Quantifying the bias in place emotion extracted from photos on social networking sites

A case study on a university campus

Yingjing Huang

School of Earth and Space Sciences, Peking University

huangyingjing@stu.pku.edu.cn

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Content

1 Introduction

2 Methodology

3 Results

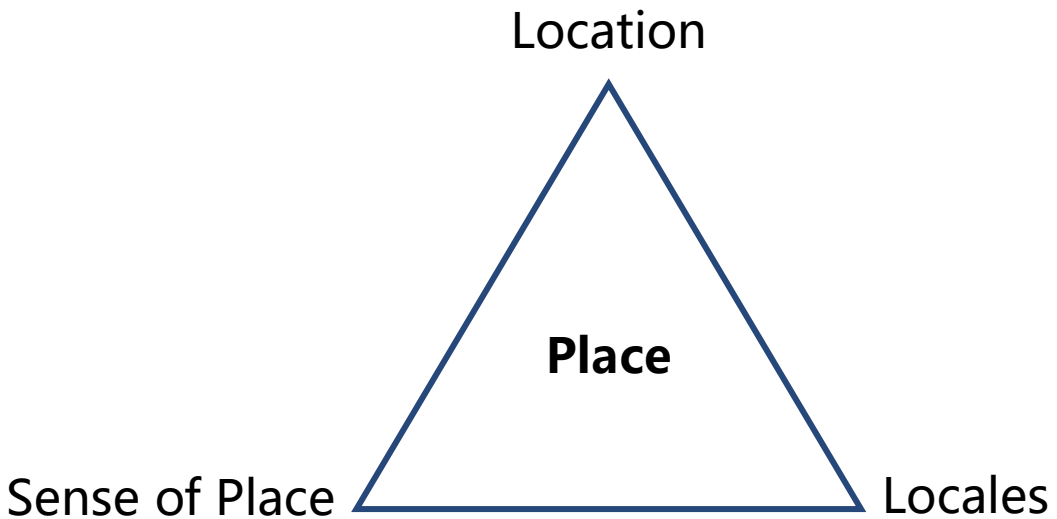
4 Conclusion

01

PART ONE

Introduction

Introduction



Place

Place is closely related to our **daily lives**.

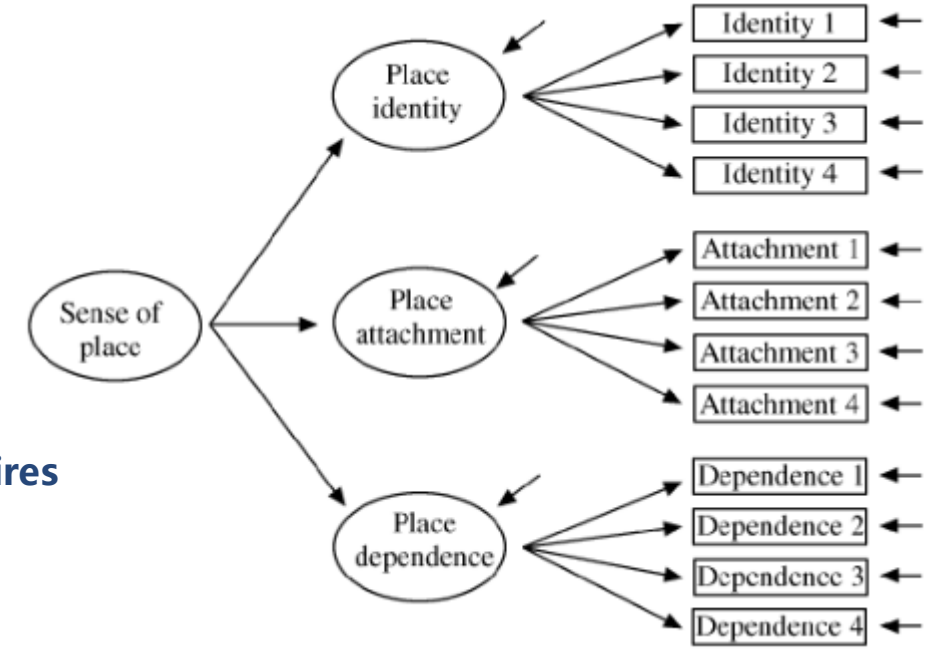
Place is also a **core concept** in Human Geography.

