

INTRODUCTION

- With the increasing spread of misinformation on online platforms, there is a critical need to detect human perception in relation to the truthfulness of news.
- We study human eye movements while reading fake and real news and their believability using advanced gaze metrics.
- We investigate the relationship between the visual scanning behavior, distribution of attention over Areas of Interest (AOIs), and cognitive load with respect to truthfulness and perceived believability of news content.

DATA AND METRICS

Dataset

- Utilized the publicly available FakeNewsPerception eye tracking dataset [1].
- Data is collected from 25 participants with normal or corrected-to-normal vision (48% Males, 52% Females).
- Each participant read 60 news items.

Conditions

- News version: News items consisting of two versions; real and fake.
- Believability rating: Self-reported believability score obtained from the participants.

Advanced Eye Gaze Metrics

Ambient/Focal Attention with Coefficient K [2]

- A dynamic indicator of fluctuation between ambient/focal visual search behavior ($K < 0 \rightarrow$ ambient visual scanning & $K > 0 \rightarrow$ focal processing).

Gaze Transition Entropy [3]

- Measures the predictability in AOI transitions and overall distribution of attention over AOIs (High values \rightarrow randomness in the gaze transitions over AOIs).

Low/High Index of Pupillary Activity (LHIPA) [4]

- A measure of pupil diameter fluctuation which indicates cognitive activity (Low values \rightarrow increased cognitive load).

ACKNOWLEDGEMENT

This work is supported in part by the U.S. National Science Foundation grant CAREER IIS-2045523.

