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# How Can Technology Support Dog Shelters in Behavioral Assessment: an Exploratory Study

Yael Hazan
University of Haifa
Israel

Orit Hirsch-Matsioulas
University of Haifa
Israel

Dirk van der Linden
Northumbria University
Newcastle upon Tyne, United Kingdom

Anna Zamansky
University of Haifa
Haifa, Israel

## ABSTRACT

Animal shelters deal with many challenges: they are understaffed, overcrowded, run on limited budgets and have very limited resources. An important issue in this context is behavioral assessment and screening of behaviour, temperament and personality of animals in shelters. Technological solutions, and specifically AI, have the potential to support shelters in these challenges. This, however, calls for better understanding the potential benefits of technology in the context of shelter dogs' behavioral assessment and evaluation, as well as barriers to its adoption. This paper reports on our ongoing exploratory study, which focuses on perceptions and attitudes of shelter officials in Israel with respect to technological solutions supporting behavioral assessment.

## CCS CONCEPTS

• **Human-centered computing** → **Human computer interaction (HCI)**.

## KEYWORDS

sheltered dogs, behavior assessment, AI, automated tracking

## 1 INTRODUCTION

Among 6–8 million animals which enter rescue shelters every year, with nearly 50% being euthanized, with one of the main reasons being behavioral problems[3]. Among the 6–8 million animals that enter rescue shelters every year, nearly 50% are euthanized due to behavioral problems. Shelters operate under extremely tight budgets, often relying on government funding, donations, grants, and nominal fees to persist [12]. They are also over-crowded, leading to

ethical questions for shelter veterinarians that need to make hard decisions on quality of life of healthy dogs that can be euthanized or kept for long periods of times in overcrowded shelters [5].

This highlights the importance of behavioral assessment and screening of behaviour, temperament and personality of dogs in shelters, which can guide decision making of shelter veterinarians and shelter management officials. Shelters tend to undertake such assessments to reduce liability and to improve prospects of a successful rehoming [10]. Other reasons include the identification of dogs which require additional training or rehabilitation prior to rehoming, and an attempt to ensure good welfare and quality of life for the dog in their new home [6]. While many shelters in different countries perform behavioral assessments, their form varies significantly; it may be informal and completely unstructured, or follow some standardized or self-developed protocol [6]. Mornement et al. [10] reviewed a sample of Australian animal shelters assessment protocols to determine adoption suitability, revealing that although shelters make efforts to ensure meaningful results, the used assessment methods lack standardization and have not been scientifically evaluated. Moreover, it is unknown whether any of the tests are useful in terms of predicting future behavior in the adoptive home [10].

Technology, and in particular AI has the potential to support shelters in the many challenges they are dealing with, and several studies apply technological solutions for a variety of problems in this domain. Bradley et al. used machine learning models for predicting the length of stay of animals in shelters [3] . Jeyaraj and Aponso applied an automated approach for assessing 'attractiveness' of dog photos to guide shelters in posting influential photos to increase adoption speed[7]. Alcaidinho et al. investigated the use of quantimetric monitors and a companion smartphone application for reduction of returns and increasing the perceived strength of bonds between newly adopted dogs and their owners [1]. Kresnye et al. investigated shelters' coordinators pressing needs, revealing that volunteer and shelter management, awareness and communication of shelter needs, and fundraising and facilitating adoption were prominent areas that could benefit from technological solutions [9]. Wearable sensors and video data have also been used for analyzing sleeping patterns [13] and activity levels [4] of shelter dogs.

As part of a wider project aiming to develop AI-based technologies to aid shelters, this paper aims to explore the potential benefits of technology in the context of shelter dogs' behavioral assessment and evaluation, as well as barriers to its adoption. To this end we report on some preliminary results from our ongoing study, which

aims to better understand the perceptions and attitudes of shelter officials in Israel and how to harness AI for their benefit. .

Like in the US, in Israel there is no specific countrywide legislation dealing with the issue of free-roaming animals. The Dog Regulation Law of 2002 of Israel requires every dog above the age of 3 months to be licensed, microchipped, and vaccinated annually against rabies. There are no Israeli laws addressing euthanizing sheltered dogs (each shelter chooses its own policy), or about sterilizing them [11]. Each municipal shelter has an appointed veterinarian, who is responsible for monitoring dogs' health and behavioral issues, and make decisions concerning euthanizing, in case the shelter practices this policy.

In this paper we describe an exploratory study conducted by semi-structured in-depth interviews with nine shelter officials from six different shelters located in different parts of Israel. We present some preliminary insights from these interviews, focusing specifically on the valence of participants' attitudes towards technology, and specific applications of AI envisioned by them for behavioral assessment of shelter dogs. We further discuss their implications for the adoption of technological solutions, and directions for future research to promote such solutions.

