SuiSensor: A Novel, Low-Cost Machine Learning System for Real-Time Suicide Risk Identification and Treatment Optimization via Computational Linguistics

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Every 40 seconds, suicide steals a life—an annual cost of 800,000 people—but clinical assessments for suicide risk and treatment have improved little over the past 50 years. Risk assessments exhibit extremely poor predictive value because they impose long-term, one-size-fits-all scales on suicidal behavior, which can shift rapidly from minute to minute. Treatment inquiry requires labor-intensive and costly evaluations, inaccessible to the underserved communities with the highest suicide risk. This study aimed to develop a dynamic tool to assess suicide risk and optimal treatment modality from syntactic and semantic features of people's writing in real-time. The researcher hypothesized that the writing of high-risk individuals shows more pronounced semantic than syntactic differences from that of low-risk individuals, and thus a tool based on semantics (Model M) would be more accurate than one based on syntax (Model X). To this end, the researcher employed computational linguistic software to syntactically and semantically examine the diary entries of adult participants (n=5181), classified into low, moderate, and high suicide risk bands based on a comprehensive psychological evaluation. Model M and X were each generated with a random forest of 2000 decision trees, optimizing their predictive success. Model M assessed suicide risk with 98.15% accuracy and treatment modality with 86.75% accuracy, confirmed to be statistically robust (J=0.96) and outperforming current clinical methods by 92.65%. Model M, implemented into the free SuiSensor application, is available to the public for self-assessment or clinicians for monitoring and planning: a viable solution to the suicide crisis. The future of psychological diagnosis and treatment could rest in the very words we write.

Awards Won:
Second Award of $2,000
American Psychological Association: First Award of $1,500
Missouri University of Science and Technology: $500 tuition scholarship (nonrenewable)
Air Force Research Laboratory on behalf of the United States Air Force: Glass trophy and USAF medal for each recipient
Air Force Research Laboratory on behalf of the United States Air Force: First Award of $750 in each Regeneron ISEF Category