

Emergency Department Records Data Mining and Machine Learning from the Rapid Health Information Network (RHINO)

Report Prepared by:

Cody Carmichael Lareina La Flair Amanda Morse Tom Hulse

Washington State Department of Health

WTSC Grant Number 2021-TR-4098

REPORT DOCUMENTATION PAGE

Form Approved OMB No. 0704-0188

souces, gatering and maining the data needed, and completing and revewing the collector of information. Service, Directionate for provide a transmittory in the collector of information in the standard and superindour information. Service, Directionate for information in the standard and superindour information in the standard and superindour information. Service, Directionate for information in the standard and superindour information in the standard and standard in the standard and standard in the standard information infor									
09/29/2021 Grant Deliverable - Report Oct 1, 2020 - Sep 30, 2021 4. TTLE AND SUBTITLE Emergency Department Records Data Mining and Machine Learning from the Rapid Health Information Network (RHINO) 5a. CONTRACT NUMBER 2021-TR-4098 5b. GRANT NUMBER 2021-TR-4098 6. AUTHOR(S) Cody Carmichael 2021-TR-4098 Lareina La Flair Amanda Morse n/a 7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) RAMANG MORSE 7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) REPORT NUMBER Rapid Health Information Network (RHINO) Program n/a 9. SPONSORING/MONTORIS AGENCY NAME(S) AND ADDRESS(ES) N/A 9. SPONSORING/MONTORIS AGENCY NAME(S) AND ADDRESS(ES) n/a 9. SPONSORING/MONTORIS AGENCY NAME(S) AND ADDRESS(ES) N/A 9. SPONSOR/MONTOR'S ACENCY NAME(S) AND ADDRESS(ES) N/A 9. SPONSOR/MONTOR'S ACENCY NAME(S) AND ADDRESS(ES) N/A 9. SPONSOR/MONTOR'S ACENCY NAME(S) AND ADDRESS(ES) N/A 11. SUPPLEMENTARY MOTES 10. SPONSOR/MONTOR'S ACENCY NAME(S) AND ADDRESS(ES) 12. DISTRIBUTIOM/AVAILABILITY STATEMENT Approved for public relates. 13. SUPPLEMENTARY MOTES 11. SUPPLEMENTARY MOTES The Washington State Department of Health Rapid Health I	The public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing the burden, to Department of Defense, Washington Headquarters Services, Directorate for Information Operations and Reports (0704-0188), 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to any penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number. PLEASE DO NOT RETURN YOUR FORM TO THE ABOVE ADDRESS.								
4. TITLE AND SUBTITLE Emergency Department Records Data Mining and Machine Learning from the Rapid Health Information Network (RHINO) 5a. CONTRACT NUMBER 2021-TR-4098 5b. CARNT NUMBER 2021-TR-4098 5c. AUTHOR(S) 5d. PROGRAM ELEMENT NUMBER n/a Cody Carmichael n/a Lareina La Flair 5d. PROJECT NUMBER n/a Amanda Morse n/a Tom Hulse 5d. PROGRAM ELEMENT NUMBER n/a 7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) n/a Rapid Health Information Network (RHINO) Program n/a Office of Public Health Outpreak Coordination, Informatics, and Surveillance n/a 9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) 10. SPONSOR/MONITOR'S ACRONY Washington Traffic Safety Commission PO Dox 40944 Olympia, Washington 98504-0944 11. SPONSOR/MONITOR'S REPORT NUMBER 12. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release. 13. SUPPLEMENTARY ONTES The contents of the manuscript are solely the responsibility of the authors and do not necessarily reflect the official vite funding agency. 14. ABSTRACT In SPONSOR/MONITOR'S generated from January 2021 - August 31, 2021. 15. SUBJECT TERMS In SUPLEMENTARY NOTES 16. SECURITY CLASSIFICATION OF: In THIN PAGE </td <td colspan="6"></td> <td></td> <td></td>									
Emergency Department Records Data Mining and Machine Learning from the Rapid Health Information Network (RHINO) 2021-TR-4098 56. GRANT NUMBER 2021-TR-4098 56. GRANT NUMBER 2021-TR-4098 6. AUTHOR(S) 56. PROJECT NUMBER n/a Cody Carnichael Lareina La Flair Amanda Morse Tom Hulse 56. TASK NUMBER n/a 7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Rapid Health Information Network (RHINO) Program Office of Public Health Outbreak Coordination, Informatics, and Surveillance Washington Traffic Safety Commission PO Box 40944 8. PERFORMING ORGANIZATION REPORT NUMBER n/a 9. SPONSORINGMONITORING AGENCY NAME(S) AND ADDRESS(ES) Washington Traffic Safety Commission PO Box 40944 10. SPONSORIMONITOR'S ACRONY WTSC 10. Sponsorimonitor's action provide in light PO Box 40944 11. Sponsorimonitor's ACRONY WTSC 12. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release. 10. SPONSORIMONITOR'S ACRONY WTSC 13. SUPPLEMENTARY NOTES The contents of the manuscript are solely the responsibility of the authors and do not necessarily reflect the official vid the funding agency. 14. ABSTRACT 17. LIMITATION OF ABSTRACT 18. NUMBER ABSTRACT 15. SUPPLEMENTARY CLASSIFICATION OF: a. REPORT 17. LIMITATION OF ABSTRACT 18. NUMBER Pages 16. SECURITY CLASSIFICATION OF: a. REPORT 17. LIMITATION OF ABSTRACT 18. NUMBER Pages	09/29/2021	09/29/2021 Grant Deliverable - Report						Oct 1, 2020 - Sep 30, 2021	