## 2 METHODS

We prepared a semi-structured interview guide addressing the use of technology in dog shelters targeting individuals having an official role in Israeli dog shelters. When recruiting for interview participants, we used an official list of municipal shelters we obtained from the Israel Ministry of Agriculture, utilizing also a snowball sampling strategy beginning with our connections.

We interviewed nine municipal shelter officials. The interviews were held via Zoom, were recorded and later transcribed for analysis. The interviews ranged from 30 to 50 minutes, and were all performed by the first author.

Each interview started with a core set of questions such as demographics, then further questions were added depending on the participant's roles and responsibilities in the shelter. The full interview guide is out of scope of this paper, we focus here on four particular questions which address perceptions and attitudes towards technology, and specifically AI for behavioral assessment of dogs, as well as other possible applications:

(1) How do you feel about the use of technology and AI in the context of behavioral assessment and monitoring of shelter dogs?
(2) What are the possible benefits of such use?
(3) What are the possible pitfalls of such use?
(4) What other applications for technology and/or AI do you envision in the context of shelters?

Table 1 summarizes the participant demographics and their roles in their shelters.

In our preliminary analysis, we coded the qualitative data, focusing on the valence of attitudes expressed in questions 1 and 3, and the perceived specific applications participants identifed in questions 2 and 4. The coding was done by three independent coders; any disagreements were resolved following discussion between them. We discuss those next in further details.

## 3 PRELIMINARY RESULTS

### 3.1 Attitudes towards technology and AI

When asked how they felt about the use of technology (question 1), and specifically AI in the context of behavior assessment and monitoring of shelter dogs (questions 2 and 3), the participants' answers revealed mixed attitudes which we identified as three different valences:

- *Positive.* These answers expressed their belief in the potential of such technologies to improve the situation with respect to various pressing issues. Some examples of such answers are:

  "I think this is the natural next step. We should definitely move from pencil and paper to digitalized information. Automated assessment is the key to saving my time so I can do other important things." (P1)

  "I can definitely envision the how such tools can help me in shelter management." (P3)

  "I think that if the output of AI is accurate, it could be of great help and would be a very important tool. " (P4)

- *Neutral.* In this category, participants' expressed mainly their lack of knowledge and understanding of what technology and AI mean in this context. Some examples of such answers are:

  "It's a good question to which I do not have an answer to. Perhaps we could benefit from AI, but I cannot immediately see how." (P2)

  "I cannot see how technology can help, as I have no good understanding of what it can do." (P5)

- *Negative.* Some participants expressed attitudes of fear and distrust towards technology, specifically with respect to a machine making important decisions, or even providing insufficiently informative input for humans to make them. Some examples of such answers are:

  "But I also think it's terrifying. The idea to use AI in the context of behavioural assesment is scary for me. Algorithms give you binary output, while the behavior of a dog, a living creature, is not binary, and there is a lot of gray areas." (P1)

  "Personally, I do not trust AI to make decisions, as I do not believe the output can be good enough." (P6)

  "Technology interventions without human in the loop scare me a lot. Dogs can be deemed as non-adoptable, while it was just a transition phase that was captured by the tool." (P5)

### 3.2 Envisioned applications of video tracking with AI

When discussing possible applications of technology and AI (question 4), the participants were presented with one such example: using automated analysis of video recordings. They reflected about potential applications of such technology, mentioning specifically the following directions:

- *Monitoring for health issues.* Some participants mentioned medical context, stressing specifically that there are hours when no staff is around to detect health issues, e.g.:

| ID | City | Area | Size of Shelter | Role | Years of experience |
|----|------|------|-----------------|------|---------------------|
| P1 | Lod | Center | 7000 m$^2$ | Dog Trainer (volunteer) | 1 Year |
| P2 | Lod | Center | 7000 m$^2$ | Dog Trainer | 1 Year |
| P3 | Lod | Center | 7000 m$^2$ | Veterinarian | 5 Years |
| P4 | Eilat | South | 20 kennels | Veterinarian | 9 Years |
| P5 | Ashkelon | South | 24 kennels | Veterinarian | 2.5 Years |
| P6 | Ramle | Center | 50 m$^2$ (7 kennels) | Dog Trainer | 2.5 Month |
| P7 | Ramle | Center | 50 m$^2$ (7 kennels) | Veterinarian | 23 Years |
| P8 | Haifa | North | 3000 m$^2$ (67 kennels) | Veterinarian | 23 Years |
| P9 | Yasur | North | 2000 m$^2$ (48 kennels) | Veterinarian | 5 Years |

