# Instagram photos reveal predictive markers of depression

Andrew G Reece and Christopher M Danforth

ELD-020 COMPUTATIONAL SOCIAL MEDIA

24TH OF APRIL 2020

CÉDRIC TOMASINI

# Goal

## Previous research

- Detection of health condition on online media through **text analysis.**
- Study of depression on Instagram with **unscalable** qualitative methods.

Identify and predict **markers** of depression in Instagram user's **posted photographs.**

In a computationally efficient way.

## Main findings

- Can **outperform** practitioner's diagnostics.
- Results hold even **before** the users are diagnosed.
- Human and computers see things in a totally **different** manner.

# Research hypotheses

- Instagram posts from users with depression are distinguishable from healthy user's posts, using only computational image features and metadatas. → Yes
- Posts made before the diagnosis by users with depression are also distinguishable. → Yes
- Human rating of posts based on semantic categories can also distinguish between posts from users with depression and posts from the control group. → Yes
- Human-rated features are correlated with computational features → No

# Method (Computational approach)

amazon mechanical turk beta

95 control users

71 with a history of depression

## Survey

Ensure:
- No history of depression
- Active Instagram use

- Inclusion criteria
- Standard clinical depression survey
- Demographics

Sharing of whole posting history

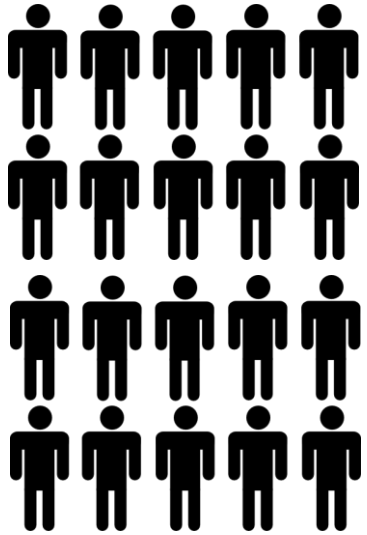
43’950 photographs

## Features

- User activity
- Community reaction
- User social activity (Face detection)
- Pixel-level HSV
- Use of Instagram filters

# Method (Human approach)

amazon mechanical turk beta



Batches of decontextualised images from the collected dataset

## Rating

Features:

- **Interesting ?**
- **Likable ?**
- **Happy ?**
- **Sad ?**

To be rated on 0-5 scale.

