Bot Detective - User Study Protocol

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1 STUDY HYPOTHESIS

We intend to conduct an online survey to evaluate the efficacy of *Bot Detective*. Our hypothesis posits that users who utilize *Bot Detective* will exhibit increased awareness of security and bot presence, as well as enhanced critical thinking when engaging with online information.

2 PARTICIPANT CHARACTERISTICS

Our plan is to conduct an online survey to reach people of all ages and locations, aiming to gather diverse insights without the need for physical presence. Our goal is to understand different perspectives, spanning from 16 to 80 years old. User behavior and perspectives on bots and Twitter usage are shaped by their country and surroundings. To address potential variations, we believe it's essential to conduct this survey in multiple countries.

3 SURVEY STRUCTURE

The study will be conducted through a pre- and post-usage survey. The survey will focus on changes in security awareness, critical thinking, and usability, resulting from the extension use over a two-month period.

The pre-usage (and initial) stage of the survey will involve assessing the participants' knowledge about bots, evaluating their ability to detect them, and estimating their awareness of their risks.

4 ONLINE SURVEY QUESTIONS

4.1 Pre- Questions

Product Motivation

(1) Are you interested in a tool that can enhance your online security and assist you in mitigating the influence of bots?

☐ Yes   ☐ No

(2) Would you be interested in using a browser extension that provides additional information about Twitter users, such as distinguishing between bots and humans?

☐ Yes   ☐ Don't
☐ No   Know

(3) On a scale of 1 to 5, how important is it for you to be informed about the authenticity of Twitter accounts you come across while browsing social media? (1 being 'Not Important' and 5 being 'Very Important')
○ 1
○ 2
○ 3
○ 4

○ 5

(4) Have you used any tools or methods in the past to determine whether a Twitter account is a bot or human?

☐ Yes   ☐ No

(5) If yes, please rate the level of satisfaction you have experienced with it. (1 being 'Not Satisfied' and 5 being 'Very Satisfied')
○ 1
○ 2
○ 3
○ 4
○ 5

(6) Do you believe that having a better understanding of bots on social media would contribute to a safer and more informed online experience?

☐ Yes   ☐ Don't
☐ No   Know

[*These initial questions are designed to assess users' interest in browser extensions like Bot Detective. They provide an overall view of users' willingness to use a tool that offers insights about Twitter users' authenticity for improved online security and gives us knowledge about prior experience with similar solutions. The answers to these questions will help us understand the potential user base for Bot Detective and the extent to which our extension can meet users' needs.*]

Bot Awareness

(7) Please rate the extent to which you agree with the following definitions of bots. (1 being 'Strongly Disagree' and 5 being 'Strongly Agree').
   (a) "Social bots are programs that automatically generate content, distribute it via a particular social network, and interact with its users"
   ○ 1
   ○ 2
   ○ 3
   ○ 4
   ○ 5

   (b) "Automated malware program that can infect a system, steal data, or commit other fraudulent activities"
   ○ 1
   ○ 2
   ○ 3
   ○ 4
   ○ 5

(8) Do you believe you have come across bots on Twitter?

☐ Yes   ☐ No

(9) Do you typically attempt to verify the authenticity of a user whose tweet you read?

☐ Yes   ☐ No

(10) If yes, please assess the amount of time do you typically spend evaluating an account to decide if it's a bot or not?
   ○ Around 1 minute
   ○ Around 5 minute
   ○ Around 10 minutes
   ○ More then 10 minute

(11) On a scale of 1 to 5, how frequently do you encounter suspicious users while browsing social media platforms? (1 being 'Rarely' and 5 being 'Very Frequently')
   ○ 1
   ○ 2
   ○ 3
   ○ 4
   ○ 5

(12) On a scale of 1 to 5, how concerned are you about your online security and privacy while using social media? (1 being 'Not Concerned' and 5 being 'Very Concerned')
   ○ 1
   ○ 2
   ○ 3
   ○ 4
   ○ 5

(13) On a scale of 1 to 5, please rate your level of trust in the content of accounts that you are not personally acquainted with or are not associated with widely known organizations. (1 being 'Low Trust' and 5 being 'High Trust')
   ○ 1
   ○ 2
   ○ 3
   ○ 4
   ○ 5

(14) Are you familiar with the practice of purchasing bot followers to enhance social engagement?

☐ Yes   ☐ No

[*These questions help us assess participants' familiarity with bot definitions which is important for understanding participants' awareness and comprehension of bot-related concepts. In addition they help us understand users experiences with bots on Twitter, their cautiousness towards user authenticity, the frequency of encountering suspicious users, online security concerns, and the need for a tool like Bot Detective.*]

Bot Awareness

(15) Have you heard about the connection to bots in any of the following cases:
   (a) 15.1. "A recent orchestrated bot campaign successfully created the appearance of a sustained discussion about a tech company called Cynk. Automatic trading algorithms picked up this conversation and started trading heavily in the company's stocks. This resulted in a 200-fold increase in market value, bringing the company's worth to $5 billion. By the time analysts recognized the orchestration behind this operation and stock trading was suspended, the losses were real."