**Table 1: Participants' Demographics**

"I can think of a few cases where shelters can benefit from such tools. For instance, real-time alerting of a medical emergency, when there are no volunteers or staff around. Another thing would be to monitor puppies for disease diagnosis." (P1)

Two participants also highlighted specifically the usefulness of monitoring eating and drinking patterns:

"It would be interesting to monitor weight loss in dogs, and in general monitoring eating habits can help detect dogs in stress." (P3)

"I think AI can help us monitor the daily life routine, such as how much dogs eat...how fast? how much they drink? how often? " (P5)

- *Monitoring for welfare and stress.* One participant specifically referred to monitoring stress levels (stress was also mentioned above in the context of monitoring eating patterns):

  "It can help in the daily routine of the shelter: monitoring in-kennel dog behaviour for monitoring stress levels of the dogs, and suggesting personalized ways to reduce it." (P2)

- *Detection and monitoring of behavioral problems.* Detection of specific behavioral problems such as separation anxiety, aggression or excessive vocalization was specifically mentioned. Moreover, the progression of problematic or stereotypic behaviors over time was highlighted as another potential application:

  "It could be used for prediction of development of separation anxiety, aggression, or excessive barking behaviour which would be problematic later in the future adopters' home. " (P5)

  "It can promote the welfare of the dogs staying in the shelter for longer time periods by monitoring the progression of behavioral issues caused by staying in the stressful shelter environment, such as stereotypic behaviors. " (P5)

- *Analyzing dogs' social behavior and interactions.* Another type of application mentioned by the participants was monitoring social behaviors of multiple dogs staying in one kennel, and specifically detecting and predicting their possible aggression towards each other.

  "One thing I can think of is monitoring dogs' behaviour in the kennel for alerting on upcoming fights between dogs living in the same kennel." (P6)

"If it can guide my decision which dogs can be housed together, it will be great help. " (P7)

## 4 DISCUSSION AND FUTURE RESEARCH

One of the pressing needs of shelters is the need for objective assessment of behavior, which can guide decisions concerning sheltered animals' adoption, which in its turn could lead to increasing adoption rates, minimizing animal returns. Technology can be a game changer in a variety of ways, some of which we explored in this paper. Adoption of new technologies, however, is associated with many adoption barriers, especially in organizations such as shelters, which is overcrowded and understaffed, and are operating on tight budgets allocated by governments or private donors. Such barriers need to be taken into consideration when developing technological solutions to address shelter problems.

Our preliminary results presented here are a first step to understanding perceptions and attitudes of shelter professionals in Israel, which can help us better understand adoption barriers for technological solutions. This study focuses on the situation in Israel, but the insights gained from it can be a comparison point to other similar studies done worldwide. One issue we identified from the preliminary data is the *lack of understanding* of shelter professionals of how technology can be helpful for their daily activities. This can be mitigated by better dissemination of scientific research where technological solutions were found effective in various domains of shelter routine (e.g., [2, 4, 9, 13]).

Another important issue to be addressed in future research is the distrust expressed by several participants towards AI analyzing dogs' behavior, and even more about predicting time until adoption, along the lines of [3, 7]. This may perhaps turn out not to be distrust of AI per sé, but a general skepticism of a computer system generating better results than professionals, in turn leading to distrust of AI's potential to replace human roles. The design and deployment of any AI-driven system in shelters to supplement human activity should certainly be carefully considered from an ethical perspective considering key ethical principles that are considered by most people across sectors [8], clearly defining together with professionals what responsible AI adoption principles mean in the context of dog shelters.

One of the participants expressed concern that recording and digitizing data from the workflow of shelters can discourage and put an overload on the work of many shelter officials due to excessive

transparency of their decisions, and their responsibility for them. This seems to be a gray area that deserves further exploration through the lens of privacy and ethical considerations.

Despite some attitudes of distrust, or lack of understanding, the majority of participants expressed their support of the idea of technological innovations, and their beliefs that they have potential for improving shelter work efficiency in terms of time and money. Moreover, the participants mentioned specific applications they envisioned for the use of automated analysis of video recordings of sheltered dogs. These included monitoring of stress levels, eating and drinking patterns, interaction and social behavior and detection of behavioral problems and their progression over time. Solutions based on in-kennel video recording setup are cheap, feasible and have been implemented in several studies ([4, 13]), and are thus a good starting point for introducing technologies supporting behavioral assessment into shelter environments. In future research, we intend to use the insights gained from our preliminary analysis to refine our questionnaire guide, focusing in particular on AI applications envisioned by our participants to better understand the requirements and the conditions in which these solutions can be implemented, further expanding the scope of our empirical study to include more shelters and shelter officials.

## ACKNOWLEDGMENTS

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