Tuan, Y.-F. (1979). Space and Place: Humanistic Perspective. In S. Gale & G. Olsson (Eds.), *Philosophy in Geography (pp. 387-427). Springer Netherlands. https://doi.org/10.1007/978-94-009-9394-5_19*

Introduction

TABLE 1 Place Attachment

	Mean	% Agree
I feel that I can really be myself there	5.50	73.7
I really miss it when I am away too long	5.42	72.7
I feel happiest when I am there	5.32	70.0
It is the best place to do the things I enjoy	5.17	68.5
It is my favorite place to be	5.14	65.4
It reflects the type of person I am	4.96	58.5
For the things I enjoy most, no other place can compare	4.82	57.3
Everything about it is a reflection of me	4.53	47.3
As far as I am concerned, there are better places to be	3.18	23.8
Scale $\alpha = .937$		



Sense of Place

The traditional measurement of Sense of place is **questionnaires**

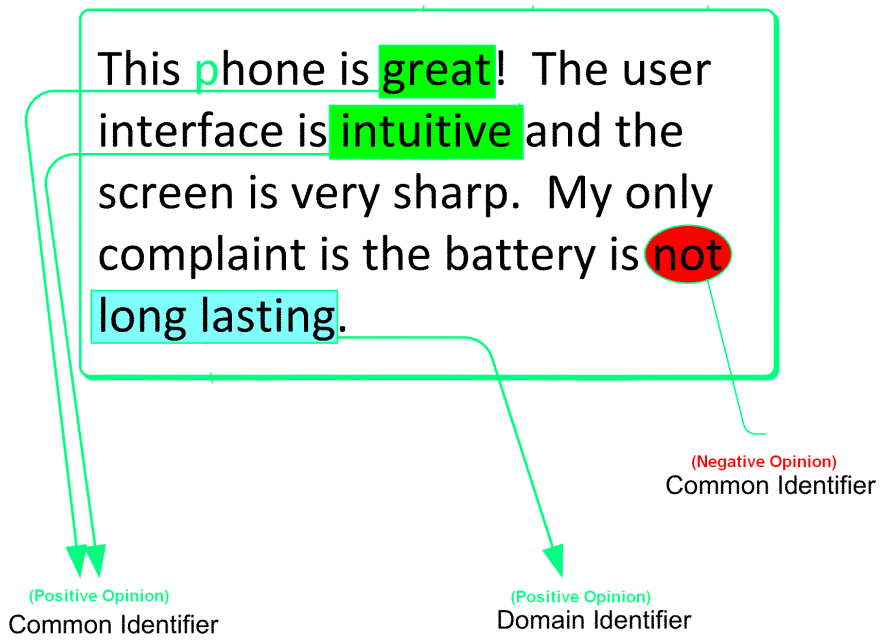
- Low recall rate
- Cognitive bias

Introduction

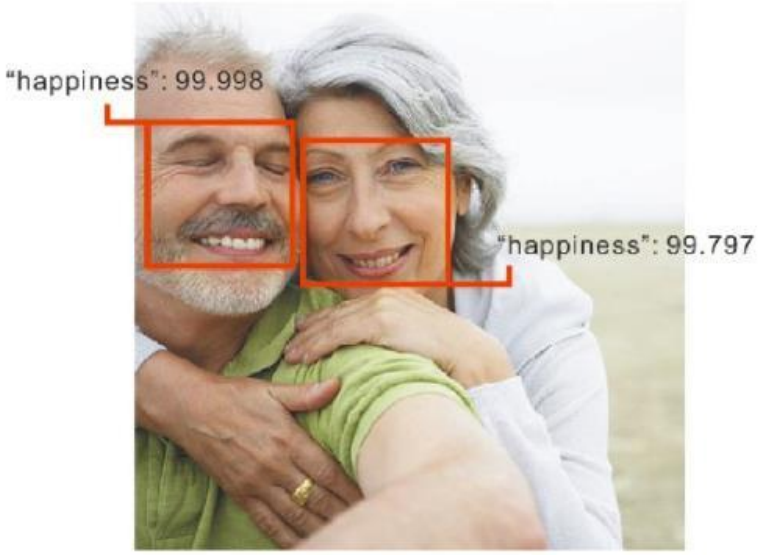
Social Networking Sites

Abundant geo-tagged user-generated content (UGC)

Introduction



(NLP-based Sentiment Analysis)



(CV-based Facial Expression Computing)

