Supporting Survivor Families with Data-Driven Insights

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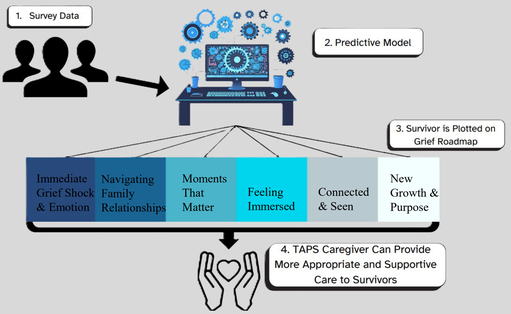
ABSTRACT

TAPS (Tragedy Assistance Program for Survivors) is a military-based program dedicated to supporting those grieving the loss of a family member, friend, or close person in the military. In collaboration with TAPS, we developed a predictive model using a survey of 23 questions to accurately determine the stage of grief a survivor is experiencing. The identified stages of grief include Immediate Grief Shock & Emotion, Navigating Family Relationships, Learning to Process Grief, Moments That Matter, Feeling Immersed, Connected & Seen, and New Growth & Purpose. This model enables TAPS to provide tailored support, helping survivors navigate their unique grief journey with personalized care.

BUSINESS PROBLEM

TAPS aims to enhance its support for families grieving military losses by using data-driven insights to identify and address diverse survivor needs. With survey data combined with survivor demographics, relationships, time since loss, and program engagement, TAPS seeks to segment survivors effectively, allowing for timely, personalized resource delivery and assistance. Predictive models will categorize survivors by stage of grief, and tailor support offerings, improving engagement and support in their journey. Ultimately, this data-driven approach will empower TAPS to prioritize outreach and optimize resources, enhancing the support experience for survivors across their grief journey.



This diagram describes a basic overview of the transformation of data and how it is utilized by TAPS to assist survivors.

ANALYTICS PROBLEM FRAMING

Analytical Context: Correctly identify what stage of grief a survivor is currently in using a predictive model trained on sample survey data. An accuracy score is returned based on how successful we were in matching survivors to their true stage of grief at that time.

Challenges: Grief is a highly personal and complicated process, making progress more of a range rather than set defined stages. The background of survivor data also varies greatly, in age, ethnicity, and relationship to the fallen, making the challenge of classifying survivors more difficult.

Success Metrics: Accurately identify what stage of grief a survivor is in, allowing TAPS caregivers to better support those on their grief journey. The accuracy of our machine learning models was measured by an F-1 score. F-1 score is an overall metric that combines recall and precision. Precision measures the proportion of predicted positive cases where the true label is positive. Recall measures the proportion of positive cases that the model identified correctly.

$$Accuracy = \frac{TP + TN}{TP + TN + FP + FN}$$

$$Precision = \frac{TP}{TP + FP}$$

$$Recall = \frac{TP}{TP + FN}$$

$$F1\text{-}score = \frac{2 \times \text{Precision} \times \text{Recall}}{\text{Precision} + \text{Recall}}$$

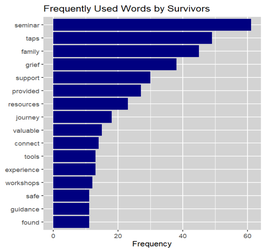
RESEARCH QUESTIONS

1. How accurately can AI-driven machine learning systems classify grief survivors survey responses into the appropriate grief stage of the TAPS survivor journey map?
2. How can utilizing natural language processing help enhance the classification accuracy of machine learning models?

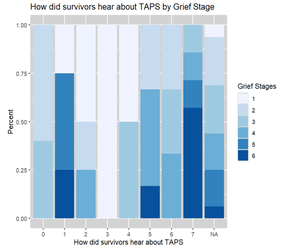
DATA

Key:

0	1	2	3	4	5	6	7
Previous Regional or National Seminar	Connected with other survivors	Learn more about TAPS resources	Learn new tools and information	Learn how to support adult family members	Learn how to support my child(ren)	Child(ren) attend Good Grief Camp	Child(ren) connect with a Military Mentor



This diagram shows frequently used words by grief survivors in their free response survey questions.