METHODOLOGY

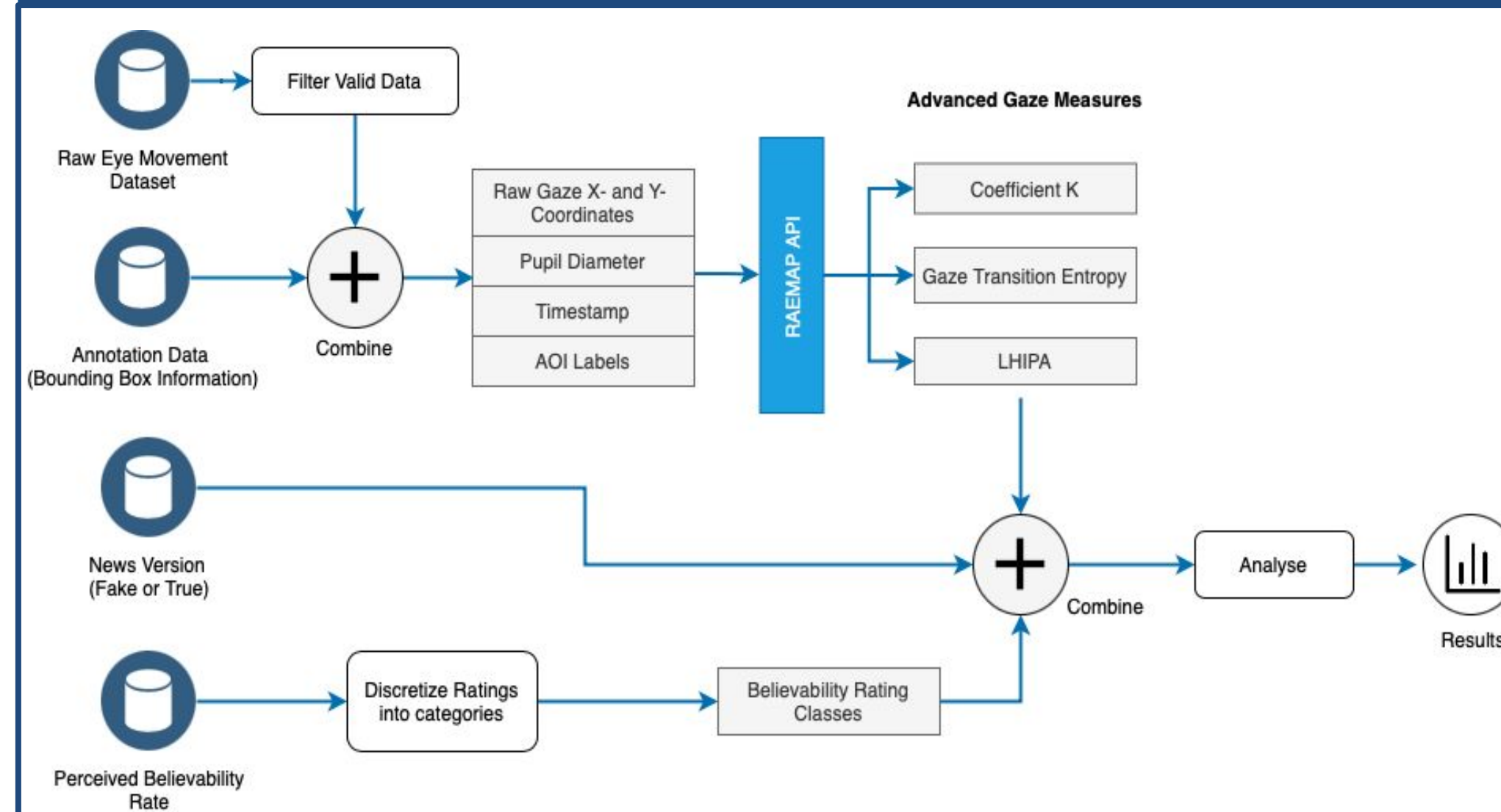


Figure 1: Processing Pipeline Including Advanced Eye Movement Analysis.

- We filtered the valid data from eye movements data.
- We added AOIs labels to eye movement record; image, headline, subheading, text, and source.
- We utilized RAEMAP [5], to calculate advanced eye gaze metrics using the eye movements.
- We categorized the linear values of the believability rating into three classes (Believable, Unsure, and Not Believable).
- We concatenated the calculated advanced gaze metrics with the generated classes of believability ratings and truthfulness of news items they viewed.

ANALYSIS

- We conducted normality and homogeneity tests with Shapiro-Wilk and Levene tests on each metric for news version conditions and believability rating conditions.
- As the results of these tests show that data are not normally distributed, we utilized non-parametric methods for analyzing gaze measures.
 - To compare two samples (news version): Mann–Whitney U test with brute-force version of Common Language Effect Size (CLES) statistic
 - To compare two or more independent samples (believability rating): Kruskal–Wallis test

RESULTS

Measurements	News Version		Believability Rating		
	Fake	Real	Believable	Unsure	Not believable
Coefficient K	0.00300 \pm 0.0040	-0.00040 \pm 0.0030	0.00060 \pm 0.0030	-0.00850 \pm 0.0050	0.01070 \pm 0.0070
Gaze Transition Entropy	0.47400 \pm 0.0051	0.47370 \pm 0.0050	0.46900 \pm 0.0050	0.48200 \pm 0.0080	0.47900 \pm 0.0080
LHIPA	0.01842 \pm 0.0003	0.01841 \pm 0.0003	0.01810 \pm 0.0003	0.01860 \pm 0.0005	0.01880 \pm 0.0005

Table 1: Mean and Standard Deviation of Coefficient K, Gaze Transition Entropy and LHIPA based on News Version and Believability Rating

