Measuring the Facebook Advertising Ecosystem

Athanasios Andreou, Márcio Silva, Fabrício Benevenuto, Oana Goga, Patrick Loiseau, Alan Mislove
Advertising in Facebook

Facebook is the second biggest advertising platform:

Facebook made $39.9 billion in ad revenue in 2017

More than the GDP of Iceland or Bahrain!
Advertising in Facebook

Facebook is the second biggest advertising platform:

- Facebook made $39.9 billion in ad revenue in 2017

  More than the GDP of Iceland or Bahrain!

- Millions advertisers and billions of users:

  Statistics
  - 1.52 billion daily active users on Facebook on average for December 2018
  - 2.32 billion monthly active users on Facebook as of December 31, 2018
Facebook ad platform issues constantly in the spotlight
Facebook ad platform issues constantly in the spotlight

MACHINE BIAS

Facebook Lets Advertisers Exclude Users by Race

Facebook's system allows advertisers to exclude black, Hispanic, and other “ethnic affinities” from seeing ads.

by Julia Angwin and Terry Parris Jr., Oct. 28, 2016, 1 p.m. EDT
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HOW RUSSIAN FACEBOOK ADS DIVIDED AND TARGETED US VOTERS BEFORE THE 2016 ELECTION

FACEBOOK BUG COULD HAVE LET ADVERTISERS GET YOUR PHONE NUMBER
Facebook ad platform issues constantly in the spotlight

**MACHINE BIAS**

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**MACHINE BIAS**

**Facebook (Still) Letting Housing Advertisers Exclude Users by Race**

After ProPublica revealed last year that Facebook advertisers could target housing ads to whites only, the company announced it had built a system to spot and reject discriminatory ads. We retested and found major omissions.

by Julia Angwin, Ariana Tobin and Madeleine Varner, Nov. 21, 2017, 1:23 p.m. EST

**HOW RUSSIAN FACEBOOK ADS DIVIDED AND TARGETED US VOTERS BEFORE THE 2016 ELECTION**

by Eric Lipowsky, Security, Oct. 16, 2018, 8:00 AM
This talk

- Who are the advertisers in Facebook?
- How are they targeting users?
Methodology

AdAnalyst — A tool to help you make sense of your ads
Methodology

AdAnalyst — A tool to help you make sense of your ads

- **Chrome** and **Firefox** extension
- Collects **Facebook ads** and related data from **real users**
Methodology

AdAnalyst — A tool to help you make sense of your ads

Increase transparency for users:
Methodology

AdAnalyst — A tool to help you make sense of your ads

Increase transparency for users:

The type of advertisers that are targeting you

[Diagram showing advertiser categories]

Left click to zoom-in/ Right click to zoom-out (two finger click in Mac)
Methodology

AdAnalyst — A tool to help you make sense of your ads

Increase **transparency for users:**

- **Time:** [Blank]
- **Advertiser:** Noom
  
  **Advertiser category:** App Page

  **Explanation:** One reason you're seeing this ad is that Noom wants to reach people who may be similar to their customers. Learn more. There may be other reasons you're seeing this ad, including that Noom wants to reach men ages 25 and older who live in France. This is information based on your Facebook profile and where you've connected to the internet.

  **Compact explanation:** Lookalike Audience

  **All users have received this ad for:** Lookalike Audience

  **The advertiser targeted you with:** Lookalike Audience, PIID-based targeting

  **The advertiser targeted other users with:** Lookalike Audience, PIID-based targeting, English (US)

  (Biographical Data), Physical exercise (Interests)

When you “woke up like this”. When you buy those skinny jeans. When you show yourself off, not hide yourself away. When you fit into the skirt you wore in college. When you feel like you can conquer the world. ... That's Noom.
Our Dataset

AdAnalyst — A tool to help you make sense of your ads

DATA-Worldwide:

- Disseminated across friends, colleagues, conferences etc
- 114 users / 89K ads / \textbf{22K advertisers}
- 50 users from \textbf{France}, 16 from \textbf{Germany}, 16 from \textbf{US}

DATA-Brazil:

- Disseminated as part of a project to monitor the 2018 \textbf{Brazilian} presidential elections
- 508 users / 146K ads / \textbf{28K advertisers}
- 495 users from \textbf{Brazil}
Our users