Emotional Computing

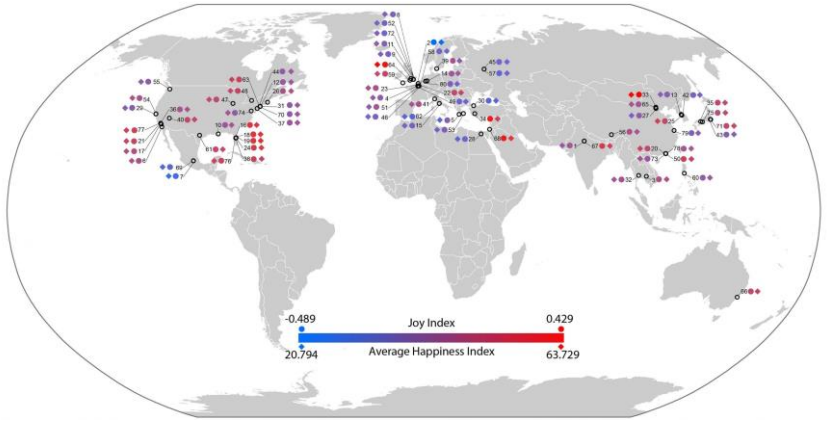
Mature artificial intelligence (AI)-based emotional computing tools and algorithms

Introduction

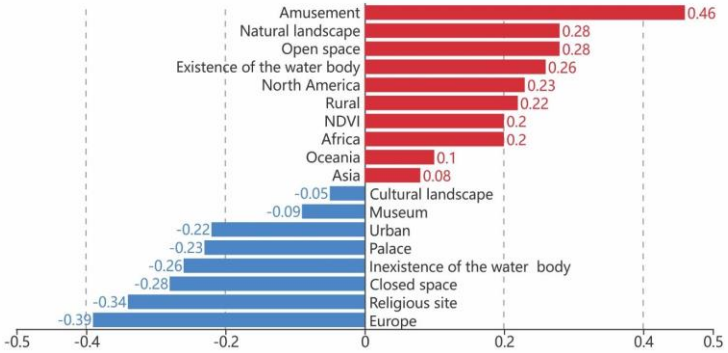
Emotion

Emotion serves as a bridge between the **environment** and the **final experience** that a person obtained from the environment

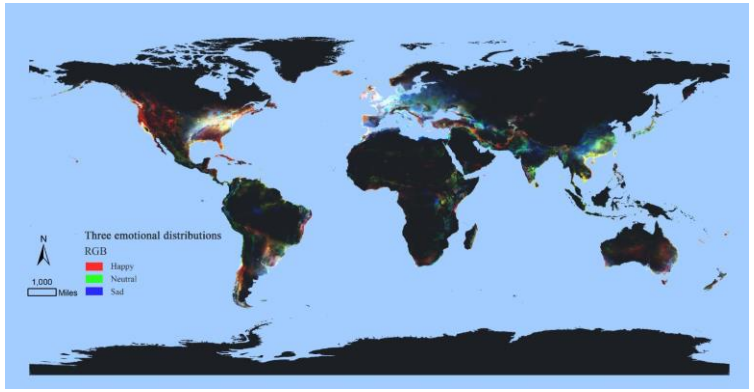
Introduction



Tourists' emotion in tourist attractions



The correlation of environment and emotion



Prediction of the distribution of emotion

Emotional information extracted from social media is wildly using in place emotion studies.

KANG, Y., JIA, Q., GAO, S., ZENG, X., WANG, Y., ANGSUESSER, S., LIU, Y., YE, X. & FEI, T. 2019. Extracting Human Emotions at Different Places Based on Facial Expressions and Spatial Clustering Analysis. Transactions in GIS, 23, 450– 480.

LI, Y., FEI, T., HUANG, Y., LI, J., LI, X., ZHANG, F., KANG, Y. & WU, G. 2020. Emotional habitat: mapping the global geographic distribution of human emotion with physical environmental factors using a species distribution model. International Journal of Geographical Information Science, 1-23.

Introduction

However,

can these emotional information in cyberspace represent the emotional information in physical space?

02

PART TWO

Methodology

Methodology

Research Questions

1. Are there significant differences between *Online Place Emotion* and *Offline Place Emotion*?
2. Is there any pattern showing what emotion is suppressed and what emotion is exaggerated on SNS compared with their offline counterparts?
3. Do demographic characteristics influence the pattern that has been observed?