   ☐ Yes   ☐ No

   (b) "America learned Russia had run a vast cyber and social media offensive targeting the 2016 US presidential election."

   ☐ Yes   ☐ No

   (c) "ISIS uses several practices designed to amplify its apparent support on Twitter, including "bots" (computer software that creates activity on a social media account in the absence of a human user) and spam (purchased tweets promoting ISIS content)."

   ☐ Yes   ☐ No

   (d) "The bot accounts attempt to convince people to invest in fake cryptocurrencies, and have even been thought to steal from existing crypto wallets"

   ☐ Yes   ☐ No

[*These questions help assess participants' understanding of real-world bot-related incidents and their potential risks. By gauging their familiarity with such cases, we can demonstrate the relevance of Bot Detective in raising awareness about the impact of bots in various contexts.*]

Presence Awareness

(16) How much content do you think that bots are responsible of on Twitter?
   ○ Under 10%
   ○ Under 20%
   ○ 20%-50%
   ○ More then 50%

(17) What percentage of Twitter users do you believe are bots?
   ○ Under 5%
   ○ 5-20%
   ○ 20-50%
   ○ More then 50%

[*Recent studies indicate that between 9% and 15% of active Twitter accounts are bot accounts, and they are responsible for generating approximately 35% of the content on Twitter. By asking these questions, we aim to understand if the participants' perspective on the prevalence of bots aligns with these findings. It will help us assess how well-informed participants are about the role of bots on the platform.*]

Bot Detection Ability

(18) On a scale of 1 to 5, how confident are you in your ability to assess the credibility of information shared by users on social media? (1 being 'Not Confident' and 5 being 'Very Confident')
   ○ 1
   ○ 2
   ○ 3
   ○ 4
   ○ 5

(19) In this section, we present you with real Twitter accounts and links to them. Your task is to evaluate whether you believe each account is a bot or not based on your perception.
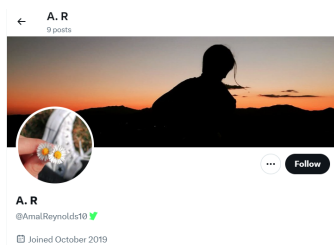   Click on attached profile image to explore it on Twitter:

(a) □ Bot   □ Human

(b) □ Bot   □ Human

(c) □ Bot   □ Human

(d) □ Bot   □ Human

[*The users are taken from the classified datasets (a,b,d are bots).*
These questions aim to gauge participants' perceptions and knowledge about bots on social media platforms. They help us evaluate their ability to identify bots among real user accounts, which is essential in evaluating the potential impact and relevance of Bot Detective.]

(20) Among the following features, which do you believe is a notable factor in determining whether a user is a bot or not?
   ○ Number of followers.
   ○ Number of following.
   ○ Number of digits in username.
   ○ Rate of likes activity.
   ○ Username length.
   [*This question aims to understand participants' perceptions regarding significant factors in identifying bot accounts and whether they align with the feature importance observed in our model.*]

After a use of 2-month periods, the participants will be asked to answer the following post-use questions.

4.2 Post- Questions

User Behavior

(1) Has the Bot Detective extension influenced your behavior in interacting with accounts and content on Twitter or changed your perception of the user's credibility?

   □ Yes   □ No

(2) Has the display of the bot percentage among 100 randomly selected user's followers influenced you to alter your interactions with that user?

   □ Yes   □ No

(3) Do you believe your actions would vary if the bot percentage was determined not from 100 randomly selected followers but from all their followers?

   □ Yes   □ No

(4) Do you feel more informed and cautious about interacting with users after using the Bot Detective extension?

☐ Yes   ☐ No

(5) Did the articles presented in the informative clicked popup contribute to your understanding of bot-related risks?

☐ Yes   ☐ No

(6) Did the accuracy information provided in the popup added to bot/human indicators play a role in your decision-making process and feel necessary to you?

☐ Yes   ☐ No

(7) Have you refrained from interacting with an account you don't know due to its bot classification?

☐ Yes   ☐ No

(8) Have you felt comfortable engaging with an account you don't know due to its human classification?

☐ Yes   ☐ No

[*These questions delve into the impact of Bot Detective on users' behavior and decision-making on Twitter, assessing whether the extension influences interactions with accounts and enhances users' sense of awareness and caution.*]
User Perception
(9) Are you surprised by the number of bots (according to Bot Detective) you have encountered?