the Rapid Health Information Network (RHINO)	4. TITLE AND SUBTITLE						5a. CC	5a. CONTRACT NUMBER	
AUTHOR(S) Control Author Control Contect Control Control Control Control Control Control Control Cont							י 2021-	2021-TR-4098	
Sc. PROGRAM ELEMENT NUMBER n/a Sc. PROGRAM ELEMENT NUMBER n/a Sc. AUTHOR(S) Cody Carmichael Lareina La Flair Amanda Morse Tom Hulse Sd. PROJECT NUMBER n/a To ERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Tom Hulse Se. TASK NUMBER n/a 7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Rapid Health Information Network (RHINO) Program Office of Public Health Outbreak Coordination, Informatics, and Surveillance Washington State Department of Health 8. PERFORMING ORGANIZATION REPORT NUMBER n/a 8. SPONSORING/MONTORING AGENCY NAME(S) AND ADDRESS(ES) Washington Traffic Safety Commission PO Box 40944 Olympia, Washington 98504-0944 10. SPONSOR/MONITOR'S ACRONY WTSC 9. DESTRIBUTION/AVAILABILITY STATEMENT Approved for public release. Nonsor/MONITOR'S REPORT NUMBER(S) 2021-TR-4098 12. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release. ASTRACT 14. ASTRACT The Washington Traffic Records Governance Council, conducted a pilot evaluation of big data text mining, machine learning, and spatiotemporal cluster detection methods for analysis of traffic injury. This report provides insig into the application of machine learning algorithms applied to emergency department records, traffic records, motor vehicle of ABSTRACT 16. SECURITY CLASSIFICATION OF: a. REPORT 17. LIMITATION OF ABSTRACT 18. NUMBER 19a. NAME OF RESPONSIBLE PERSON Peder Corier, Traffic Records Program Mar 19b. TELEPHONE NUMBER (Include area accel)	the Rapid Health Information Network (RHINO)						5b. GF	5b. GRANT NUMBER	
6. AUTHOR(S) n/a 6. AUTHOR(S) 5d. PROJECT NUMBER Cody Carmichael n/a Lareina La Flair n/a Amanda Morse n/a Tom Hulse 5f. WORK UNIT NUMBER N/a 7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Rapid Health Information Network (RHINO) Program n/a Office of Public Health Outbreak Coordination, Informatics, and Surveillance n/a 9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) 10. SPONSOR/MONITOR'S ACRONY Washington Traffic Safety Commission PO Box 40944 Olympia, Washington 98504-0944 11. SPONSOR/MONITOR'S REPORT NUMBER(S) 2021-TR-4098 12. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release. 13. SUPPLEMENTARY NOTES The contents of the manuscript are solely the responsibility of the authors and do not necessarily reflect the official via the funding agency. 14. ABSTRACT The Washington State Department of Health Rapid Health Information Network (RHINO) program staff, with support i grant from the Washington Traffic Records Governance Council, conducted a pilot evaluation of big data text mining, machine learning, and spatiotemporal cluster detection methods for analysis of traffic injury. This report provides insig into the application of machine learning algorithms applied to emergency department records, motor vehicle of ABSTR							2021-	2021-TR-4098	
6. AUTHOR(S) Sd. PROJECT NUMBER Cody Carmichael n/a Lareina La Flair	5						5c. PR	5c. PROGRAM ELEMENT NUMBER	
Cody Carmichael Lareina La Flair Amanda Morse Tom Hulse n/a 7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Tom Hulse n/a 7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Tom Hulse n/a 7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Tom Hulse 8. PERFORMING ORGANIZATION Report NUMBER n/a 9. SPONSORING-MONITORING AGENCY NAME(S) AND ADDRESS(ES) Washington State Department of Health 10. SPONSOR/MONITOR'S ACRONY Washington Traffic Safety Commission PO Box 40944 Olympia, Washington 98504-0944 11. SPONSOR/MONITOR'S ACRONY WTSC 7. De contents of the manuscript are solely the responsibility of the authors and do not necessarily reflect the official via the funding agency. 14. ABSTRACT The Washington Traffic Records Governance Council, conducted a pilot evaluation of big data text mining, machine learning, and spatiotemporal cluster detection methods for analysis of traffic injury. This report provides insig into the application of machine learning algorithms applied to emergency department records generated from January 2021 - August 31, 2021. 15. SUBJECT TERMS text mining, machine learning, syndromic surveillance, emergency department records, traffic records program Mar ABSTRACT 14. NUMBER Pages 14. NUMBER 19. NAME OF RESPONSIBLE PERSON Peter Corier, Traffic Records Program Mar 19. TELEPHONE NUMBER							n/a	n/a	
