

# Assessing Violence Risk in Threatening Communications

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## Abstract

Violence risk assessment is an important and challenging task undertaken by mental health professionals and others, in both clinical and nonclinical settings. To date, computational linguistic techniques have not been used in the risk assessment process. However they could contribute to the current threat assessment process by allowing for early detection of elevated risk, identification of risk factors for violence, monitoring of violent intent, and determination of threat level. We analyzed a sample of communications to judges that were referred to security personnel for evaluation as constituting potential threats. We categorized them along multiple dimensions including evidence of mental illness, presence and nature of any threat, and level of threat. While neither word count-based or topic models were able to effectively predict elevated risk, we found topics indicative of persecutory beliefs, paranoid ideation, and other symptoms of Axis I and Axis II disorders.

## 1 Introduction

Mental health professionals are called upon to assess the risk of violence in many different settings, from the determination of the need for hospitalization or increased treatment to consultations for the criminal justice system (Skeem and Monahan, 2011). These assessments include examination of the verbal content of a subject's communications,

primarily for the purpose of detecting symptoms of thought disorder or evidence of impending violent behavior. Language technology is rarely utilized in these efforts, yet it could be a valuable tool for detecting evidence of illness and increased violence risk in verbal and written communications.

We analyzed a unique data set of threatening communications sent to judges. Examination of these written communications indicate that, for this sample, explicit threats are rare, but evidence of mental illness is common. We applied two types of computational methods to the communications in the sample—topic models, and a simple computational text analysis method: LIWC (Pennebaker et al., 2001). The results point towards a useful role for such methods in the analysis of threatening communications, as well as limitations. Advances in language technology methods, as well as the availability of more data, may both be needed to make substantial progress.

## 2 Violence Risk Assessment and Mental Health Professionals

Assessment of the risk of violence is a task that belongs to a diverse group of mental health professionals (MHPs): those who provide clinical care, forensic MHPs specializing in mental health issues related to the legal system, and those who engage in the even more specialized field of threat assessment. Other disciplines involved in threat assessment include law enforcement, security professionals, and intelligence analysts.

Violence risk assessment is a routine aspect of the work of mental health professionals treating

people with mental illness. While violence against others on the part of people with diagnoses of mental illness is far less prevalent than is popularly thought, the increased risk attributable to these illnesses is barely statistically significant (Steadman et al., 1998; Swanson et al., 1990). This increased risk is largely attributable to a small group of individuals who have a history of childhood or adult antisocial behavior in combination with substance use disorders and psychotic illness (Elbogen and Johnson, 2009).

## **2.1 Methods and Practice of Violence Risk Assessment**

Treating clinicians are responsible for evaluating their patients to determine if they pose a risk of violence and adjusting treatment accordingly, or arranging for hospitalization, as needed. The risk of violence, as evidenced by threats or attempts to harm self or others, are two of the bases for hospitalizing people with mental illness against their will. This assessment primarily relies upon information obtained through interviewing and observing the patient, as well as information from collateral sources when it is available. The patient's language is taken into account largely as a part of the mental status examination, in which attention is paid to the content and form of the patient's thoughts, which are characteristically disrupted in certain illnesses. Clinicians look at many factors to determine if someone poses a risk of violence, but a patient's written communications is typically not one of them.

MHPs who practice in the field of forensic mental health do so as an even larger component of their work. Many are routinely asked to assess the risk of violence in both the civil and criminal justice systems. In the civil justice system, for example, they may be called upon as expert witnesses in civil commitment proceedings or as consultants on such matters. In the criminal justice system, they may be asked to assess the risk of violence in conjunction with the issuance of restraining orders, determination of conditions of bail and probation, and sentencing. While judges make the ultimate decisions, they generally rely highly upon the clinical judgment of MHPs with regard to diagnosis and assessment of the risk of violence.

In recent years, a number of tools have been introduced to assist in the assessment of violence risk, such as the HCR-20 (Webster et al., 1982),

COVR (Monahan et al., 2006), and VRAG (Quinsey et al., 1998). None of these instruments consider linguistic factors. They utilize actuarial determinations of violence risk. These instruments do not provide strict cutoff scores that differentiate between nonviolent and violent individuals. Rather, they serve as adjunct tools to clinical judgment. As a result, the current best practice in violence risk assessment consists of structured clinical judgment, a process in which actuarial risk assessments are combined with clinical judgment to reach a determination regarding a specific individual's risk.