This diagram shows the percentage of survivors in different stages of grief, grouped by how they heard about TAPS.

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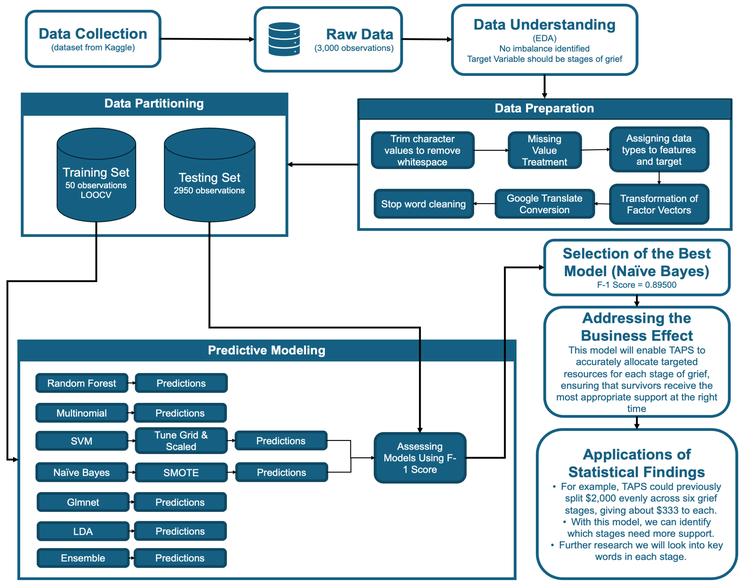
METHODOLOGY



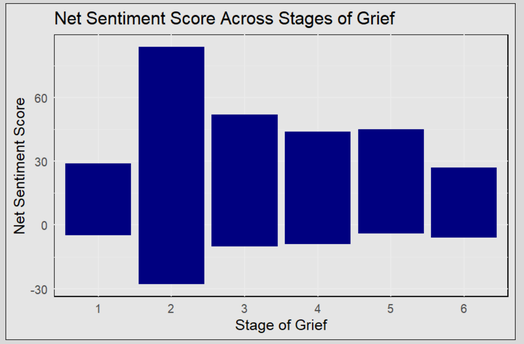
MODEL BUILDING AND EVALUATION – STATISTICAL PERFORMANCE

We evaluated the data set using various models, but ultimately, the Naive Bayes algorithm yielded the best results. We also conducted a sentiment analysis, which gave insight into the structure of the data, but yielded lower accuracy.
We chose this model for its reliability in classifying large data sets like the one we worked with. It was also useful since it incorporates the sentiment analysis we conducted.

When ran on the test set, accuracy was 1.0, and no false positives. When ran on the testing set, the accuracy was 0.89.

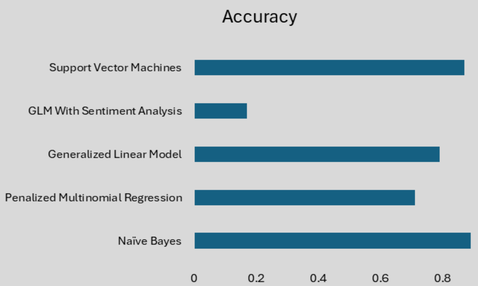
Here is the fundamental equation the Naïve Bayes algorithm uses and also our findings from the sentiment analysis.

$$P(A|B) = \frac{P(B|A)\,P(A)}{P(B)}$$



MODEL EVALUATION – BUSINESS IMPLICATIONS

With these findings, we will be able to help these grief survivors get the help they need at 89% accuracy. Looking forward, we would like to delve into the survivors' passages. We feel that if we could find key words for each stage, we could better classify each survivor.



CONCLUSIONS

Grief is a complex issue, and by creating a model to better understand an individual's struggle we can help a survivor along their grief journey in a more supportive and efficient way.

- Our machine learning models classified survey responses into the appropriate TAPS grief stages with an average accuracy improvement of 89%.
- Using natural language processing improved classification accuracy by 8%, capturing nuances in responses more effectively.

One area that could be further developed to improve the accuracy of our results include breaking down the survey data demographically, and to see if there are trends among how children, young adults, etc. navigate their grief journeys.