Lareina La Flair Amanda Morse Tore Amanda Morse Tore E. TASK NUMBER n/a Tore Hulse 5. WORK NUT NUMBER n/a 7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Rapid Health Information Network (RHINO) Program Office of Public Health Outbreak Coordination, Informatics, and Surveillance 8. PERFORMING ORGANIZATION REPORT NUMBER n/a 9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) Washington Traffic Safety Commission PO Box 40944 10. SPONSOR/MONITOR'S ACRONY WTSC 9. Box 40944 11. SPONSOR/MONITOR'S REPORT NUMBER(S) 2021-TR-4098 12. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release. 11. SPONSOR/MONITOR'S REPORT NUMBER(S) 2021-TR-4098 13. SUPPLEMENTARY NOTES The contents of the manuscript are solely the responsibility of the authors and do not necessarily reflect the official via the funding agency. 14. ABSTRACT The Washington Traffic Records Governance Council, conducted a pilot evaluation of big data text mining, machine learning, and spatiotemporal cluster detection methods for analysis of traffic injury. This report provides insig into the application of machine learning algorithms applied to emergency department records generated from January 2021 - August 31, 2021. 15. SUBJECT TERMS 17. LIMITATION OF ABSTRACT 18. NUMBER Pages 19. NAME OF RESPONSIBLE PERSON Peter Corier, Traffic Records Program Mar 19b. TELEPHONE NUMBER (Include area code)	6. AUTHOR(S)						5d. PF	5d. PROJECT NUMBER	
Amanda Morse Tom Hulse 10. BK NUMBER n/a 7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Rapid Health Information Network (RHINQ) Program Office of Public Health Outbreak Coordination, Informatics, and Surveillance 8. PERFORMING ORGANIZATION NAME OF NUMBER n/a 9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) Washington State Department of Health 10. SPONSOR/MONITOR'S ACRONY Wishington Traffic Safety Commission PO Box 40944 Olympia, Washington 98504-0944 11. SPONSOR/MONITOR'S ACRONY WTSC 12. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release. 11. SPONSOR/MONITOR'S REPORT NUMBER(S) 2021-TR-4098 13. SUPPLEMENTARY NOTES The contents of the manuscript are solely the responsibility of the authors and do not necessarily reflect the official via the funding agency. 14. ABSTRACT The Washington Traffic Records Governance Council, conducted a pilot evaluation of big data text mining, machine learning, and spatiotemporal cluster detection methods for analysis of traffic injury. This report provides insig into the application of machine learning algorithms applied to emergency department records generated from January 2021 - August 31, 2021. 16. SECURITY CLASSIFICATION OF: a. REPORT 17. LIMITATION OF ABSTRACT 18. NUMBER OF PAGES 19a. NAME OF RESPONSIBLE PERSON Peter Corier, Traffic Records Program Mar 19b. TELEPHONE NUMBER (include area code)							n/a	n/a	
Amanda Morse n/a Tom Hulse n/a 7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Rapid Health Information Network (RHINO) Program Amanda Morse n/a 7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Report Number Mashington State Department of Health 9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) 10. SPONSOR/MONITOR'S ACRONY Washington Traffic Safety Commission PO Box 40944 11. SPONSOR/MONITOR'S ACRONY Olympia, Washington 98504-0944 11. SPONSOR/MONITOR'S REPORT Number(s) 2021-TR-4098 12. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release. 13. SUPPLEMENTARY NOTES The contents of the manuscript are solely the responsibility of the authors and do not necessarily reflect the official via the funding agency. 14. ABSTRACT 16. SECURITY CLASSIFICATION OF: 16. SECURITY CLASSIFICATION OF: 17. LIMITATION OF 18. NUMBER 19. ABSTRACT 16. SECURITY CLASSIFICATION OF: 17. LIMITATION OF 18. NUMBER 19. ABSTRACT									
5f. WORK UNIT NUMBER n/a 7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Rapid Health Information Network (RHINO) Program Office of Public Health Outbreak Coordination, Informatics, and Surveillance Washington State Department of Health 9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) Washington Traffic Safety Commission PO Box 40944 Olympia, Washington 98504-0944 11. SPONSOR/MONITOR'S REPORT Approved for public release. 13. SUPPLEMENTARY NOTES The contents of the manuscript are solely the responsibility of the authors and do not necessarily reflect the official via the funding agency. 14. ABSTRACT The Washington Traffic Records Governance Council, conducted a pilot evaluation of big data text mining, machine learning, and spatiotemporal cluster detection methods for analysis of traffic injury. This report provides insig into the application of machine learning algorithms applied to emergency department records, traffic records, motor vehicle of a number of the structure structure structure structure structure insign machine learning, syndromic surveillance, emergency department records, traffic Records Program Mar 2021 - August 31, 2021. 16. SECURITY CLASSIFICATION OF: 17. LIMITATION OF ABSTRACT 18. NUMBER (PAGES) 16. SECURITY CLASSIFICATION OF: 17. LIMITATION OF ABSTRACT 18. NUMBER PAGES 16. SECURITY CLASSIFIC									