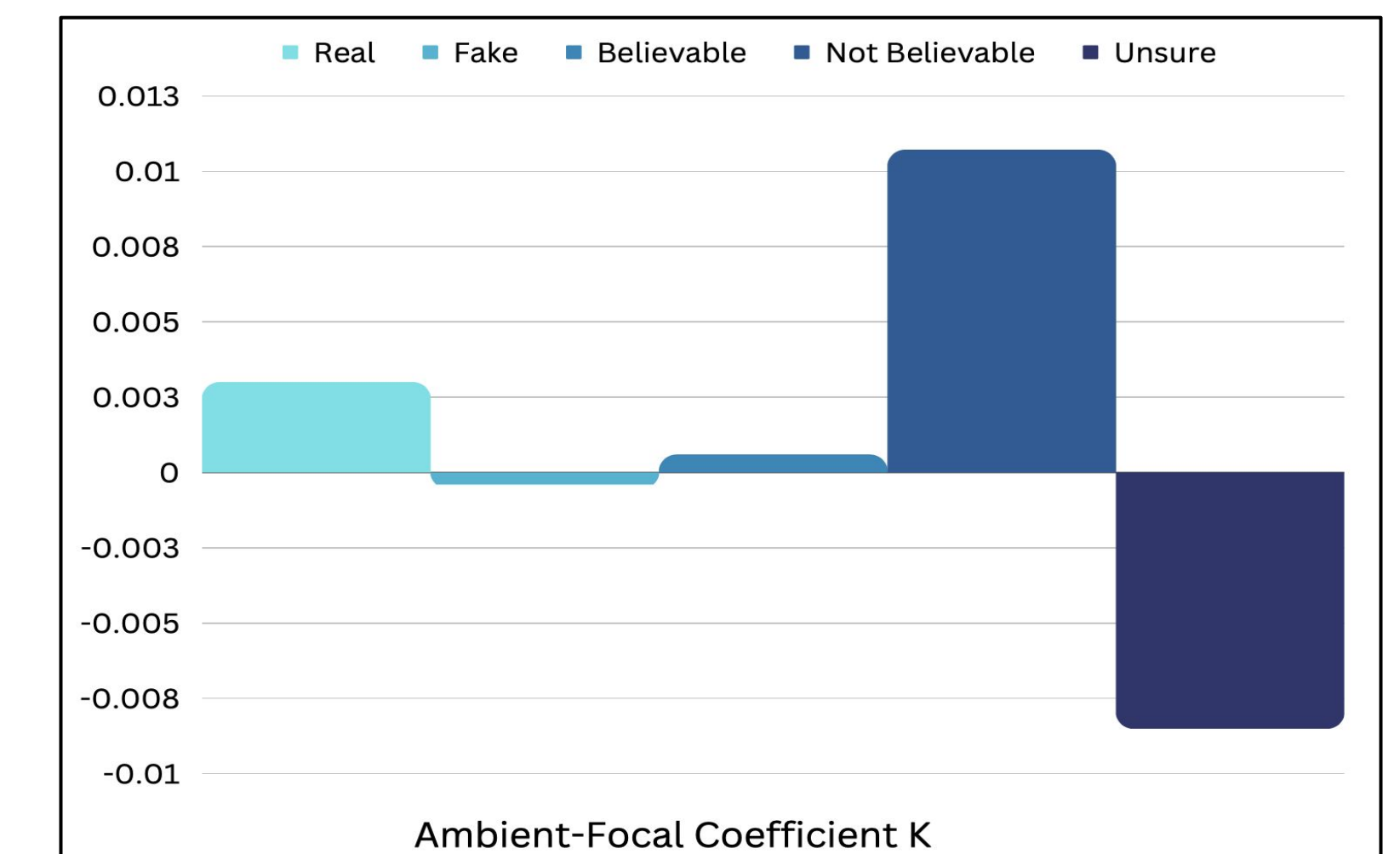


Figure 2: Mean coefficient K between news version and believability rating

CONCLUSION

- We analyzed advanced gaze measures with respect to truthfulness and perceived believability of news content.
- We observed the participants exhibit more ambient visual scanning when they are unsure of the news and more focal processing when they do not believe the news.
- We observed a similar distribution of attention over AOIs and similar cognitive load among participants regardless of the conditions.

REFERENCES

- [1] Ö. Sümer, E. Bozkir, T. Kübler, S. Grüner, S. Utz, and E. Kasneci, "FakeNewsPerception: An eye movement dataset on the perceived believability of news stories", Data in Brief, 2021
- [2] K. Krejtz, A. Duchowski, I. Krejtz, A. Szarkowska, and A. Kopacz, "Discerning Ambient/Focal Attention with Coefficient K", in ACM Transactions on Applied Perception, 2016.
- [3] K. Krejtz, A. Duchowski, T. Szmidt, I. Krejtz, F. González Perilli, A. Pires, A. Vilaro, and N. Villalobos, "Gaze transition entropy" in ACM Transactions on Applied Perception, 2015.
- [4] A. Duchowski, K. Krejtz, N. Gehrer, T. Bafna, and P. Bækgaard, "The Low/High Index of Pupillary Activity", in Proceedings of the 2020 CHI Conference on Human Factors in Computing System, 2020.
- [5] G. Jayawardena, "RAEMAP: Real-Time Advanced Eye Movements Analysis Pipeline", in ACM Symposium on Eye Tracking Research and Applications, 2020.