

“I Can Haz Emoshuns?” – Understanding Anthropomorphosis of Cats among Internet Users

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The attribution of human-like traits to non-human animals, termed anthropomorphism, can lead to misunderstandings of animal behaviour, which can result in risks to both human and animal wellbeing and welfare. In this paper, we, during an interdisciplinary collaboration between social computing and animal behaviour researchers, investigated whether a simple image-tagging application could improve the understanding of how people ascribe intentions and emotions to the behaviour of their domestic cats. A web-based application, Tagpuss, was developed to present casual users with photographs drawn from a database of 1631 images of domestic cats and asked them to ascribe an emotion to the cat portrayed in the image. Over five thousand people actively participated in the study in the space of four weeks, generating over 50,000 tags. Results indicate Tagpuss can be used to identify cat behaviours that lay-people find difficult to distinguish. This highlights further expert scientific exploration that focuses on educating cat owners to identify possible problems with their cat’s welfare.

Keywords: cats, user-generated content, image tagging, animal behaviour, anthropomorphism

I. INTRODUCTION

The popularity of cats in many industrialised countries has grown enormously in the last decade, to the point that, for instance 26% of households in the UK own a cat [5]. The typical domestic cat in such countries fulfils a role as a focus for human affection, which, for many owners, appears to be reciprocated. As a result, the owner displays a strong affiliative relationship towards the cat [11]. It is not surprising, therefore, that a massive industry has developed around cats and cat related items in society. This ranges from bespoke cat furniture to cat memorabilia.

The popularity of cats in modern culture is perhaps best exemplified in the numerous websites, forums, videos and images devoted to them online, of which “LOLcats” are merely one famous example [6]. The popularity of cats online has even led to interventions in the real world to stop or highlight abusive behaviour [9].

A. Why is this of interest to HCI?

As social computing researchers, we are interested in how, and why, people use online social technology. Often the internet is used for highly introspective experiences which are extensions of an individual’s lifestyle. The focus of this

particular paper is the passion and enthusiasm of a community of cat owners and how they perceive, and feel empathy toward, their cats. Popular cat themed websites such as icanhazcheeseburger.com and cuteoverload.com can therefore be seen as fulfilling the need to engage with cats in ways that may complement real life activity. However, the reasons why people engage at all with such sites are in fact not well understood. Shirky [12], in an exploration of what he terms cognitive surplus, singles out the activity of labelling and uploading of LOLcat images as an example of how people can be highly motivated to do seemingly meaningless online tasks. Like Shirky, we are interested in understanding how cat-themed social media and online social networks can be used for purposes other than entertainment.

Thus, there must be some questions about cat behaviour, or people’s understanding of cat behaviour, for which websites like LOLcats can actually provide valuable data. As animal behaviour scientists, we have identified the phenomenon of anthropomorphism with cats as an issue which is both observable on popular websites and which has genuine consequences for animal welfare.

II. INAPPROPRIATE ANTHROPOMORPHISM

Perhaps the most interesting feature of the popular cat-themed websites and online collections of cat pictures are the human-like intentions and emotions that people attribute to the featured animals. These sites are simply the most recent in a long history of anthropomorphism, stretching back through Aesop’s Fables and numerous mythologies and belief systems.

In particular, complicated motivations and feelings (revenge, love, thoughtfulness, etc.) cannot be determined by judging animal behaviour on human terms. A vivid example of the dangers of anthropomorphism is in the high occurrence of dog bites to the face of children, who presume the exposing of teeth is a “smile” and indicates friendliness [3].

A. Anthropomorphism and companion animal behaviour

Companion animals are an important part of western civilizations, and wherever there are pets, there is anthropomorphism. Most cat and dog owners, for instance, will typically claim to know how their companion animal is ‘feeling’. However, it is evident from the large number of

animals that fail to integrate successfully and end up in animal rescue centres, that understanding their behaviour can be problematic, New et al [8].