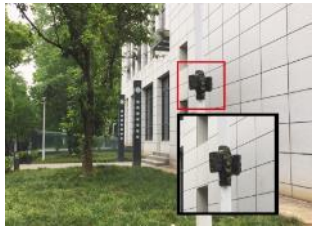
Methodology

A campus of
Wuhan University

SNS
(Sina Weibo)

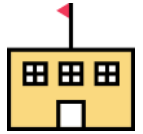
Web Photos

Online Dataset



in-situ Camera

in-situ Photos



Offline Dataset

Data Collection

Two datasets collected within same geographic region and same periods

Methodology

Face++ 旷视

Emotion Recognition API

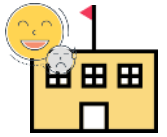
7-dimensional emotional confidence

(sadness, neutral, disgust, anger, surprise, fear, happiness)

Demographic characteristics

(age, gender, ...)

Online Place Emotion



Offline Place Emotion

Methodology

1. **Emotion Probability Index**
   EPI

2. **Emotion Intensity Index**
   EII

3. **Emotion Evenness Index**
   EEI

4. **Emotion Suppressed Index**
   ESI

Basic Emotions

Neutral

Methodology

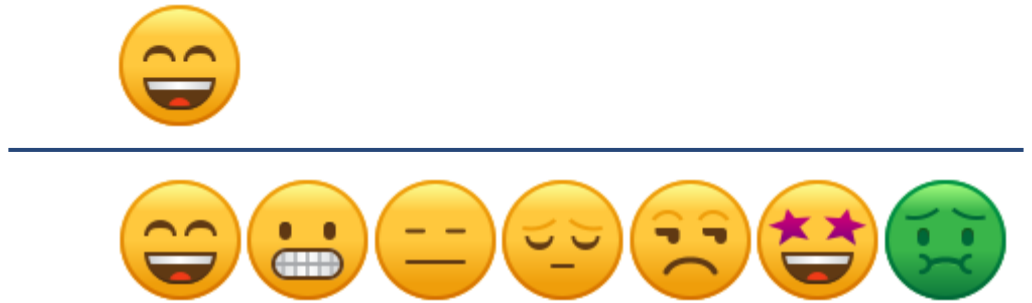
1 Emotion Probability Index