n/a 7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Rapid Health Information Network (RHINO) Program Office of Public Health Outbreak Coordination, Informatics, and Surveillance Washington State Department of Health 8. PERFORMING ORGANIZATION REPORT NUMBER n/a 9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) Washington Traffic Safety Commission PO Box 40944 Olympia, Washington 98504-0944 10. SPONSOR/MONITOR'S ACRONY WTSC 12. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release. 11. SPONSOR/MONITOR'S REPORT NUMBER(S) 2021-TR-4098 13. SUPPLEMENTARY NOTES The contents of the manuscript are solely the responsibility of the authors and do not necessarily reflect the official vid the funding agency. 14. ABSTRACT The Washington State Department of Health Rapid Health Information Network (RHINO) program staff, with support of grant from the Washington Traffic Records Governance Council, conducted a pilot evaluation of big data text mining, machine learning, and spatiotemporal cluster detection methods for analysis of traffic injury. This report provides insig into the application of machine learning algorithms applied to emergency department records generated from January 2021 - August 31, 2021. 15. SUBJECT TERMS text mining, machine learning, syndromic surveillance, emergency department records, traffic records, motor vehicle of ABSTRACT 16. SECURITY CLASSIFICATION OF: a. REPORT 17. LIMITATION OF ABSTRACT 18. NUMBER PAGES Page PAGES	Tom Hulse								
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Rapid Health Information Network (RHINO) Program Office of Public Health Unbreak Coordination, Informatics, and Surveillance Washington State Department of Health 8. PERFORMING ORGANIZATION REPORT NUMBER n/a 9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) Washington Traffic Safety Commission PO Box 40944 Olympia, Washington 98504-0944 10. SPONSOR/MONITOR'S ACRONYI WTSC 12. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release. 11. SPONSOR/MONITOR'S REPORT NUMBER(S) 2021-TR-4098 13. SUPPLEMENTARY NOTES The contents of the manuscript are solely the responsibility of the authors and do not necessarily reflect the official via the funding agency. 14. ABSTRACT The Washington Traffic Records Governance Council, conducted a pilot evaluation of big data text mining, machine learning, and spatiotemporal cluster detection methods for analysis of traffic injury. This report provides insig into the application of machine learning algorithms applied to emergency department records generated from January 2021 - August 31, 2021. 15. SUBJECT TERMS text mining, machine learning, syndromic surveillance, emergency department records, traffic records, motor vehicle of PAGES 16. SECURITY CLASSIFICATION OF: a. REPORT 17. LIMITATION OF ABSTRACT 17. LIMITATION OF A REPORT 18. NUMBER PAGES									
Rapid Health Information Network (RHINO) Program Office of Public Health Outbreak Coordination, Informatics, and Surveillance Washington State Department of Health n/a 9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) Washington Traffic Safety Commission PO Box 40944 10. SPONSOR/MONITOR'S ACRONY WTSC 9. DPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) Washington 17affic Safety Commission PO Box 40944 11. SPONSOR/MONITOR'S ACRONY WTSC 12. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release. 11. SPONSOR/MONITOR'S REPORT NUMBER(S) 2021-TR-4098 13. SUPPLEMENTARY NOTES The contents of the manuscript are solely the responsibility of the authors and do not necessarily reflect the official via the funding agency. 14. ABSTRACT The Washington Traffic Records Governance Council, conducted a pilot evaluation of big data text mining, machine learning, and spatiotemporal cluster detection methods for analysis of traffic injury. This report provides insig into the application of machine learning algorithms applied to emergency department records generated from January 2021 - August 31, 2021. 15. SUBJECT TERMS text mining, machine learning, syndromic surveillance, emergency department records, traffic records, motor vehicle of ABSTRACT 18. NUMBER OF PAGES 19a. NAME OF RESPONSIBLE PERSON Peter Corier, Traffic Records Program Mar 19b. TELEPHONE NUMBER (include area code)							n/a		