Indeed, New et al found that if a cat soiled the house, was destructive or was perceived as overly active, it was significantly more likely to be returned to a rescue centre by the owner. They also found people relinquishing cats exhibited misunderstandings regarding the concept of *spite* as a motivating force behind some types of cat behaviour (i.e. cats don't necessarily grasp the human concept of revenge).

Having a scientific understanding of how people ascribe emotions to their cat or dog can potentially lead to an improved understanding of the human-animal relationship, and why it can sometimes go wrong. We are therefore interested in the process whereby owners attribute human-like emotions to their pets.

With this in mind, a free online resource was developed that aims at explaining and illustrating in a very graphic way the behavioural repertoire of the cat. This resource is known as an *ethogram*. In order to generate this ethogram, we collected a large amount of images and videos (1631) from cat owners worldwide. These images and videos have been categorized and labelled in terms of the behaviour being exhibited in order to create an educational and scientific resource.

III. TAGPUSS

As part of an inter-disciplinary working group, the "Tagpuss" project was created as collaboration between the University of Lincoln's School of Computer Science and the Department of Biological Sciences. The aim of the project was to exploit the repository of cat images in order to create a large-scale study of anthropomorphism among Internet users, drawing upon the large community of cat owners.

A. The three main objectives of this research:

- Firstly to examine the diversity of perceptions that relate to cat behaviour across a large sample of participants.
- Secondly, to identify the extent of dangerous anthropomorphism on the part of the participants – highlighting cat behaviours that pose the most difficulty for owners to evaluate.
- Finally, to explore the phenomenon of cat pictures on the Internet as being intrinsically motivating and rewarding for users to engage with scientific inquiry.

IV. METHOD

Tagpuss is a web application that presents participants with images drawn from the ethogram repository, and allows for the images to be tagged with emotions and motivations from a predefined list. The list was aggregated from findings of a

number of researchers [10] and included both simple and more complex human emotions, motivations and feelings.

On opening the Tagpuss website, a user is presented with a random selection of one of the 1631 images currently in the repository, and asked the question 'How is this cat feeling?'. If a tag is chosen for the image and submitted, the user is then presented with feedback in the form of a tag-cloud displaying other tags provided by users for the image with the most popular emotion tags displayed larger. This feature allows the user to compare their own perception of an image to that of others. Feedback is only shown after the user has made a tag submission with an example shown in figure 1. If a user felt that they could not tag that particular image, there was a simple 'skip image' button, which allowed them to advance to the following image without submitting a tag. Skipped images were flagged for later analysis. We also developed a short questionnaire that participants were asked to complete at the conclusion of the trial period.



Figure 1. Example tag cloud providing multiple user feedback

A. Procedure

The Tagpuss application was free to use and open for participation during a 30 day period. Participants were free to visit the site and look at as many or as few images as they wanted. There were no minimum or maximum limitations on participation. In addition, participants could choose to either tag, or to skip (i.e. not tag), any of the images that they were shown.

B. Questionnaire

An online questionnaire was deployed to capture qualitative and quantitative responses from participants who had used Tagpuss. The questionnaire was used to expand knowledge about user motivations - whether users of Tagpuss wanted to contribute towards science, what features of Tagpuss facilitated this contribution, suggestions to improve their contribution and if they believed cats displayed emotions. User generated emotion tags were elicited from the questionnaire allowing us to understand the emphasis participants placed on being empathic towards their cats.

V. RESULTS AND DISCUSSION

During the trial, 50,044 emotion tags were submitted by 5759 unique users (out of over 10,000 visitors). Every image received at least one tag, with an average of 30.7 tags per image. 2892 of active users (tagged at least one image) tagged 5 or more images each with 1476 users tagging 10 or more images each.

