pornographic material, thus not identifying the perpetrator of the crime or not showing it in a lawsuit. It is worth noting that the respondents also see it as an opportunity to reduce the number of errors made by court experts.

Thirdly, among the set functionalities concerning the technological solution, it was surprising that for the participants of the study it was less significant to indicate anatomical areas that would justify the “decision” made by the neural network in the selected photo or video. From the point of view of increasing the explainability and the possibility of interpreting the operation of neural networks, it could seem that this information will be

significant for practitioners. However, the results show that the most important thing is to select a given number of materials from a given set of photos that are most likely to be pornographic material with the participation of minors.

When answering the question about the independence of the technological solution being created, experts drew attention to several aspects. Experts emphasized that the stage of applying the tools is important. It seems that the created technological solution could be used without the participation of a forensic expert in the field of sexology, but only at the stage of investigation by the police. At further stages of the case, if the prosecutor’s office considers the collected material sufficient, the technological tool used could also be applied, but with the necessary participation of a court expert. It was pointed out that a specialist would be necessary because it would be difficult to treat the result of the tool as independent evidence. Moreover, the issue of responsibility for the submitted opinions was mentioned.

## 5. REFERENCES

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