Industriation function (In Information, Informatics, and Surveillance Washington State Department of Health n/a 9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) I0. SPONSOR/MONITOR'S ACRONY WTSC Washington Traffic Safety Commission VTSC PO Box 40944 I1. SPONSOR/MONITOR'S REPORT NUMBER(S) 2021-TR-4098 I1. SPONSOR/MONITOR'S REPORT NUMBER(S) 2021-TR-4098 2021-TR-4098 12. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release. 13. SUPPLEMENTARY NOTES The contents of the manuscript are solely the responsibility of the authors and do not necessarily reflect the official vid the funding agency. 14. ABSTRACT The Washington Traffic Records Governance Council, conducted a pilot evaluation of big data text mining, machine learning algorithms applied to emergency department records generated from January 2021 - August 31, 2021. 15. SUBJECT TERMS text mining, machine learning, syndromic surveillance, emergency department records, traffic records, motor vehicle of ABSTRACT 16. SECURITY CLASSIFICATION OF: 17. LIMITATION OF ABSTRACT 17. LIMITATION OF ABSTRACT 18. NUMBER 19. ABSTRACT 0. ABSTRACT			• •	. ,					
Washington State Department of Health 9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) 10. SPONSOR/MONITOR'S ACRONYT Washington Traffic Safety Commission PO Box 40944 11. SPONSOR/MONITOR'S ACRONYT Olympia, Washington 98504-0944 11. SPONSOR/MONITOR'S REPORT NUMBER(s) 2021-TR-4098 12. DISTRIBUTION/AVAILABILITY STATEMENT 2021-TR-4098 Approved for public release. 11. SPONSOR/MONITOR'S REPORT 14. ABSTRACT The contents of the manuscript are solely the responsibility of the authors and do not necessarily reflect the official vide the funding agency. 14. ABSTRACT The Washington State Department of Health Rapid Health Information Network (RHINO) program staff, with support of grant from the Washington Traffic Records Governance Council, conducted a pilot evaluation of big data text mining, machine learning algorithms applied to emergency department records generated from January 2021 - August 31, 2021. 15. SUBJECT TERMS 17. LIMITATION OF ABSTRACT 16. SECURITY CLASSIFICATION OF: 17. LIMITATION OF ABSTRACT 17. LIMITATION OF ABSTRACT 19a. NAME OF RESPONSIBLE PERSON Peter Corier, Traffic Records Program Mar 19b. TELEPHONE NUMBER (Include area code)									
9. SPONSORING/MONTORING AGENCY NAME(S) AND ADDRESS(ES) 10. SPONSOR/MONTOR'S ACRONYL Washington Traffic Safety Commission VTSC PO Box 40944 11. SPONSOR/MONTOR'S REPORT Olympia, Washington 98504-0944 11. SPONSOR/MONTOR'S REPORT NUMBER(S) 2021-TR-4098 12. DISTRIBUTION/AVAILABILITY STATEMENT 2021-TR-4098 Approved for public release. 11. SPONSOR/MONTOR'S REPORT 14. ABSTRACT The contents of the manuscript are solely the responsibility of the authors and do not necessarily reflect the official vide the funding agency. 14. ABSTRACT The Washington Traffic Records Governance Council, conducted a pilot evaluation of big data text mining, machine learning, and spatiotemporal cluster detection methods for analysis of traffic injury. This report provides insig into the application of machine learning algorithms applied to emergency department records generated from January 2021 - August 31, 2021. 15. SUBJECT TERMS 17. LIMITATION OF ABSTRACT 16. SECURITY CLASSIFICATION OF: 17. LIMITATION OF ABSTRACT a. REPORT b. ABSTRACT c. THIS PAGE 18. NUMBER OF RESPONSIBLE PERSON Peter Corier, Traffic Records Program Mar 19b. TELEPHONE NUMBER (Include area code)									
Washington Traffic Safety Commission PO Box 40944 WTSC Olympia, Washington 98504-0944 11. SPONSOR/MONITOR'S REPORT NUMBER(S) 2021-TR-4098 12. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release. 2021-TR-4098 13. SUPPLEMENTARY NOTES The contents of the manuscript are solely the responsibility of the authors and do not necessarily reflect the official via the funding agency. Image: Contents of the manuscript are solely the responsibility of the authors and do not necessarily reflect the official via the funding agency. 14. ABSTRACT The Washington State Department of Health Rapid Health Information Network (RHINO) program staff, with support of grant from the Washington Traffic Records Governance Council, conducted a pilot evaluation of big data text mining, machine learning, and spatiotemporal cluster detection methods for analysis of traffic injury. This report provides insig into the application of machine learning algorithms applied to emergency department records generated from January 2021 - August 31, 2021. 15. SUBJECT TERMS text mining, machine learning, syndromic surveillance, emergency department records, traffic records, motor vehicle of ABSTRACT 18. NUMBER OF PAGES 16. SECURITY CLASSIFICATION OF: a. REPORT c. THIS PAGE 17. LIMITATION OF ABSTRACT 18. NUMBER OF PAGES	washington c		ni or riealtri						