Whereas treating clinicians primarily rely upon examination of the patient in assessing the risk of violence, forensic MHPs are expected to go beyond the clinical examination and incorporate information from a variety of collateral sources, such as medical and mental health records, psychological testing, legal documents, police reports, and criminal histories in order to increase the objectivity and "scientific" basis of their opinion. As in clinical care, language is an important part of the mental status examination. More detailed review of the evaluatee's communications is more common in forensic work, as it may provide insight into the writer's emotional state, motivation, and intention, as well as thought processes. The content, syntax, and grammar of communications, as well as the page layout, variations in font size, use of color, and graphics may all be considered in assessing for presence of a mental disorder and indications of violence risk.

## **2.2 Threat Assessment**

Threat assessment is a discipline that relates to, yet is separate from, clinical violence risk assessment. Meloy, et al. distinguish between the two fields, noting that violence risk assessment is consultative in nature, and generally aimed at assisting legal decision-making and managing a particular individual over the long term. They note that threat assessment is operational, rather than consultative, in nature and is aimed at protecting victims by determining the level of risk that they face at a given moment in time (Meloy and Hoffmann, 2013). Although the emphasis is different, both take into account the likelihood that a given individual will act in a violent fashion. Threat assessment goes beyond the determination of risk of physical violence and extends to insider threats such as sabo-

tage, espionage, hacking, harassment, and attacks on reputation. Language assumes an even greater role in the analysis of threat than it does in violence risk assessment.

The Risk Assessment Guideline Elements for Violence (RAGE-V) produced by the Association of Threat Assessment Professionals lists a wide range of behaviors and risk factors to be considered in assessing the threat of violence. It contains no reference to the analysis of written materials or communications, other than suicide notes. (Available at [www.atapworldwide.org](http://www.atapworldwide.org)).

### 3 The Language of Threat

Analysis of language is an important aspect of threat assessment and has traditionally been utilized in much the same manner as in forensic evaluations. That is, it has largely involved ad hoc, impressionistic assessments of communications. Efforts towards a more methodical approach to linguistic analysis of threatening communications have been made. However, many of these still rely primarily on human judgment of content. Smith and Shuy describe closely examining language as evidence for clues to race, ethnicity, or gender of a perpetrator, for identifying false allegations, and for related law enforcement tasks (Smith and Shuy, 2002). Scalora describes analyzing threatening language towards members of Congress in terms of several thematic areas relating to presence and types of demands (such as policy changes or personal favors) (Scalora et al., 2003), and Calhoun (Calhoun, 1998) examines threatening or inappropriate communications and assaults against federal judicial officials based upon factors such as the directness or immediacy of the threat.

In other related work, efforts to predict case outcomes for a set of 96 FBI cases involving threatening communications have incorporated interviews and automated text processing (Smith, 2008). Computational methods have also been applied to the communications of terrorist or radical religious extremist groups to detect aggressive or violent intent, using function word categories (Pennebaker et al., 2008) or frame analysis (Sanfilippo, 2010).

### 4 Data

Our data consisted of 60 documents that were sent to judges in a major metropolitan area in the United States. These documents were genuine,

natural, purposeful communications from a sender to at least one judge or court official. They were perceived as threatening, and referred to court security officers for risk assessment. These referrals were usually made by judges, though District Attorneys and Clerks of the Court can also report threats to court security. The documents represented all cases that contained written material (not just verbal threats) from the two largest districts within the purview of the office responsible for trial court security for this region. Judges may refer a potentially threatening communication based on a perceived risk of harm to self, or to the security of the courtroom.

All documents were in English. All documents underwent optical character recognition (OCR), and the output of the OCR process was reviewed to correct errors in the text. Handwritten portions of documents were manually transcribed.

Each document was manually annotated for the presence of atypical formatting or text features, (e.g., the inclusion of magazine cut-out words or images, or the use of unusual bolding or italics, centering, or large point size in text), or presence of handwritten comments in addition to the text. These documents include legal documents, letters, faxes, cards, and other printed materials, as well as hard copies of emails.

Documents were also coded for indications of psychotic symptoms, Axis I mental disorders such as mania, depression, anxiety and psychotic disorders, or Axis II disorders such as personality disorders, developmental disabilities or autism spectrum disorders, utilizing the multi-axial diagnostic scheme contained in the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV-TR) (American Psychiatric Association, 2000). Psychotic symptoms are characteristic of a number of Axis I disorders, but were coded separately due to their special significance in the conveyance and determination of violence risk. Where indications of one of these types of disorders were present, the strength of the evidence was rated as significant, or very compelling. Forty-eight of the 60 documents showed significant or very compelling indications of at least one of these disorders.