EPI

$$EPI_{At} = 100 - \frac{1}{n}\sum_{i=1}^{n} EC_{neutral}(i)$$

Methodology

2 Emotion Intensity Index
EII

$$EII_{At-e} = \frac{n_e}{n}$$

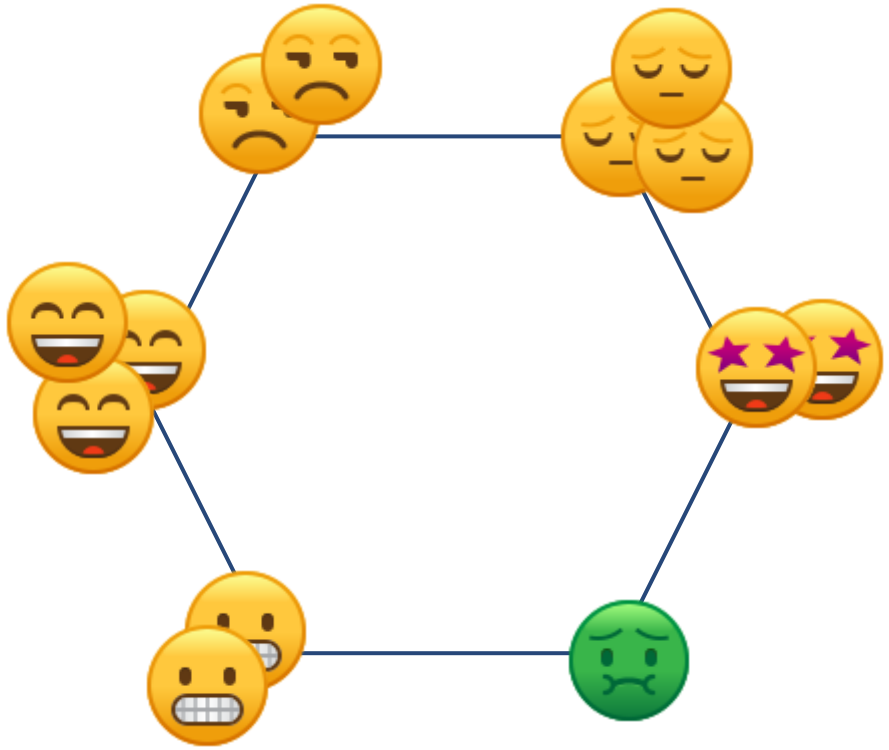


Methodology

3 Emotion Evenness Index
EEI

$$EEI_{At} = \frac{1 - \sum EII_e^2}{1 - n_b^{-1}}$$

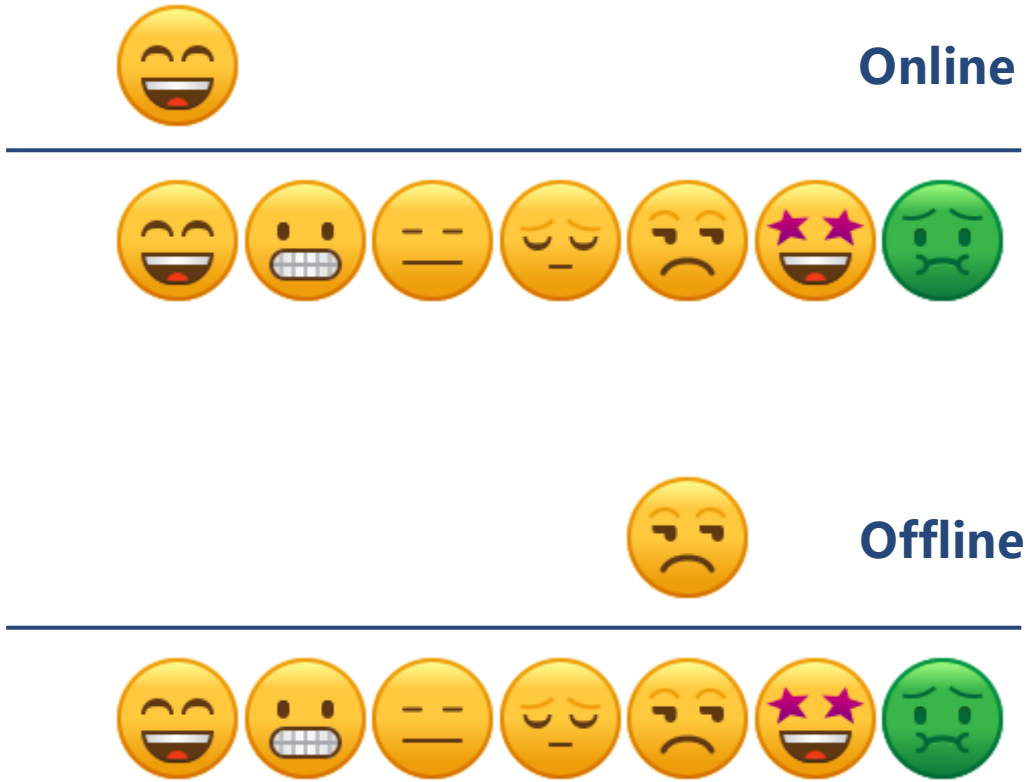
* Refer to Pielou's Species Evenness



Methodology

4 **Emotion Suppressed Index**
ESI

$$ESI_{At-e} = \frac{EII_{offline} - EII_{online}}{EII_{offline}}$$



03

PART THREE

Results

Results

Are there significant differences between *Online Place Emotion* and *Offline Place Emotion*?

EPI

Online dataset	**61.182**
Offline dataset	**56.653**

- There were indeed **significant differences** between online and offline place emotion.
- Online place emotion will **overestimate** the probability of 6-dimensional basic emotions.