Washington Traffic Safety Commission PO Box 40944 WTSC Olympia, Washington 98504-0944 11. SPONSOR/MONITOR'S REPORT NUMBER(S) 2021-TR-4098 12. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release. 2021-TR-4098 13. SUPPLEMENTARY NOTES The contents of the manuscript are solely the responsibility of the authors and do not necessarily reflect the official via the funding agency. Image: Contents of the manuscript are solely the responsibility of the authors and do not necessarily reflect the official via the funding agency. 14. ABSTRACT The Washington State Department of Health Rapid Health Information Network (RHINO) program staff, with support of grant from the Washington Traffic Records Governance Council, conducted a pilot evaluation of big data text mining, machine learning, and spatiotemporal cluster detection methods for analysis of traffic injury. This report provides insig into the application of machine learning algorithms applied to emergency department records generated from January 2021 - August 31, 2021. 15. SUBJECT TERMS text mining, machine learning, syndromic surveillance, emergency department records, traffic records, motor vehicle of ABSTRACT 18. NUMBER OF PAGES 16. SECURITY CLASSIFICATION OF: a. REPORT c. THIS PAGE 17. LIMITATION OF ABSTRACT 18. NUMBER OF PAGES	9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)							10. SPONSOR/MONITOR'S ACRONYM(S)	
Olympia, Washington 98504-0944 11. SPONSOR/MONITOR'S REPORT NUMBER(S) 2021-TR-4098 12. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release. 13. SUPPLEMENTARY NOTES The contents of the manuscript are solely the responsibility of the authors and do not necessarily reflect the official view the funding agency. 14. ABSTRACT The Washington State Department of Health Rapid Health Information Network (RHINO) program staff, with support of grant from the Washington Traffic Records Governance Council, conducted a pilot evaluation of big data text mining, machine learning algorithms applied to emergency department records generated from January 2021 - August 31, 2021. 15. SUBJECT TERMS text mining, machine learning, syndromic surveillance, emergency department records, traffic records, motor vehicle of ABSTRACT 16. SECURITY CLASSIFICATION OF: a. REPORT b. ABSTRACT c. THIS PAGE								WTSC	
NUMBER(S) 2021-TR-4098 12. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release. 2021-TR-4098 13. SUPPLEMENTARY NOTES The contents of the manuscript are solely the responsibility of the authors and do not necessarily reflect the official vio the funding agency. 14. ABSTRACT 14. ABSTRACT The Washington State Department of Health Rapid Health Information Network (RHINO) program staff, with support of grant from the Washington Traffic Records Governance Council, conducted a pilot evaluation of big data text mining, machine learning, and spatiotemporal cluster detection methods for analysis of traffic injury. This report provides insig into the application of machine learning algorithms applied to emergency department records generated from January 2021 - August 31, 2021. 15. SUBJECT TERMS text mining, machine learning, syndromic surveillance, emergency department records, traffic records, motor vehicle of ABSTRACT 16. SECURITY CLASSIFICATION OF: a. REPORT 17. LIMITATION OF ABSTRACT 18. NUMBER OF PAGES 19a. NAME OF RESPONSIBLE PERSON Peter Corier, Traffic Records Program Mar 19b. TELEPHONE NUMBER (Include area code)									
2021-TR-4098 12. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release. 13. SUPPLEMENTARY NOTES The contents of the manuscript are solely the responsibility of the authors and do not necessarily reflect the official via the funding agency. 14. ABSTRACT The Washington State Department of Health Rapid Health Information Network (RHINO) program staff, with support of grant from the Washington Traffic Records Governance Council, conducted a pilot evaluation of big data text mining, machine learning, and spatiotemporal cluster detection methods for analysis of traffic injury. This report provides insign into the application of machine learning algorithms applied to emergency department records generated from January 2021 - August 31, 2021. 15. SUBJECT TERMS text mining, machine learning, syndromic surveillance, emergency department records, traffic records, motor vehicle of ABSTRACT 18. NUMBER 16. SECURITY CLASSIFICATION OF: a. REPORT b. ABSTRACT C THIS PAGE 17. LIMITATION OF ABSTRACT a. NAME OF RESPONSIBLE PERSON Pages Place NAME OF RESPONSIBLE PERSON Pages	Olympia, Washington 98504-0944								
12. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release. 13. SUPPLEMENTARY NOTES The contents of the manuscript are solely the responsibility of the authors and do not necessarily reflect the official view the funding agency. 14. ABSTRACT The Washington State Department of Health Rapid Health Information Network (RHINO) program staff, with support of grant from the Washington Traffic Records Governance Council, conducted a pilot evaluation of big data text mining, machine learning, and spatiotemporal cluster detection methods for analysis of traffic injury. This report provides insig into the application of machine learning algorithms applied to emergency department records generated from January 2021 - August 31, 2021. 15. SUBJECT TERMS text mining, machine learning, syndromic surveillance, emergency department records, traffic records, motor vehicle of ABSTRACT 16. SECURITY CLASSIFICATION OF: a. REPORT b. ABSTRACT c. THIS PAGE 17. LIMITATION OF ABSTRACT c. THIS PAGE 18. NUMBER OF RESPONSIBLE PERSON Peter Corier, Traffic Records Program Mar 19b. TELEPHONE NUMBER (Include area code)									
Approved for public release. 13. SUPPLEMENTARY NOTES The contents of the manuscript are solely the responsibility of the authors and do not necessarily reflect the official view the funding agency. 14. ABSTRACT The Washington State Department of Health Rapid Health Information Network (RHINO) program staff, with support of grant from the Washington Traffic Records Governance Council, conducted a pilot evaluation of big data text mining, machine learning, and spatiotemporal cluster detection methods for analysis of traffic injury. This report provides insig into the application of machine learning algorithms applied to emergency department records generated from January 2021 - August 31, 2021. 15. SUBJECT TERMS text mining, machine learning, syndromic surveillance, emergency department records, traffic records, motor vehicle of ABSTRACT 16. SECURITY CLASSIFICATION OF: a. REPORT b. ABSTRACT c. THIS PAGE 17. LIMITATION OF ABSTRACT 18. NUMBER OF RESPONSIBLE PERSON Pages 19a. NAME OF RESPONSIBLE PERSON Peter Corier, Traffic Records Program Mar 19b. TELEPHONE NUMBER (Include area code)	12. DISTRIBUTION/AVAILABILITY STATEMENT							2021 111 4000	
13. SUPPLEMENTARY NOTES The contents of the manuscript are solely the responsibility of the authors and do not necessarily reflect the official view the funding agency. 14. ABSTRACT The Washington State Department of Health Rapid Health Information Network (RHINO) program staff, with support of grant from the Washington Traffic Records Governance Council, conducted a pilot evaluation of big data text mining, machine learning, and spatiotemporal cluster detection methods for analysis of traffic injury. This report provides insig into the application of machine learning algorithms applied to emergency department records generated from January 2021 - August 31, 2021. 15. SUBJECT TERMS text mining, machine learning, syndromic surveillance, emergency department records, traffic records, motor vehicle of ABSTRACT 16. SECURITY CLASSIFICATION OF: 17. LIMITATION OF ABSTRACT a. REPORT b. ABSTRACT c. THIS PAGE 17. LIMITATION OF ABSTRACT 18. NUMBER 19a. NAME OF RESPONSIBLE PERSON Peter Corier, Traffic Records Program Mar 19b. TELEPHONE NUMBER (Include area code)									
The contents of the manuscript are solely the responsibility of the authors and do not necessarily reflect the official via the funding agency. 14. ABSTRACT The Washington State Department of Health Rapid Health Information Network (RHINO) program staff, with support of grant from the Washington Traffic Records Governance Council, conducted a pilot evaluation of big data text mining, machine learning algorithms applied to emergency department records generated from January 2021 - August 31, 2021. 15. SUBJECT TERMS text mining, machine learning, syndromic surveillance, emergency department records, traffic records, motor vehicle of ABSTRACT 18. NUMBER 16. SECURITY CLASSIFICATION OF: a. REPORT b. ABSTRACT C. THIS PAGE 17. LIMITATION OF ABSTRACT 19a. NAME OF RESPONSIBLE PERSON Peter Corier, Traffic Records Program Mar 19b. TELEPHONE NUMBER (Include area code)									
The contents of the manuscript are solely the responsibility of the authors and do not necessarily reflect the official via the funding agency. 14. ABSTRACT The Washington State Department of Health Rapid Health Information Network (RHINO) program staff, with support of grant from the Washington Traffic Records Governance Council, conducted a pilot evaluation of big data text mining, machine learning algorithms applied to emergency department records generated from January 2021 - August 31, 2021. 15. SUBJECT TERMS text mining, machine learning, syndromic surveillance, emergency department records, traffic records, motor vehicle of ABSTRACT 18. NUMBER 16. SECURITY CLASSIFICATION OF: a. REPORT b. ABSTRACT C. THIS PAGE 17. LIMITATION OF ABSTRACT 19a. NAME OF RESPONSIBLE PERSON Peter Corier, Traffic Records Program Mar 19b. TELEPHONE NUMBER (Include area code)									