A high, medium, or low judgment for risk of violence was made in the manner common in threat assessment practice, i.e., an overall impression based upon the intensity of emotion conveyed, the presence of paranoid ideation directed toward the

Indications of Mental Illness	Psychotic	Axis I Disorder	Axis II Disorder
Absent	34	24	29
Present	26(7,19)	36(15,21)	31(3,28)

Table 1: Indications of mental illness appeared in most of the threatening communications. When indications were present, these were shown as counts of total number of document, and further broken down into counts of (very compelling, significant).

recipient, and specificity and nature of any threat. This annotation was performed by one of the authors, who is a board-certified forensic psychiatrist with over 20 years' experience in both violence risk assessment and clinical practice.

The presence of an actual threat in the document, and the nature of that threat, were also recorded. Interestingly, while all documents were referred out of concern for the personal safety of at least one judge or court official, in or outside the courtroom, only a minority of the documents threatened violence. Just three of the 60 documents made clear threats of violence, while another five contained vague or ambiguous threats. Fewer than half (26) contained threats of any kind, and most of these were threats to take legal action. Other documents expressed threats to reputation – they purported to “expose” or embarrass the judge in some way. Some threatened to file an ethics complaint. Other threats were more fanciful and clearly outside the power of the author to effect. For example, they threatened to report the judge to a non-existent “people’s committee,” or threatened punishment from God. Some documents contained more than one threat.

Type of Threat	No. of Documents
None	34
Violence	8 (3 clear, 5 vague)
Legal Action	16
Ethics Complaint	4
Reputation	8
Other	2

Table 2: Actual threats of violence are uncommon. Most communications do not contain a threat.

Based on application of the standard threat assessment methods described above to each document, the perceived risk was rated low for two-thirds of the documents (41), moderate for 18, and high for only one document. These methods consisted of examining each document in isolation. Where two or more communications were avail-

able from a single sender, the documents were examined individually, with an effort to isolate each document from its companions, in order to maintain a focus on language used in the document itself, and enable clearer comparison with the automated methods used later.

In the actual practice of threat assessment, if multiple documents were attributed to a single sender, and the case was not referred for assessment until after multiple documents had been received, the documents would be assessed together as a pattern of communications. Our approach more closely parallels the situation faced in assessing anonymous threatening communications, where knowledge of personal, historical, or clinical factors of the sender is not available. Assessment in these circumstances must rely more heavily on linguistic factors of the communications (Simons and Tunkel, 2013).

The fact that a single assessor reviewed all the documents is a limitation of the current study, which can be addressed in future work.

This research was approved as exempt by the Partners Institutional Review Board, with the provisions that the confidentiality of materials and the privacy of individuals be protected.

## 5 Methods

The potential for computational text analytic methods to contribute to violence risk assessment and threat assessment has been noted (Meloy and Hoffmann, 2013). We apply two such methods, LIWC and topic models, to our sample of threatening communications.

Word count-based methods, such as LIWC (Linguistic Inquiry and Word Count) are widely used. LIWC’s central premise is that words people use reveal their psychological or emotional state, and may provide insight into their perceptions and intentions. LIWC has been applied to assessing text for a range of psychological phenomena (Pennebaker et al., 2001), and recently has been used for detecting indications of decep-

tion, and of aggression and hostility in the communications of terrorist groups (Pennebaker et al., 2008; Chung and Pennebaker, 2011).

LIWC is organized into a set of dozens of categories that contain words and word stems. These may be grammatical categories such as prepositions or pronouns, or they may be more psychologically informed categories such as “anger” (attack, battle, angry, enemy, violent, etc.). LIWC calculates the percentage of words in a document that belong in each of its categories.

We also employ topic models, which are probabilistic models for illuminating an underlying semantic or thematic structure within a set of documents (Blei and Lafferty, 2009). As an unsupervised method, a topic model is not based on some predetermined set of associated words, as is LIWC, with its dozens of categories for function words, emotion words, and so on. Instead the topics emerge based on the statistical properties of the documents themselves. This is a consequence of documents that are about different things typically using different words with different frequencies.