A. Research Q1 – Diversity of Perceptions

When tagging cat pictures on Tagpuss, users select from one of 40 emotion tags. Since each image was tagged 30.7 times on average, it is possible to analyse user tags in order to get a value for how consistently users agree on emotions (we call this *consensus*). Consensus is calculated based on the number of distinct tags collected for each image - the value is the proportion of tags that match the most popular tag for that image.

High consensus of emotions tagged on an image is an indicator that the emotions of the cat appear to be clear and easily distinguished by a large proportion of the users. Similarly, high numbers of skips and a low consensus on tags indicate either that the emotion is not clear, or that the image is otherwise unsuitable (low resolution, more than one cat visible, etc.)

The number of times different users skipped the same image can be used as context for an image in terms of *confidence* – low confidence (i.e. high proportion of skips) indicates that any consensus should be treated with caution.

In general, images showed high confidence – the top 50% images have confidence values over 0.737. Across the repository, consensus varies significantly – this reflects the public, voluntary nature of the images as donations. Given this source, it is perhaps surprising that there is so much consensus among the users. 18.3% of images show a consensus value of at least 0.5 – in other words, one common emotion has been selected by half of the tagging users. The image with highest consensus has been tagged 33 times, of which 30 tags are identical. The lowest consensus in the database is 0.1. Random selection of tags by users would tend towards a consensus of 0.025.

B. Research Q2 - Identifying problematic behaviours

Images from the repository that exhibit difficult to interpret behaviours are manifested from the server logs as one of three types.

Firstly, images having a low consensus or confidence rating indicate a problem with users reaching agreement on the content. Secondly, images which have contrasting and a large number of distinct emotion tags attached to it are likely to be difficult to interpret and indicate users may find the image confusing. Finally, images that have been recorded as having high instances of skipping activity may indicate possible reasons for users not being able to select an appropriate tag.

These findings indicate Tagpuss can be used to identify images of difficult to interpret cat behaviours, offering further expert scientific exploration that focuses on educating cat owners to identify possible problems with their cat’s welfare.

C. Research Q3 - Cats as Motivators and Rewards

In common with related work on harnessing human computation for tagging of Internet images (e.g. *The ESP Game* [1] and *Peekaboom* [2]), Tagpuss asks users to add metadata to images in terms of emotions (instead of image content).

However, unlike “Games with a Purpose” (GWAPs) Tagpuss was deliberately designed to be as simple as possible, and purposefully lacked any intrinsically motivating features. Specifically, there are no rewards and no game-like mechanics or social features to encourage repeat participation.

Instead, the major motivating factors for user contribution in Tagpuss were designed twofold – the altruistic support of scientific research and the intrinsically motivating nature of cat photographs on the Internet. Of the users who viewed more than 10 images (i.e. not brief visitors), an average of 25.23% of images were skipped (n=2007; median 18.0%). The users’ skipping behaviour varies greatly. However, a non-trivial proportion of this population shows extremely high skipping behaviour. 73 of these users skipped every image they saw. The single most active user on the site was shown 380 images and skipped all but 3.

The other indicator of skipping behaviour was using a single tag for every image. However, the vast majority of users tagged images with a variety of emotions. Just one of the active tagging users (those that *tagged* 10 or more images; n=1476) clicked through by repeatedly choosing the same tag.

These findings support the assumption that cat pictures are indeed intrinsically rewarding for some individuals, to whom the scientific aspect of Tagpuss was perhaps considered of little concern.

