חשיפה למחקר
המחלקה להנדסת תעשייה וניהול

רון הירשפרונג

Ariel Cyber Innovation Center

CHARM Lab
Collaborative Human-Agent Relationship Management

אוניברסיטת אריאל בשומרון

ה"פילוסופיה" שמאחורי המוטיבציה המחקרית

- אדם אינו יכול להזיז אבן כבדה שהונחה במקום מסוים ע"י מכונה.
  להשגת מטרה זו הוא נדרש להשתמש בשירותיה של מכונה אחרת.

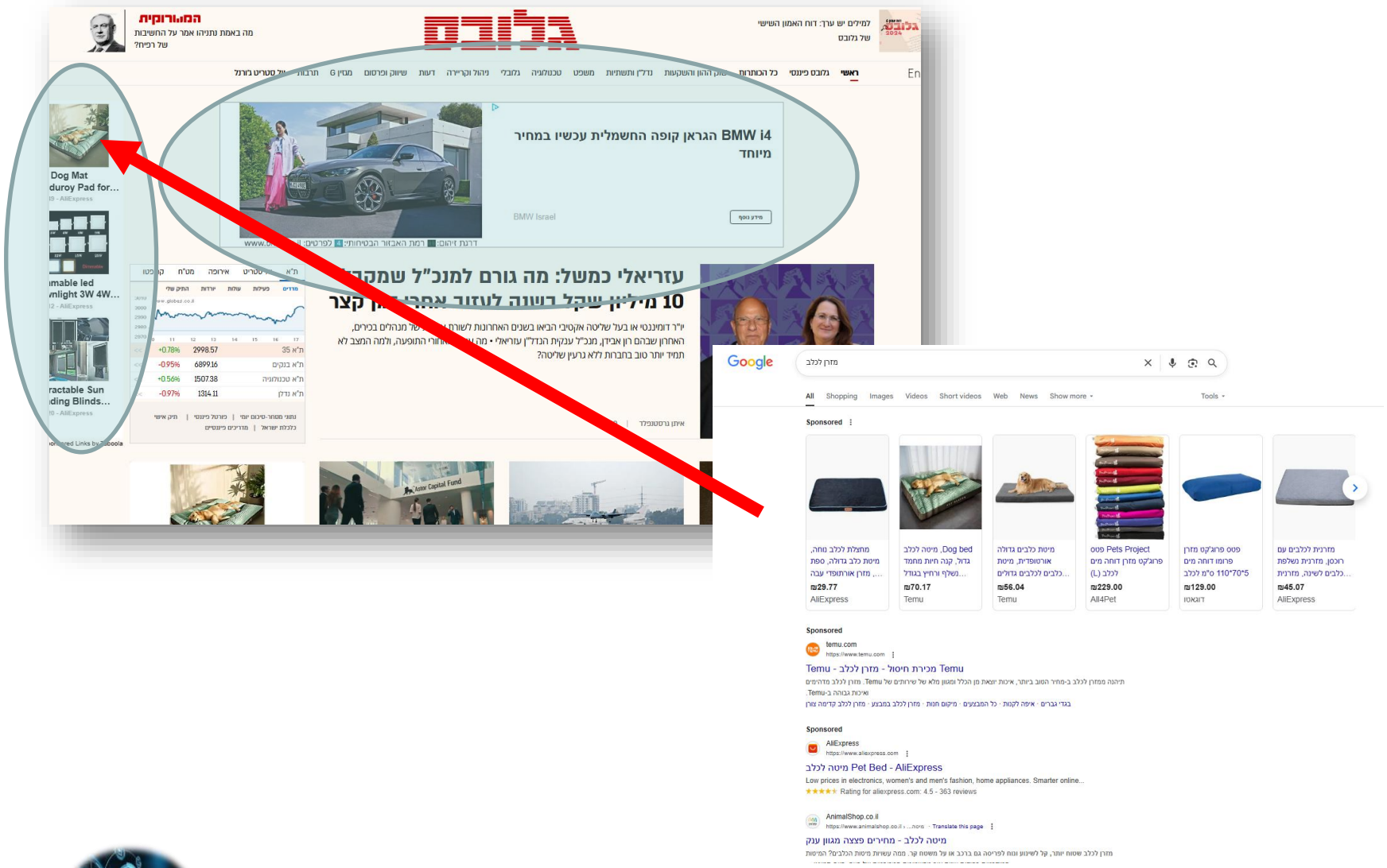
- פרטיות היא סוגייה מרכזית, ונחשבת בעולם המערבי ל-Human Right.

