

D30 Computational Classification of Written Statements as True or False: Comparing Experimental and High-Stakes Data in the Forensic Setting

Angela Almela, PhD*, Universidad de Murcia, Murcia 30071, SPAIN

Learning Overview: After attending this presentation, attendees will better understand the motivation and challenges of the computational classification of written statements as true or false in the forensic setting.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by providing empirical evidence on the classification of true and false texts of different nature by means of computational tools.

In the past decade, fields such as psychology and natural language processing have devoted considerable attention to the automatization of the process of deception detection, developing and employing a wide array of automated and computer-assisted methods for this purpose.^{1,2} Similarly, another emerging research area is focusing on computer-assisted deception detection using linguistics, with promising results.³⁻⁵ Thus, some computational approaches supervised by experts in the field are considered an efficient way to supplement and support criminal investigators, being of special interest to linguists, jurists, criminologists, and professionals in the field of communications.

Accordingly, in this presentation, attendees will first be provided with a framework introducing the theory that explains the origin of deception, offering an operational definition of the concept and describing key notions like theory of mind, emotional arousal, and empathy. Then, an overall review of the state of the art regarding linguistic cues to deception will be provided, as well as an overview on several approaches to the study of deception and on previous research into its linguistic detection, describing the main controversies in the area.⁶ Furthermore, this presentation will draw a distinction between software packages specifically developed for linguistic deception detection, like Witness Statement Evaluation Research (WISER) and VeriPol, and other verbal assessment tools that are widely used for this and many other purposes, such as Linguistic Inquiry and Word Count (LIWC).⁷⁻⁹

An empirical study is presented, whose aim is to explore the linguistic cues to deception in written language using WISER, a project using automated text analysis and statistical classifiers to determine the best protocol for computational classification of true and false statements in the forensic-investigative setting. The tool has been tested on ground truth data, which involves the use of data where the researcher knows what the correct answers are, as only with ground truth data can the researcher accurately report its error rate. Specifically, in previous work, the results showed a remarkable difference between the experimental data, in which students were asked to write true and false narratives, and high-stakes data, actual statements from real criminal investigations with non-linguistic evidence of their veracity or falsehood. This result demonstrates that there is a real difference between lies told in an experimental setting (or “laboratory produced”) and lies told in a police investigation.

In the current study, a different set of experimental data was tested against the high-stakes data to determine if the previously reported distinction between laboratory-produced lies and high-stakes lies is replicated. The dataset has already been analyzed with different sets of variables, through the application of Machine Learning and statistical classifiers, which provides a solid basis for comparison.^{1,3} Specifically, data were produced by 100 participants, all of them native speakers of English participating through Amazon® Mechanical Turk. Subjects were asked to write on three different topics, first voicing their real opinion on the matters in four or five sentences; then, they had to express the opposite of their opinion, explicitly lying about their true beliefs. The corpora do not contain spontaneously produced language, but the Hawthorne effect was minimized by not explicitly telling the participants the ultimate aim of the study. Moreover, a reward provided medium motivation for the participants, as they were assigned with the tasks as an exercise for extra credit.

Reference(s):

1. Mihalcea, Rada, and Carlo Strapparava. The lie detector: Explorations in the automatic recognition of deceptive language. In *Proceedings of the 47th Annual Meeting of the Association for Computational Linguistics*, 309–312. Singapore: ACL, 2009.
2. Vrij, Aldert. *Detecting lies and deceit: Pitfalls and opportunities* (2nd ed.). Chichester: John Wiley and Sons, 2008.
3. Almela, Ángela, Rafael Valencia-García, and Pascual Cantos. Seeing through deception: A computational approach to deceit detection in written communication. In *Proceedings of the Workshop on Computational Approaches to Deception Detection*, 15–22. Avignon: ACL, 2012.
4. Chaski, Carole E., Larry Barksdale, and Michael Reddington. Collecting Forensic Linguistic Data: Police and Investigative Sources of Data for Deception Detection Research. In *Proceedings of the Linguistic Society of America Annual Meeting*, 93–94. Minneapolis: LSA, 2014.
5. Picornell, Isabel. Cues to Deception in a Textual Narrative Context: Lying in Written Witness Statements. PhD diss., Aston University, 2012.
6. Granhag, Pär A., Aldert Vrij, and Bruno Verschuere. *Detecting Deception: Current Challenges and Cognitive Approaches*. Chichester: Wiley Blackwell, 2015.
7. Chaski, Carole E., Ángela Almela, Gary Holness, and Larry Barksdale. WISER: Automatically Classifying Written Statements as True or False. In *Proceedings of the American Academy of Forensic Sciences*, 67th Annual Scientific Meeting, Orlando, FL. 2015. 576–577.
8. Quijano-Sánchez, Lara, Federico Liberatore, José Camacho-Collados, and Miguel Camacho-Collados. Applying automatic text-based detection of deceptive language to police reports: Extracting behavioral patterns from a multi-step classification model to understand how we lie to the police. *Knowledge-Based Systems* 149, 155–168, <https://doi.org/10.1016/j.knosys.2018.03.010>.
9. Pennebaker, James W., Martha E. Francis, and Roger J. Booth. *Linguistic Inquiry and Word Count: LIWC*. Texas: Erlbaum Publishers, 1999.

Automatic Text Classification, Deception Detection, Forensic Computational Linguistics