# Method

## Bayesian logistic regression

Goal: measure strength of individual predictor

## Supervised ML

Goal: estimate the model's predictive capacity

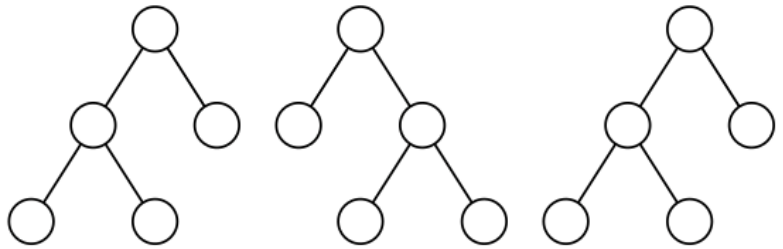
Features →

**All-Data model**

**Pre-diagnosis model**
(Use all control group but only data from before the first diagnosis for depressed group)

Null hypothesis model

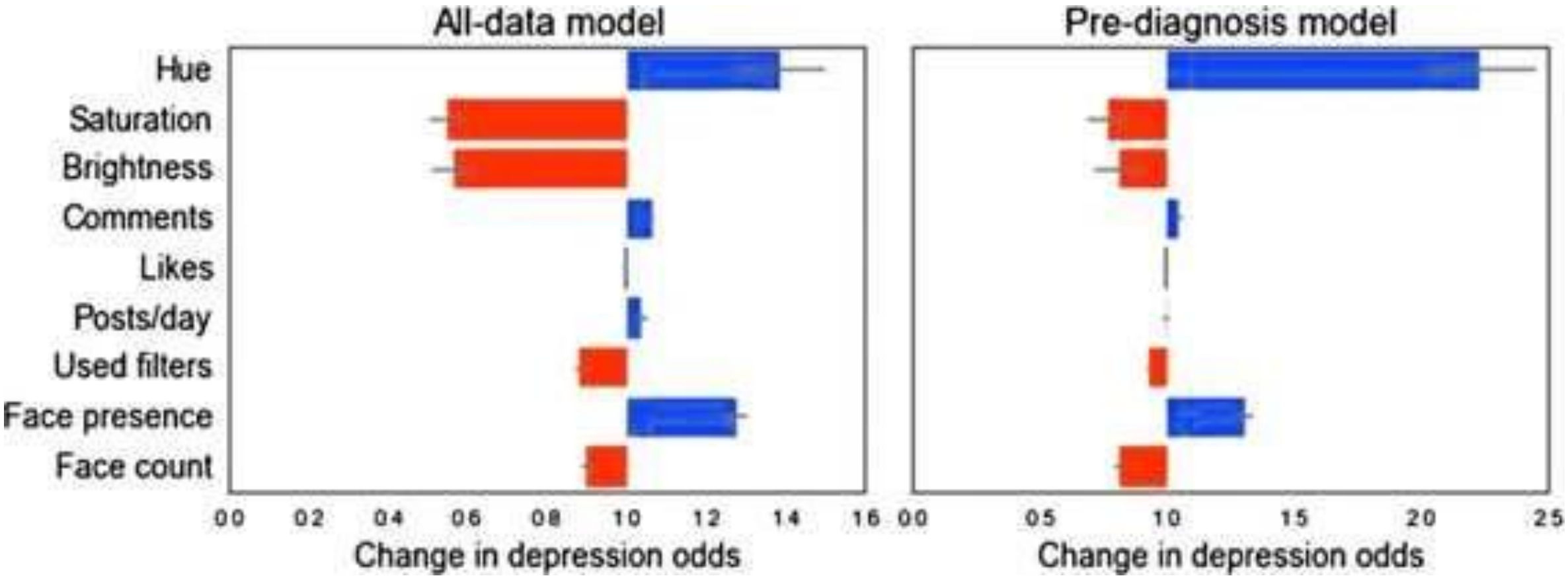
→



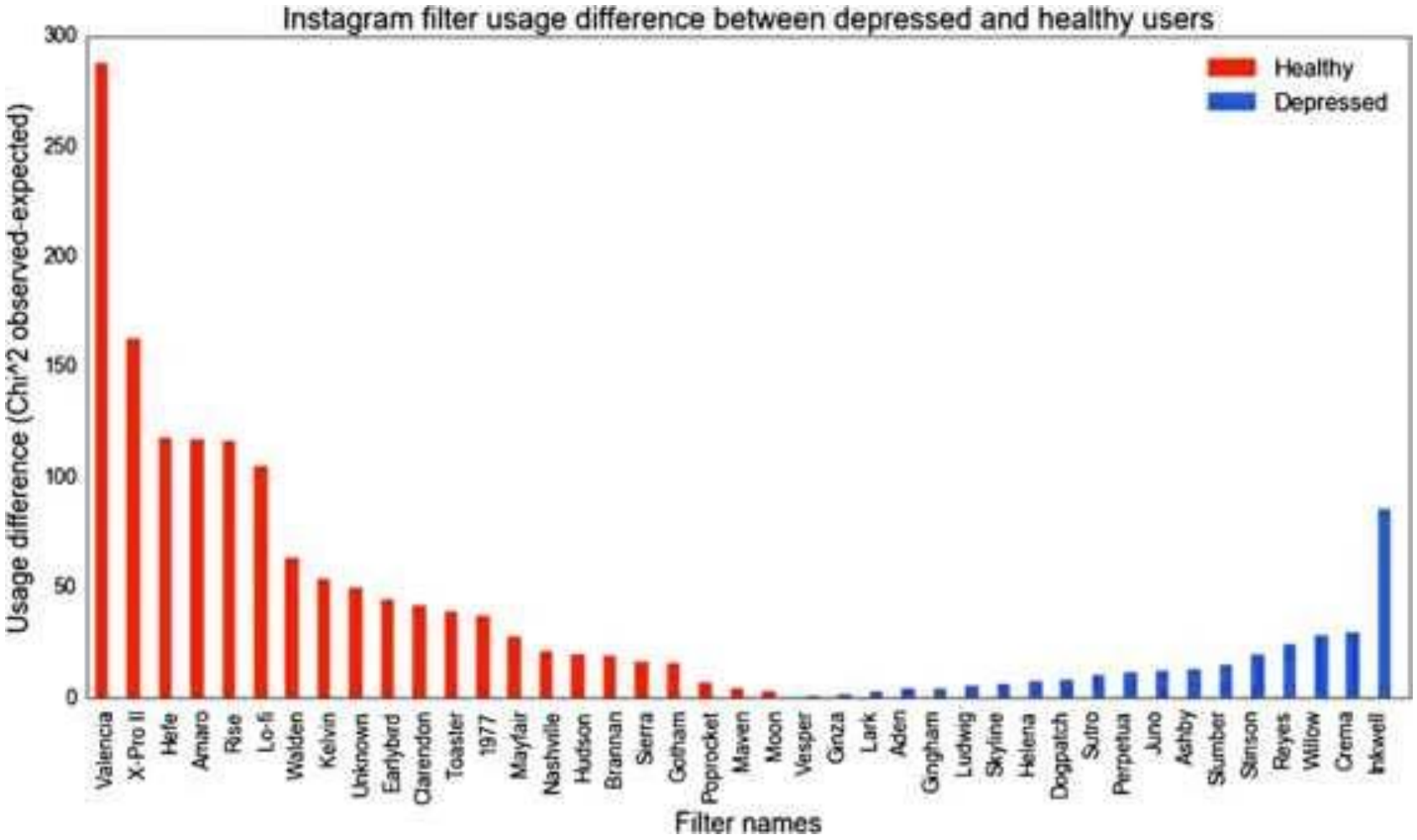
# Results

- Posts by depressed users are on average **bluer, darker, grayer** (hue +, saturation -, brightness - )
- Depressed users posts more photos with one ore more faces, but the **number of faces is lower**.
- Depressed users use **less filters**, and the filter choosen are different.

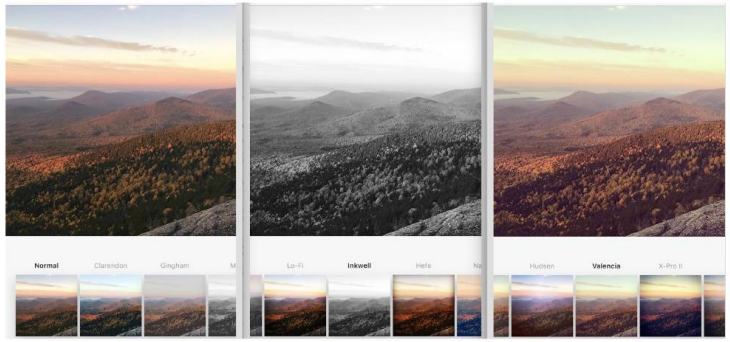
# Results


All-data model
Hue
Saturation
Brightness
Comments
Likes
Posts/day
Used filters
Face presence
Face count
00
02
04
06
08
10
12
14
16
Change in depression odds
Pre-diagnosis model
00
05
10
15
20
25
Change in depression odds

# Results

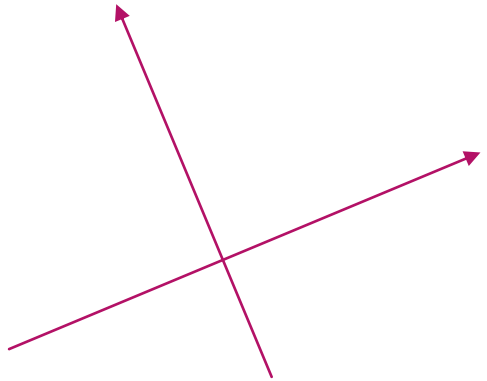



- Inkwell filter = black-and-white
- Valencia = tint lightening



# Results (Human)

- **Sadness** and **happiness** are the only significant predictors (in contrary to likability and interestingness).
- Posts by depressed users are more likely to be sadder and less happy.
- **Extremely low correlation** with computational features.
- Both humans and machines are able to work out significant features, but in a very different way.



# Results (Predictive models comparison)

« without assistance from scales, questionnaires, or other measurement instruments. » → **?**

- Comparison: unassisted general practitioners.
- Recall : TP/(TP + FN), true depression diagnosis among all depressed subjects. All-data > Practitioners.
- Specificity:  TN/(TN + FP), true non-depression diagnosis among all healthy subjects.

| | Practitioners | All-data model | Pre-diagnosis model |
|---|---|---|---|
| Recall | 51% | 70% | 31% |
| Specificity | 81% | 48% | 83% |

Bad because too few data ?

# Conclusion

- Highlight: cheap, scalable and can outperform practicers diagnoses.
- Possible usage: Area where health is underdeveloped ; Complementary tool to prevent false diagnoses.
- Privacy issue: users must agree to share their data. What are the ethical implications?
- Voluntary participation issue: Were the participants biased? Representative? What «depression» means for them?
- Diachronic validity issue: Are those results dependent of trends?