T-test

t value	**-9.527**
p value	**<0.001**

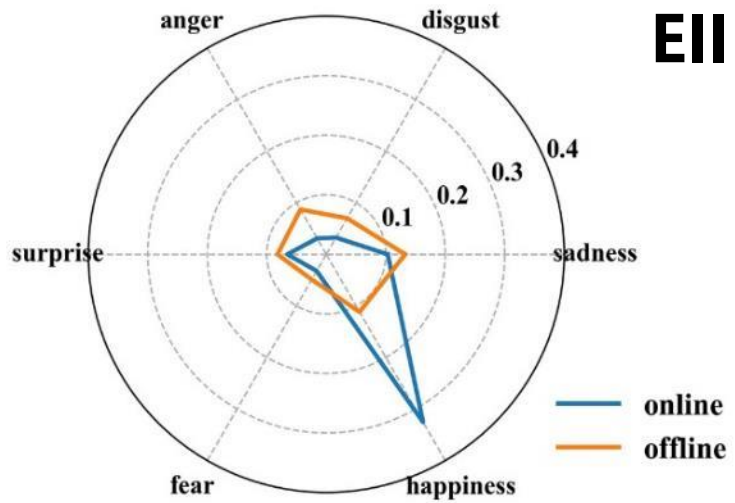
Results

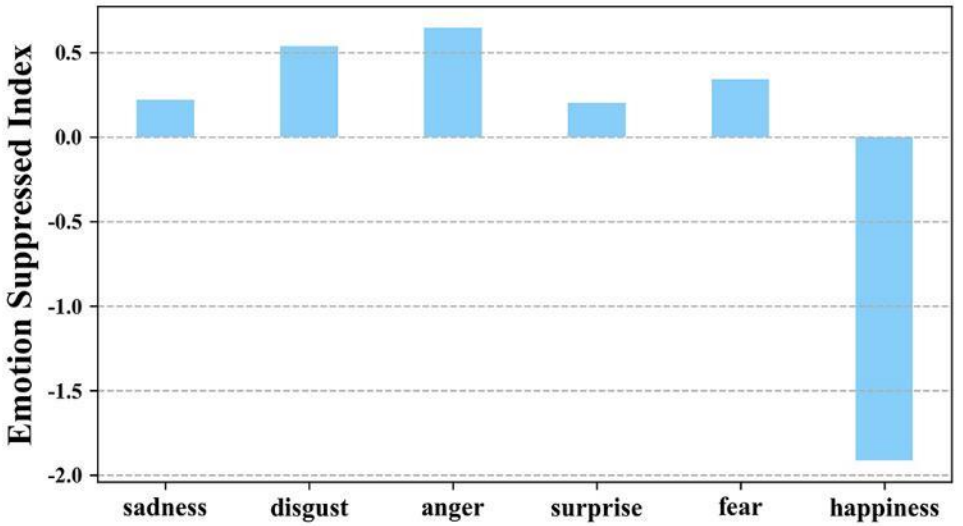
The differences in multi-dimension emotions

EEI

Online dataset **0.644**

Offline dataset **0.818**





- Online place emotion is more **uneven** than offline place emotion
- Online place emotion tends to **exaggerate** people's **happiness** and **suppress other emotions**.

Results

Do demographic characteristics influence the pattern that has been observed?