- Dissemination strategy introduces some **biases**
Our users

Dissemination strategy introduces some biases

Younger educated men:

- 47.4% ages 22-30 vs 32.5% on Facebook
- 71.1% with tertiary education vs 35.9%
- 68.4% men vs 57%
Our users

Dissemination strategy introduces some biases

Younger educated men:
- 47.4% ages 22-30 vs 32.5% on Facebook
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Our users are overall similar to the global Facebook population
- More likely to travel frequently and know people that are expats
This talk

- Who are the advertisers in Facebook?
- How are they targeting users?
Advertisers’ identity

- How popular are advertisers?
Advertisers’ identity

How popular are advertisers?

Facebook Likes

- **Popular:**
  - >100K
  - (1K, 100k]

- **Ordinary:**
  - <=1K

- **Niche:**
  - 0%
  - 20%
  - 40%

- **Popular:**
  - Netflix
  - Google

- **Ordinary:**
  - MIRI
  - Saarbrücken

- **Niche:**
  - BachChor
  - Saarbrücken
  - @BachChorSB

- **Popular:**
  - INDUS
  - Nexenx
Advertisers’ identity

How popular are advertisers?

- Popular: NETFLIX, Google
- Ordinary: MIRI, SAP
- Niche: BachChor Saarbrücken (@BachChorSB)

Facebook Likes

- >100K: 40%
- (1K,100K]: 20%
- <=1K: 0%

How trustworthy are advertisers?
Advertisers’ identity

How popular are advertisers?

<table>
<thead>
<tr>
<th>Facebook Likes</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt;100K</td>
<td>20%</td>
</tr>
<tr>
<td>(1K, 100k]</td>
<td>40%</td>
</tr>
<tr>
<td>&lt;=1K</td>
<td>0%</td>
</tr>
</tbody>
</table>

Popular: Netflix, Google

Ordinary: MIRI, machine intelligence research institute

Niche: BachChor Saarbrücken, @BachChorSB

How trustworthy are advertisers?

- advertisers can verify their account

- phone number or official document

- government issued photo id
Advertisers’ identity

How popular are advertisers?

- Popular:
  - Facebook Likes: >100K
  - 66.9%

- Ordinary:
  - Facebook Likes: (1K,100K]
  - 10.3%

- Niche:
  - Facebook Likes: <=1K
  - 0.2%

How trustworthy are advertisers?

- Advertisers can verify their account
- Phone number or official document
- Government issued photo id

- 64% of advertisers are not verified

<table>
<thead>
<tr>
<th></th>
<th>Verified</th>
<th>Not Verified</th>
</tr>
</thead>
<tbody>
<tr>
<td>Popular</td>
<td>66.9 %</td>
<td>6.1 %</td>
</tr>
<tr>
<td>Ordinary</td>
<td>10.3 %</td>
<td>12.6 %</td>
</tr>
<tr>
<td>Niche</td>
<td>0.2 %</td>
<td>6.4 %</td>
</tr>
</tbody>
</table>
Advertisers’ categories

- Advertisers can **self-report** their categories

- **943** categories:
  - Nonprofit Organization, Shopping & Retail
  - Evangelical Church, Aquarium, Opera

- We group them to **35** broader categories (IAB)

- Sensitive Categories
Advertisers’ categories

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Sensitive Categories

<table>
<thead>
<tr>
<th><strong>Sensitive Categories</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Food and Drink: 9.3%</td>
</tr>
<tr>
<td>2. Style &amp; Fashion: 8.5%</td>
</tr>
<tr>
<td>3. Technology and Computing: 8.4%</td>
</tr>
<tr>
<td>4. Community Organization: 8.2%</td>
</tr>
<tr>
<td>5. Shopping: 6.7%</td>
</tr>
<tr>
<td>6. <strong>News and Politics</strong>: 5.5%</td>
</tr>
<tr>
<td>7. Travel: 4.6%</td>
</tr>
<tr>
<td>8. <strong>Education</strong>: 4.4%</td>
</tr>
<tr>
<td>9. Healthy Living: 4.2%</td>
</tr>
<tr>
<td>10. Home &amp; Garden: 3.6%</td>
</tr>
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- **Business and finance**: 2%
- **Medical Health**: 1.2%
- **Legal**: 0.2%
- **Religion and Spirituality**: 0.1%
This talk