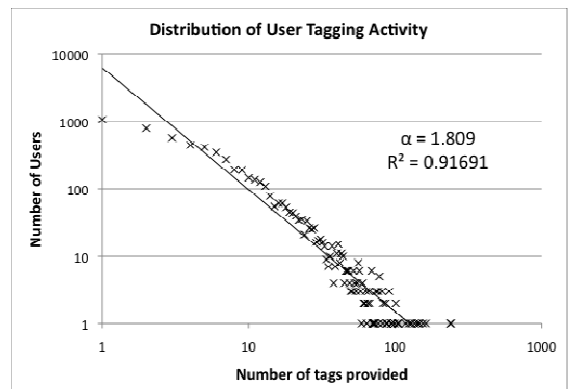


Figure 1. Power distribution of tagging activity

D. Distribution of Activity

Distribution of tagging behaviour among visitors to the site follows a power law – The top 10% most active users were responsible for 44.5% of all tags recorded in the system. The decay of the power law has a best-fit exponent of 1.8 ($R^2 = 0.917$). This reflects the fact that a lot of users contribute just a few tags, where a handful of highly active users contribute the majority of tags. The emergence of a power law in activities of users in social software is consistent with existing research in the field (e.g. [7],[4]).

E. Questionnaire Data

1) Demographics

A total of 154 questionnaire responses were returned. The responses showed that users of Tagpuss were predominately (93%) female and largely (72%) resident in the UK. Total cat

ownership from the respondents was 438 cats (mean 2.8 cats per respondent). These results in themselves are not unexpected and reflect wider demographic findings of cat owners in [5].

2) *User-Provided Emotions*

A key aim of Tagpuss was to generate emotion metadata attached to the images from an emotion list. As this list contained only 40 emotion tags, there may not always have been a suitable tag available for use in every instance. This was evident in the questionnaire responses where users were asked to suggest up to ten tags that weren't on the list. A total of 508 (141 unique) user generated emotion tags were submitted with 70% of respondents suggesting at least one tag; 27% of respondents suggesting 5 or more tags. This finding suggests that some users of Tagpuss may have been more confident in tagging particular images had a wider range of tags been at their disposal.

The most popular requested emotion was "curiosity". This is a common cultural association with cats. However, curiosity is a complicated motivational state that is perhaps impossible to determine based on behaviour alone. This is a well-known and common example of anthropomorphism.

Further data from the questionnaire reveals that 82% of respondents strongly agree that cats display emotion. However, when asked if "cats display the same emotions as humans" 22% strongly agreed with a further 49% opting for 'somewhat agree'. The findings suggest that users of Tagpuss wanted a much larger range of tags to describe the cats. This supports how easily a cat's behaviour can be open to misinterpretation, which in turn may not be in the best interests for the cat's welfare.

3) *Desire to Contribute to Science*

A question was put forward asking users if they were motivated to make a contribution to science. 61% of respondents 'strongly agreed' and 32% 'somewhat agreed' that they used Tagpuss to support scientific work.

4) *Motivation of Cat Pictures*

Additional findings on the usage of Tagpuss were gathered from the questionnaire. 52% of respondents strongly agreed that they used Tagpuss because they enjoyed looking at pictures of cats with a further 35% selecting 'somewhat agree'.

VI. CONCLUSIONS

With this study, Tagpuss aimed to use an online tagging application to increase our understanding of empathy and anthropomorphism of cats by their owners. The findings inform and contribute to further scientific enquiry in the domain of animal behaviour. Notably, findings indicate that the observation of cat behaviours is an intrinsically rewarding experience and draws on people who are passionate about embedding companion animals such as cats into their lives.

The findings of high consensus for emotions tagged on images shows that there is a general agreement among people

over emotional states as judged by viewing images of cat behaviour.

Misunderstanding cat emotions can lead to negative effects for both the cat and its owner. We found that users consistently applied overly complex human emotions and motivations to cats. This was further highlighted in the questionnaire data where a total of 141 additional unique emotion tags were suggested, many of which are internal motivations that are impossible to determine objectively through behaviour alone.

Finally, we were interested in the innate motivation of Internet users to view cat images. With the popularity of Tagpuss gaining enough momentum in the 1 month trial to attract over 5000 active users and harvest over 50,000 tags it is obviously a subject of powerful value. Even the high response rate of invitations to the questionnaire (62%) emphasises the motivation and passion the Internet population has for cats. It can be argued that the catalyst was the use of online social web applications as the bridge between the complexities of the scientific method and the passion of the people willing to make a contribution.

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