teen female
Age <20

adult female
Age 20~50

old female
Age >50

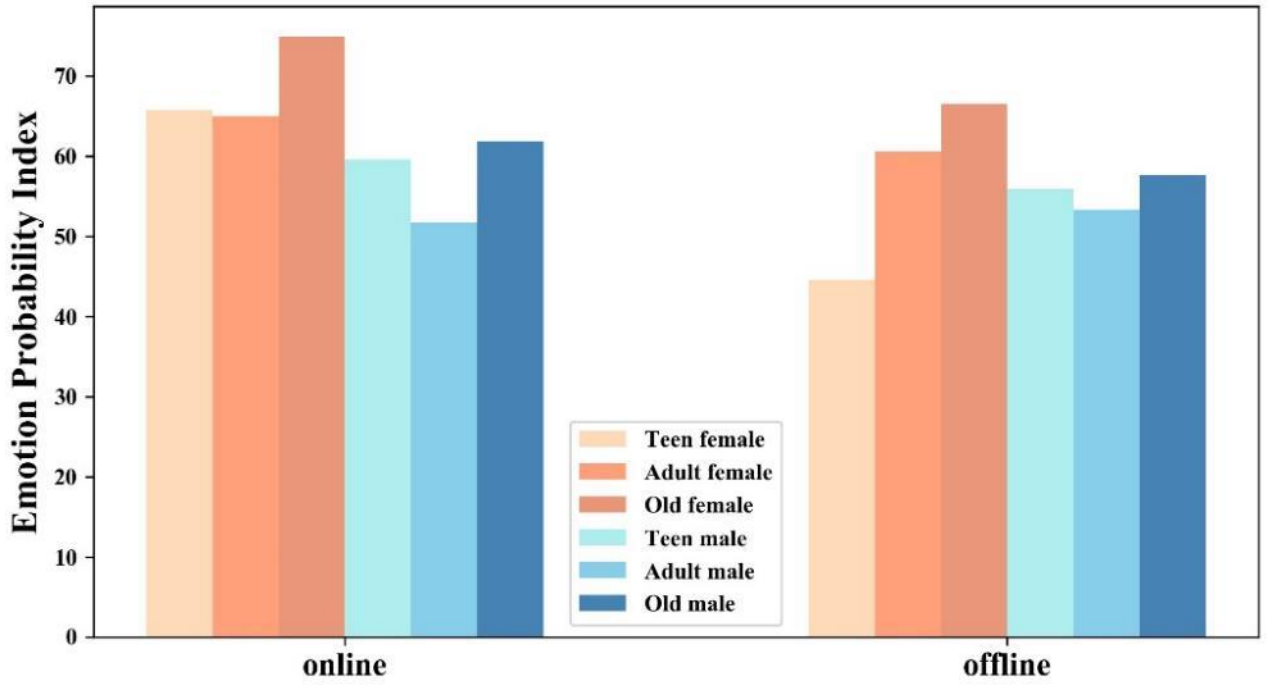
teen male
Age <20

adult male
Age 20~50

teen female
Age >50

Results

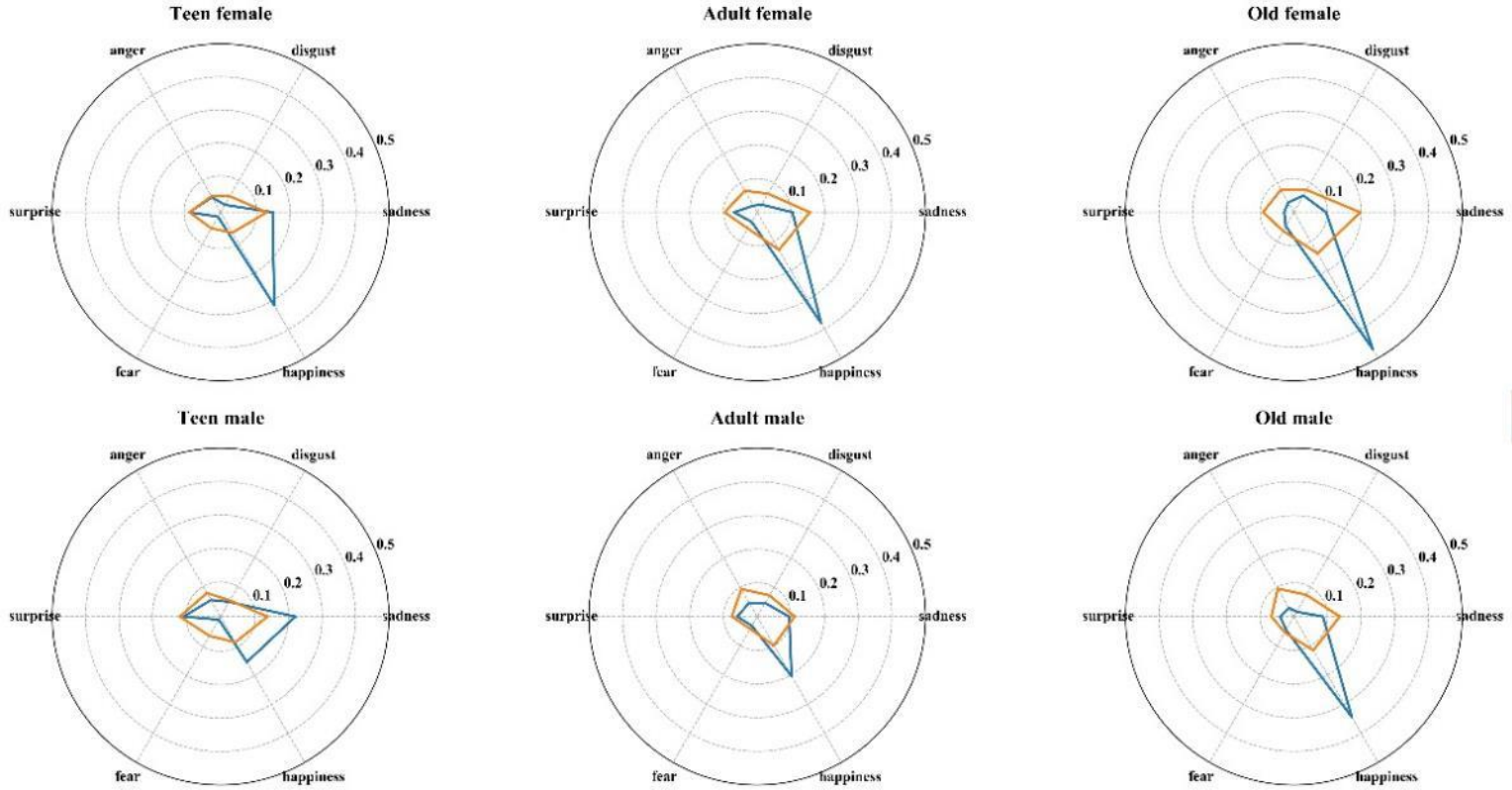
Do demographic characteristics influence the pattern that has been observed?