☐ Yes   ☐ No

(10) Were there any instances where you were surprised by the classification made by Bot Detective (i.e., a user marked as a bot or human)?

☐ Yes   ☐ No

[*These questions aim to assess whether users' perceptions regarding bots have evolved after using Bot Detective. In essence, they help us determine the effectiveness of Bot Detective in raising awareness and providing valuable insights into the prevalence of bots on social media platforms.*]
Bot Detection Ability
(11) On a scale of 1 to 5, how confident are you in your ability to assess the credibility of information shared by users on social media? (1 being 'Not Confident' and 5 being 'Very Confident')
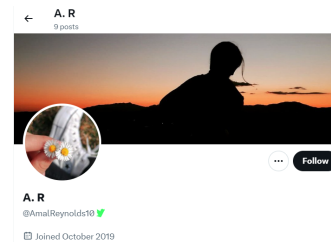○ 1
○ 2
○ 3
○ 4
○ 5

(12) In this section, we present you real Twitter accounts and links to them. Your task is to evaluate whether you believe each account is a bot or not based on your perception of the provided information.
Click on attached profile image to explore it on Twitter:

(a)   ☐ Bot   ☐ Human

(b)   ☐ Bot   ☐ Human

☐ Bot   ☐ Human

(c)   ☐ Bot   ☐ Human

[*(a,c are bots).*

The purpose of this section is to evaluate users' capacity to identify bots and compare their performance to the previous test. This detection exercise is composed of two human accounts and two bot accounts. Notably, one human and one bot account were previously classified by the participants in the initial test before using Bot Detective. We are conducting this assessment with the assumption that users have not acquired additional knowledge about these accounts' true nature since their initial classification. This approach allows us to ascertain if users' bot detection skills have improved. We assume that using Bot Detective can enhance users' ability to independently identify bots. We believe that participants can gain insights into the common characteristics shared by users classified as bots, potentially enabling them to identify patterns and develop their own criteria for identifying bots. In essence, we anticipate that Bot Detective will serve as a valuable tool in educating users about bot-like behavior and facilitating their capacity to discern between genuine users and bots in other social media too.]

Usability

(13) On a scale of 1 to 5, How satisfied are you with the Bot Detective extension? (1 being 'Not Satisfied' and 5 being 'Very Satisfied')
- ◯ 1
- ◯ 2
- ◯ 3
- ◯ 4
- ◯ 5

(14) Has your browsing speed on Twitter decreased since you started using Bot Detective?

☐ Yes   ☐ No

(15) Will you continue using the Bot Detective extension in the future?

☐ Yes   ☐ No

(16) Were there any challenges or difficulties you faced while using Bot Detective? If yes, please elaborate.

(17) Did Bot Detective meet your expectations in terms of functionality and performance?

☐ Yes   ☐ No

(18) Rate the comprehensibility of Bot Detective's results. (1 being 'Not Understandable' and 5 being 'Very Understandable')
- ◯ 1
- ◯ 2
- ◯ 3
- ◯ 4
- ◯ 5

(19) How valuable is the feature that displays the bot percentage among a user's followers? (1 being 'Not Valuable' and 5 being 'Very Valuable')
- ◯ 1
- ◯ 2
- ◯ 3
- ◯ 4
- ◯ 5

[*These questions are designed to gather feedback on various aspects of Bot Detective. They aim to assess usability satisfaction, potential impact on browsing speed, challenges faced during usage, alignment of the tool with their expectations, ease of result understanding, and perceived value of the bot percentage display feature. This feedback provides valuable insights into the extension's user experience, effectiveness, and areas for improvement.*]

Bot Detective Effectiveness

(20) On a scale of 1 to 5, 1 being 'Strongly Disagree' and 5 being 'Strongly Agree', please rate your agreement with the following statements:

  (a) "Using Bot Detective has made me more aware of the presence of bots on social media platforms."
  - ◯ 1
  - ◯ 2
  - ◯ 3
  - ◯ 4
  - ◯ 5

  (b) "Using Bot Detective has encouraged me to critically evaluate content and interactions on Twitter."
  - ◯ 1
  - ◯ 2
  - ◯ 3
  - ◯ 4
  - ◯ 5

  (c) "If more users will use Bot Detective we will be able to create a more secure and informed online environment for you."
  - ◯ 1
  - ◯ 2
  - ◯ 3
  - ◯ 4
  - ◯ 5

(21) Has your overall perception of online security and privacy changed since using Bot Detective?

☐ Yes   ☐ No

(22) Has using Bot Detective changed your perception of how many bots are present on Twitter?

☐ Yes   ☐ No

[*These questions are designed to gauge the effectiveness of Bot Detective in enhancing users' awareness of bot presence, promoting critical content evaluation, and influencing their perception of online security. The responses will help validate our hypothesis and provide insights into the tool's impact on users' behavior and mindset.*]