When the most frequent words in a topic cohere, it is relatively simple to infer what the topic is “about.” For example, applying topic modeling to over twenty years of the Yale Law Journal yielded topics appear to relate to various areas of the law, such as labor (labor, workers, employees, union, employer) and contract law (contract, liabilities, parties, contracts, party, creditors) (Blei, 2012).

To help avoid overtraining the model, location names were removed from the documents. Names of individuals were replaced with tokens for last name (LN), male first name (MFN), female first name (FFN), or middle initial (MI). References to famous historical figures (e.g., Abraham Lincoln, Hitler, Winston Churchill) were not altered.

We run a Latent Dirichlet Allocation topic model (Blei, Ng, and Jordan 2003) using MALLET (McCallum, 2002) (McCallum 2002) on the set of threatening communications. In addition to ignoring the standard English stopwords in our documents, we also ignore a small set of extremely common words in the documents (district, court, judge), the “LN” (last name) token, and the months of the year.

Despite the relatively small size of our document corpus, a number of intriguing topics emerge. We observe topics relating to corruption,

misconduct and ethics, conspiracy or other delusional beliefs, and family and community relationships.

## 6 Findings

**Expressions of Anger and Negative Emotion and Violence Risk** Expression of anger and negative emotions has long been considered a factor in violence risk assessment and threat assessment. It has been observed that acts of targeted violence commonly arise from a grievance on the part of the perpetrator, such as a perceived injustice (Calhoun and Weston, 2003). Chung and Pennebaker also find significantly elevated rates of anger words in the language of Al Qaeda leaders compared to controls (Pennebaker et al., 2008). In our threatening communications to judges, however, we do not observe a comparable effect with respect to perceived violence risk. Words reflecting anger, death, or negative emotions are not used more frequently in documents that indicate elevated risk. Nor do they vary significantly across documents reflecting Axis I, Axis II, or psychotic symptoms.

This may reflect a limitation of any tool such as LIWC that uses word lists to capture emotion. The expressive capacity of natural language is much greater. For example, one threatening communication that contained no terms from LIWC’s anger, death, or negative emotion categories, called others “animals” and “CRIMINAL TRASH!”, who would be “held accountable” for their actions.

**Themes Induced through Topic Modeling** Unsurprisingly, given that these threatening communications were sent to judges, often by litigants, terms referencing the judicial system appear prominently in many topics. A closer look reveals themes relating to claims of judicial misconduct or ethical violations, conspiracies and fundamentally sinful or evil acts (“malum in se”). Such topics are suggestive of symptoms such as persecutory beliefs, paranoid ideation, hyperreligiosity, and hypermorality that can be found in both Axis I and Axis II disorders. Tellingly, these themes emerged from the corpus, not from an a-priori categorization of terms.

Not all topics show potential links to detectable psychopathology. Another topic relates to family and emotional attachment, and may be indicative of child custody or child welfare issues. Topics

Risk Level	Number of Documents	Anger	Death	Negative Emotion
Elevated	19	1.22 (1.02)	0.21 (0.40)	2.42 (1.35)
Low	41	1.06 (0.74)	0.20 (0.40)	2.50 (1.45)
All	60	1.11 (0.83)	0.20 (0.40)	2.47 (1.45)

Table 3: Threatening communications judged to show an elevated risk cannot be distinguished from low risk documents, based on LIWC categories of anger, death, or negative emotion. Means and standard deviations based on LIWC scores are reported.

from this 10-topic LDA include

- *Relationships, family, and community*: love children years told thing drug wife family conviction make date person community felony simply letter dss
- *Conspiracy and injustice*: criminal filed order attorney trial conspiracy federal justice conduct made constitutional dr se abuse malum
- *Misconduct, ethics*: judicial complaints appointed justice case attorneys federal commission attorney misconduct ethical conduct complaint respect integrity.

Efforts to build predictive models for identifying documents containing indications of Axis I, Axis II, or psychotic symptoms based solely on topic distributions were not entirely successful. For example, a logistic regression model using features based on a 10-topic LDA outperformed chance on a test set at predicting presence of Axis I symptoms, achieving excellent recall, but low precision. This may have been due to the small size of the document collection. Additionally, the overlap of symptoms between Axis I and Axis II may have lead to topics that do not effectively distinguish between them.

## 7 Discussion

It is not surprising that judges can be the object of considerable ire and attention directed at them by disappointed litigants, family members, or others who have concerns about legal and social issues. They sit at the apex of a system that resolves interpersonal conflicts and administers justice, but with no shortage of disappointed parties.