- כמשל: כיוון שהפרטיות מופרת בעיקר ע"י מכונות (AI) ⇦ נדרש שימוש בעוצמה זהה, קרי AI, לשמירת הפרטיות.

- ניתן להגיד שהמחקרים שלי עוסקים ב:

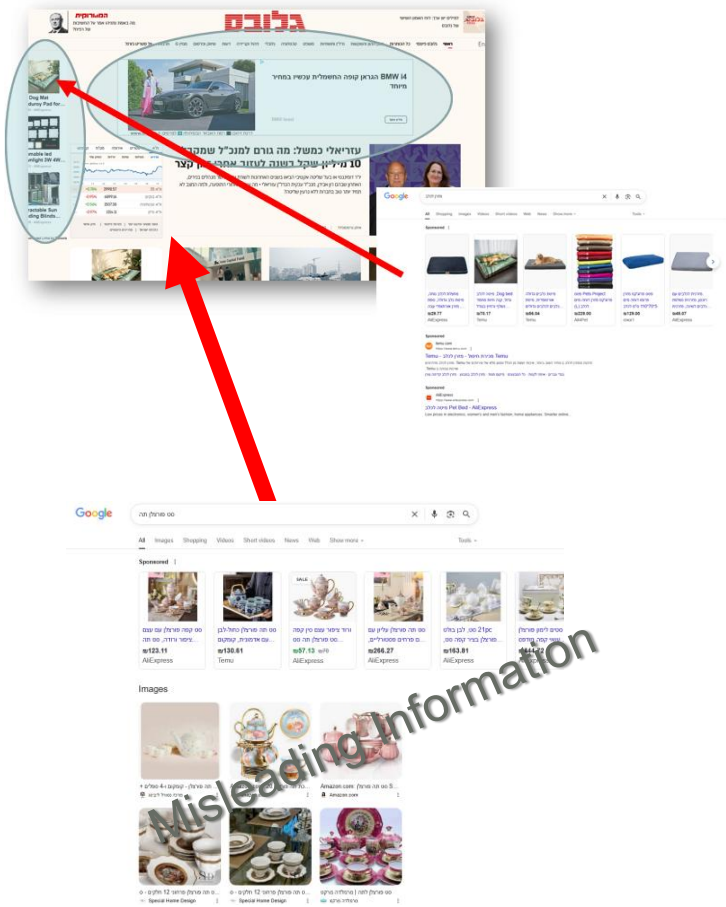
  Harnessing AI to defeat AI

הגנת פרטיות פרואקטיבית



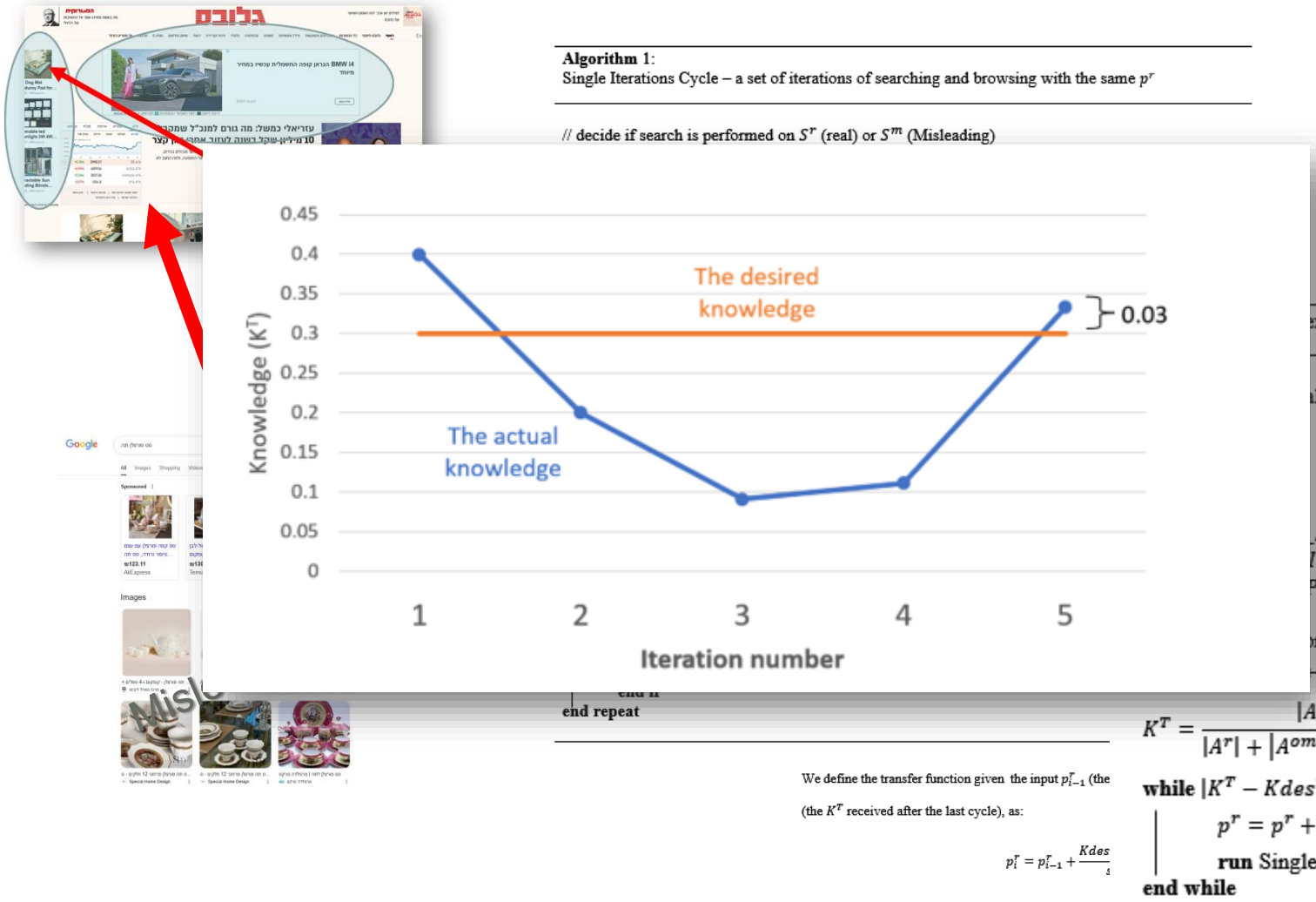
הגנת פרטיות פרואקטיבית

❖ פתרון אפשרי: Anonymization



CONTROL

הגנת פרטיות פרואקטיבית



Algorithm 1:
Single Iterations Cycle – a set of iterations of searching and browsing with the same p^r

// decide if search is performed on S^r (real) or S^m (Misleading)

external process

lization

$\_Pfirst$
$Initial\_DecayFactor$
$Prem$

ns Cycle
– evaluate knowledge()

$$K^T = \frac{|A^r|}{|A^r| + |A^{om^+}| + |A^{om^-}|}$$

while $|K^T - Kdes^T| > TR$

$$p^r = p^r + \frac{Kdes^T - K^T}{step}$$

run Single Iterations Cycle

end while

end repeat

We define the transfer function given the input p^r_{i-1} (the

(the K^T received after the last cycle), as:

$$p^r_i = p^r_{i-1} + \frac{Kdes}{s}$$

מוזיקה כמזהה אישי

"Adon Olam"
https://www.youtube.com/embed/d29qSLUstxw?enablejsapi=1&wmode=opaque&autoplay=0

Makes me happy on many levels - the soulful, minor melody of the verses moves to an upbeat major chorus of hope and appreciation; the words can fit almost any other melody; reminds me of great times with my kids and at shul

danceability	0.438
acousticness	0.763
energy	0.382
instrumentalness	0.00301
liveness	0.112
loudness	-9.3
speechiness	0.0288
tempo	149.967
valence	0.185
key	9
mode	0

anger	0.000956
disgust	0.000689
fear	0.000212
joy	0.98506
neutral	0.005446
sadness	0.00452
surprise	0.003117