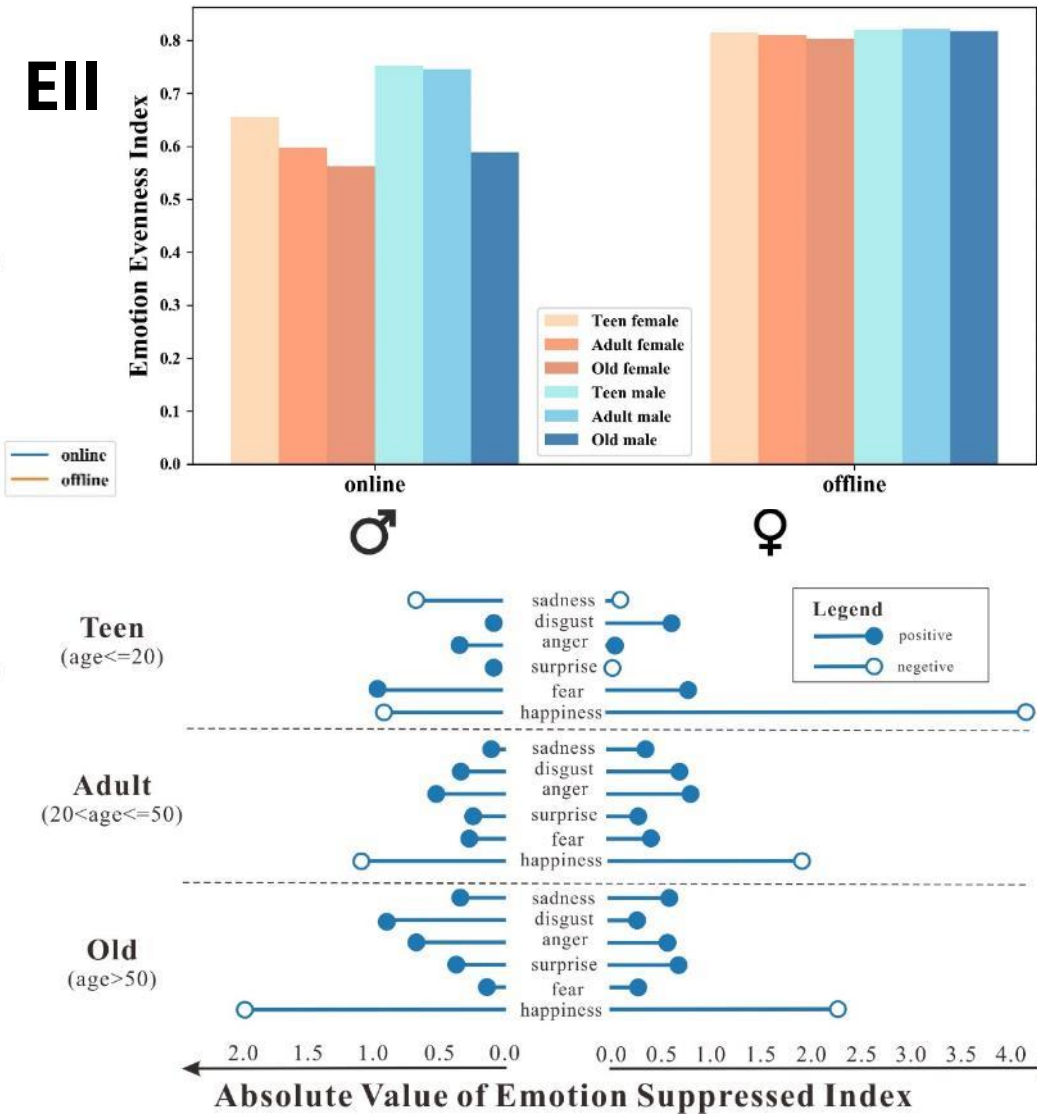
Females are **significantly consistent** with the overall pattern, and the pattern of males is **less obvious**

Results

Do demographic characteristics influence the pattern that has been observed?



Females show a more obvious overall pattern than males.



04

PART FOUR

Conclusion

Conclusion

- There are significant differences of place emotions in physical space and cyberspace
- Females have greater emotional differences in the two spaces than males do.

Future Directions

1. Does the conclusion still positive in other places?
2. Whether the functionality of places influences the patterns?
3. Can we build a model to correct the bias we found in cyberspace?

Thanks!

Yingjing Huang, Jun Li, Guofeng Wu and Teng Fei. 2020. Quantifying the bias in place emotion extracted from photos on social networking sites: A case study on a university campus. Cities, 102, 102719.