Because of the important role they play in our society, judges are normally accorded considerable respect and deference. The majority of disappointed litigants use socially acceptable means

of redressing their grievances, e.g. appealing the decision, seeking other legal remedies, or more rarely, filing complaints of judicial misconduct. Others express their disagreement and disappointment in a more direct fashion, either by choice or because they cannot restrain themselves from doing so, in some cases by communicating implied or direct threats to judges. In doing so, they cross the boundary of respect for judges and the legal system that prevents the majority of litigants from personalizing and pursuing their grievances.

Some such communications are referred by their recipients to a protective service responsible for the court in question. The ensuing threat assessment process yields a determination of the level and type of violence risk, and the need for any protective measures. The majority of the communications referred for examination are determined to represent low risk of violence. Others, however, are considered to represent significant risk of harm and to require actions to eliminate or diminish the threat.

Since the office responsible for court security has not yet cataloged its threatening communications, we cannot ensure that this sample is perfectly representative of all threatening communications received by the courts. Plans to implement such a database are under development. In addition, we do not have a sample of communications to judges that the recipients themselves did not find sufficiently threatening to refer for assessment, nor do we know the prevalence of such communications.

This pilot study represents an attempt to use computational linguistic analysis to explore what aspects of written communications to judges result in the perception of threat and the determination of risk level. We analyzed a sample of documents referred by their recipients as potentially threatening. In this sample we found evidence of direct or implied threat of violence in a small minority of examples. An expert rater categorized

only one communication as indicating a high level of threat. Evidence of mental illness on the part of the senders was found in the majority of examples (80 percent).

Possible explanations for the disparity between the universal perceptions of threat by recipients and expert assessment of threat may include a combination of the following:

1. The very act of sending an argumentative or hostile communication to a judge represents a breach of normative behavior, and suggests that the sender may have difficulty controlling hostile impulses and maintaining appropriate boundaries.
2. The popular belief that mental illness is associated with a high risk of violence may increase the likelihood that communications containing evidence of psychotic beliefs and other forms of disordered thinking, but no evidence of threat, get referred by court personnel for further investigation.
3. Over-assessment of mental illness by the expert rater, in spite of efforts to be conservative in those ratings.
4. Under-assessment of violence risk by the expert rater, however it should be noted that documents spanned a period from 1995 to 2013 and there have been no episodes of violence against judges in that jurisdiction to date. Whether that represents the true level of actual risk or the successful efforts of court security personnel in managing the threat cannot be determined.

The purpose of the current pilot study was to explore if language technology could be used to identify those aspects of a communication that render it threatening to its recipients or correlate with expert assessment of the level of violence threat they present. We applied these tools to a relatively small group of 60 written communications sent to judges. A single forensic psychiatrist, experienced in threat and violence risk assessment, rated each document individually for the study factors. The results were promising, yet not dispositive, with regard to the ability of language technology to identify those factors that render a communication “threatening,” are predictive of increased risk, or indicative of mental illness.

The next steps for this work include examination of a larger number of communications referred for assessment of possible increased risk of violence. Communications addressed to other public figures, as well as organizations and their personnel, can be analyzed and compared to those received by judges. Progress on automating the extraction of text features that were manually annotated, including distinctive orthographic features (contextually inappropriate use of capitalization and emphasis), and number and titles of recipients would be valuable. In addition, it will be important to have the presence of indicators of mental illness and level of risk, rated independently by multiple experts in the field of threat assessment in a two part process. First, the documents will be rated in the absence of any contextual information. Second, evaluators will be provided with additional information regarding the individual’s background and asked to rerate the communications.

## 8 Conclusion

Mental health professionals are asked to assess the risk of violence on a regular basis and in a wide variety of settings. The accuracy and reliability of this complex and challenging task increases with the amount of information available to the evaluator. To date, those charged with conducting these assessments have not utilized automated approaches for linguistic analysis to inform their assessments. The results of this pilot study suggest that such analysis may be a useful addition to the traditional tools currently used in violence threat assessment. The availability of such a tool could increase the accuracy and objectivity of currently applied threat assessment methods. However, more data is needed to train and build models, and fully test their utility. Supervised machine learning approaches, or more sophisticated topic models, may be needed to tackle the complexities of supporting violence risk assessment through language technology.

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