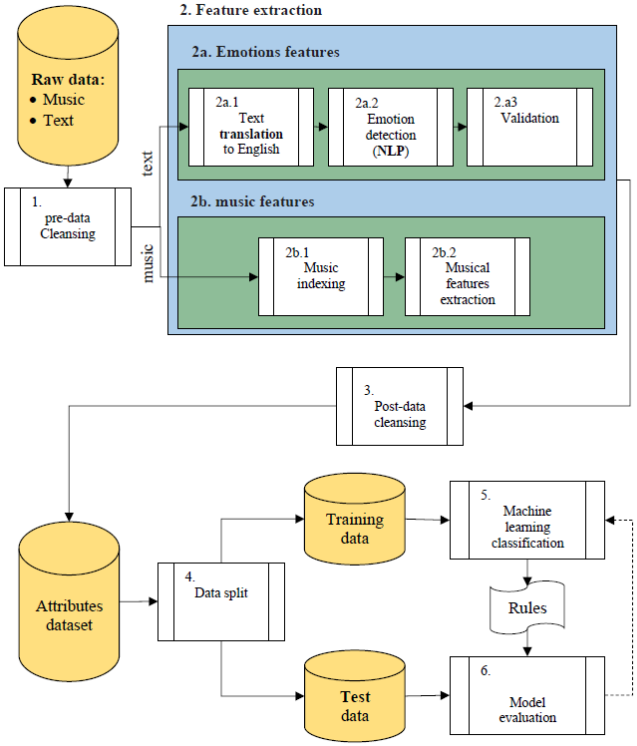
Musical features

- YouTube ID extraction
- SOPTIFY API

Emotions

- text translation
- NLP (DistilRoBERTa)
- Manual validation

מוזיקה כמזהה אישי



- First emotion prediction:

  Accuracy = 0.575 (baseline $= \frac{1}{7} = \sim 14.3\%$)

- One of the two leading emotions prediction:

  Accuracy = 0.751 (baseline $= \frac{12}{42} = \sim 28.6\%$)

ערך זליגת מידע ברשתות חברתיות

Information Leakage

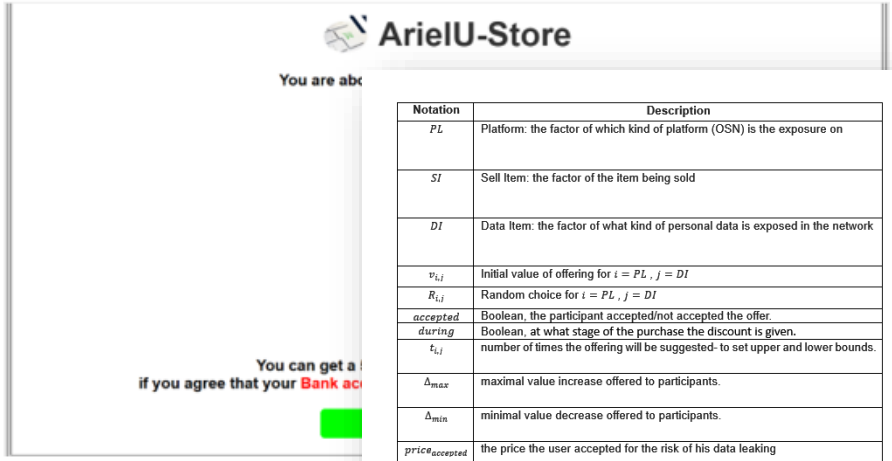
BENEFITS

Trade-off

COSTS

How much? (in tangible values like $)

ערך זליגת מידע ברשתות חברתיות



Notation	Description
PL	Platform: the factor of which kind of platform (OSN) is the exposure on
SI	Sell Item: the factor of the item being sold
DI	Data Item: the factor of what kind of personal data is exposed in the network
$v_{i,j}$	Initial value of offering for $i = PL$, $j = DI$
$R_{i,j}$	Random choice for $i = PL$, $j = DI$
$accepted$	Boolean, the participant accepted/not accepted the offer.
$during$	Boolean, at what stage of the purchase the discount is given.
$t_{i,j}$	number of times the offering will be suggested- to set upper and lower bounds.
Δ_{max}	maximal value increase offered to participants.
Δ_{min}	minimal value decrease offered to participants.
$price_{accepted}$	the price the user accepted for the risk of his data leaking
B_{upper}	upper bound of estimated value of privacy
B_{lower}	lower bound of estimated value of privacy
R_t	random int (0-3) for a minimal 0 times and maximal 3 times of increasing/decreasing offer

The evaluation method

After defining the notation and the matrix of values for the different factors we proceed to define the game's algorithm, that is as follows:

Algorithm 1. $PrivacyValueEstimationGame$
input: $v_{i,j}$, $accepted$, $during$, $t_{i,j}$, Δ_{max}, Δ_{min}, $price_{accepted}$, B_{upper}, B_{lower}, R_t
$B_{lower} \leftarrow 0$
$B_{upper} \leftarrow \infty$
$price_{accepted} \leftarrow 0$
$accepted \leftarrow false$
if $during = false$
  for all the values of SI
  $R_{i,j} \leftarrow$ Random value from the cells $c_{i,j}$ from Matrix (PL X DI)
  Offer a coupon with the value of $v_{i,j}$
    if $accepted = true$
      $price_{accepted} \leftarrow v_{i,j}$
      $B_{upper} \leftarrow price_{accepted}$
    end if
    else
      $B_{lower} \leftarrow v_{i,j}$
      $B_{upper} \leftarrow v_{i,j} + \Delta_{max}$
    end else
  end if
  for all the values of SI
  $R_{i,j} \leftarrow$ Random value from the cells $c_{i,j}$ from Matrix (PL X DI)
  Offer a coupon with the value of $v_{i,j}$
    if $accepted = true$
      $price_{accepted} \leftarrow v_{i,j}$
      $B_{upper} \leftarrow price_{accepted}$
      $t_{i,j} \leftarrow R$
      $index \leftarrow 0$
        while $index < t_{i,j}$
        Offer $v_{i,j} - \frac{index}{t_{i,j}} \Delta_{min}$
        if $accepted = false$:
          $B_{lower} \leftarrow price_{accepted}$
        end if
        else
          $price_{accepted} \leftarrow v_{i,j}$
        end else
        $index \leftarrow index + 1$
      end while
    end if
    else
      $B_{lower} \leftarrow v_{i,j}$
      $B_{upper} \leftarrow v_{i,j} + \Delta_{max}$
      $t_{i,j} \leftarrow R$
      $index \leftarrow 0$
      while $index < t_{i,j}$
        Offer $v_{i,j} + \frac{index}{t_{i,j}} \Delta_{max}$
        if $accepted = true$
          $price_{accepted} \leftarrow v_{i,j} + \frac{index}{t_{i,j}} \Delta_{max}$
          $B_{upper} \leftarrow price_{accepted}$
        end if
        $index \leftarrow index + 1$
      end while
    end else
  end for
return B_{lower} , B_{upper}

ערך זליגת מידע ברשתות חברתיות

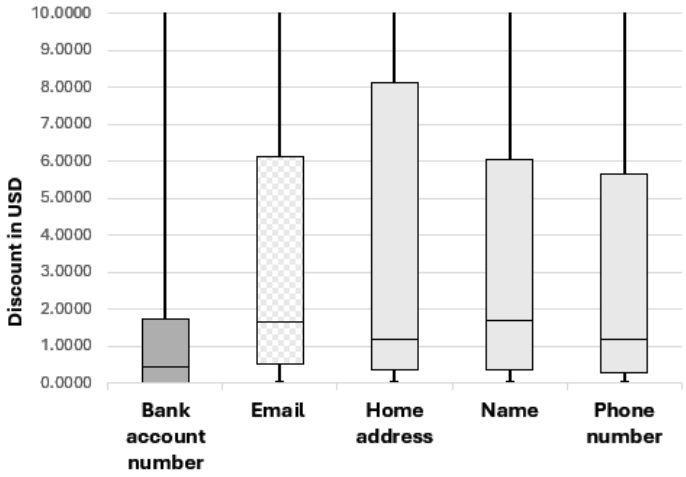


Figure 4. Box Plot results for types of personal data items.

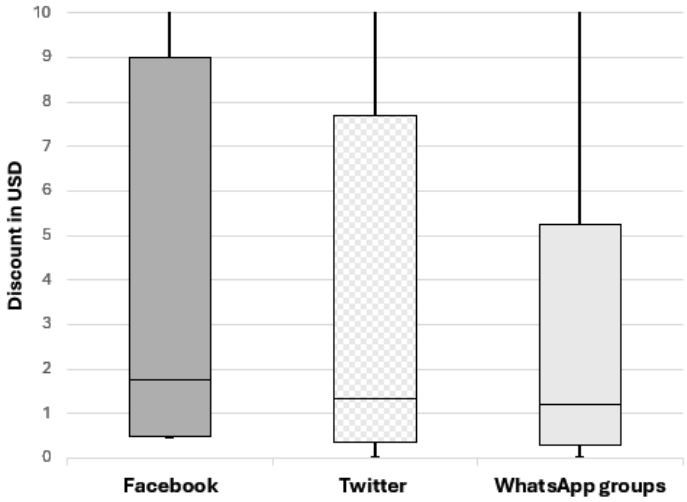


Figure 5. Box Plot results for types of platforms the data is exposed in.

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