- Who are the advertisers in Facebook?
- How are they targeting users?
Many strategies available for targeting

- Attribute-based
Many strategies available for targeting

- Attribute-based
- PII-based
Many strategies available for targeting

- Attribute-based
- PII-based
- Lookalike audiences
Many strategies available for targeting
Many strategies available for targeting

- Retargeting
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- Retargeting

- Location-based
Many strategies available for targeting

- Retargeting

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- Social Neighborhood
How do we know how advertisers target users?
How do we know how advertisers target users?
How do we know how advertisers target users?

One reason you're seeing this ad is that Manta Sleep wants to reach people interested in Sleep, based on activity such as liking Pages or clicking on ads.

There may be other reasons you're seeing this ad, including that Manta Sleep wants to reach people ages 25 to 55 who live or were recently in France. This is information based on your Facebook profile and where you've connected to the internet.

Let us know if this topic interests you
Sleep

Tell Us What You Think
Was this explanation useful? Yes No

Learn more about Facebook Ads
How do we know how advertisers target users?

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Learn more about Facebook Ads
Limitations of Facebook Explanations

- Facebook ad explanations reveal information about the targeting
Limitations of Facebook Explanations

- Facebook ad explanations reveal information about the targeting

- They have limitations:
  - They show one attribute
  - Demographics > Interests > PII-based > Behaviors
  - Show the most prevalent attribute
What targeting strategies do advertisers use?

- **Attribute-based**: 47% of ads
- Age/Gender/Location: 23%
- **Lookalike Audiences**: 18%
- Retargeting: 8%
- Social Neighborhood: 3%
- **PII-based**: 2%
- Location-based: 1%
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- 74% of users PII-based, 92% Lookalike audiences
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74% of users PII-based, 92% Lookalike audiences

Differences between **North America** and **Europe**:

- PII-based 6% vs 2%
- Lookalike audiences 30% vs 17%
What attributes do advertisers use?

- 2.5K attributes:
What attributes do advertisers use?

- 2.5K attributes:
  - Music-I
  - Shopping and fashion-I
  - Entertainment-I
  - Technology-I
  - Sports-I
  - Travel-I
  - French (France)-PD
  - Food and drink-I
  - Member of a family-based household-PD
  - English (US)-PD
  - Online shopping-I
What attributes do advertisers use?

2.5K attributes:

- 38% of attributes appear only in one ad:
  - *Pokemon Yellow, Adobe After Effects, Modernism*
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  - Attributes not always aligned with nature of advertiser:
    - **Google**: Hacker News, Digital Media, Masters degree
    - **Also Google**: Women’s rights, US politics (very liberal), Politics and social issues
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  - 591 attributes used by News and politics advertisers:
    - Anti-fascism, LGBT community
Do advertisers change ads over attributes?

- 2.5K advertisers that have used more than one attributes

- 65% of them never used the same text with two different attributes

VICE news:

- **PC Magazine**: “A self-driving, flying taxi could soon be a reality”

- **Democratic Party**: “Mr. Trump and Mr. Cohen have a lot of explaining to do”

- **US Politics (Very Liberal)**: “One of the reasons it’s hard for Trump to navigate the guns issue after Parkland is that the gun rights community itself is still trying to figure out what change is acceptable”
Conclusion

- Popular and verified advertisers mixed with niche and unverified

- Advertisers that can be sensitive

- They use strategies that can be considered invasive or opaque

- They use a plethora of attributes that are difficult to monitor

- They change the content of the ads w.r.t. attributes they use
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- They change the content of the ads w.r.t. attributes they use

Need for better mechanisms to audit ads and advertisers

Need for global approach towards transparency
AdAnalyst

- A tool to help you make sense of your Facebook ads
- https://adanalist.mpi-sws.org

Disable adblockers for Facebook and anti-tracking

Set your Facebook in English or French
Capturing Facebook Ads
Capturing Facebook Ads
Capturing Facebook Ads