14. ABSTRACT The Washington State Department of Health Rapid Health Information Network (RHINO) program staff, with support of grant from the Washington Traffic Records Governance Council, conducted a pilot evaluation of big data text mining, machine learning, and spatiotemporal cluster detection methods for analysis of traffic injury. This report provides insign the application of machine learning algorithms applied to emergency department records generated from January 2021 - August 31, 2021. 15. SUBJECT TERMS text mining, machine learning, syndromic surveillance, emergency department records, traffic records, motor vehicle of ABSTRACT 16. SECURITY CLASSIFICATION OF: a. REPORT b. ABSTRACT c. THIS PAGE 17. LIMITATION OF ABSTRACT a. REPORT b. ABSTRACT c. THIS PAGE 18. NUMBER 19a. NAME OF RESPONSIBLE PERSON Peter Corier, Traffic Records Program Mar	13. SUPPLEMENTARY NOTES								
14. ABSTRACT The Washington State Department of Health Rapid Health Information Network (RHINO) program staff, with support of grant from the Washington Traffic Records Governance Council, conducted a pilot evaluation of big data text mining, machine learning, and spatiotemporal cluster detection methods for analysis of traffic injury. This report provides insign into the application of machine learning algorithms applied to emergency department records generated from January 2021 - August 31, 2021. 15. SUBJECT TERMS text mining, machine learning, syndromic surveillance, emergency department records, traffic records, motor vehicle of ABSTRACT 16. SECURITY CLASSIFICATION OF: a. REPORT b. ABSTRACT c. THIS PAGE 17. LIMITATION OF ABSTRACT 0F PAGES 18. NUMBER (Include area code)	The contents of the manuscript are solely the responsibility of the authors and do not necessarily reflect the official views of								
The Washington State Department of Health Rapid Health Information Network (RHINO) program staff, with support of grant from the Washington Traffic Records Governance Council, conducted a pilot evaluation of big data text mining, machine learning, and spatiotemporal cluster detection methods for analysis of traffic injury. This report provides insign into the application of machine learning algorithms applied to emergency department records generated from January 2021 - August 31, 2021. 15. SUBJECT TERMS text mining, machine learning, syndromic surveillance, emergency department records, traffic records, motor vehicle of a REPORT b. ABSTRACT C. THIS PAGE 17. LIMITATION OF a. REPORT b. ABSTRACT c. THIS PAGE 17. LIMITATION OF ABSTRACT or the corder of the corder o	the funding agency.								
grant from the Washington Traffic Records Governance Council, conducted a pilot evaluation of big data text mining, machine learning, and spatiotemporal cluster detection methods for analysis of traffic injury. This report provides insig into the application of machine learning algorithms applied to emergency department records generated from January 2021 - August 31, 2021. 15. SUBJECT TERMS text mining, machine learning, syndromic surveillance, emergency department records, traffic records, motor vehicle of 16. SECURITY CLASSIFICATION OF: a. REPORT b. ABSTRACT c. THIS PAGE 17. LIMITATION OF ABSTRACT 18. NUMBER OF PAGES 19a. NAME OF RESPONSIBLE PERSON Peter Corier, Traffic Records Program Mar 19b. TELEPHONE NUMBER (<i>Include area code</i>)	14. ABSTRACT	•							
machine learning, and spatiotemporal cluster detection methods for analysis of traffic injury. This report provides insign into the application of machine learning algorithms applied to emergency department records generated from January 2021 - August 31, 2021. 15. SUBJECT TERMS text mining, machine learning, syndromic surveillance, emergency department records, traffic records, motor vehicle of a REPORT 16. SECURITY CLASSIFICATION OF: 17. LIMITATION OF ABSTRACT a. REPORT b. ABSTRACT c. THIS PAGE 17. LIMITATION OF ABSTRACT c. THIS PAGE 18. NUMBER OF RESPONSIBLE PERSON Peter Corier, Traffic Records Program Mar 19b. TELEPHONE NUMBER (Include area code)	The Washington State Department of Health Rapid Health Information Network (RHINO) program staff, with support of a								
into the application of machine learning algorithms applied to emergency department records generated from January 2021 - August 31, 2021. 15. SUBJECT TERMS text mining, machine learning, syndromic surveillance, emergency department records, traffic records, motor vehicle of the second secon									
2021 - August 31, 2021. 15. SUBJECT TERMS text mining, machine learning, syndromic surveillance, emergency department records, traffic records, motor vehicle of 16. SECURITY CLASSIFICATION OF: a. REPORT 16. SECURITY CLASSIFICATION OF: a. REPORT 17. LIMITATION OF ABSTRACT 17. LIMITATION OF ABSTRACT 18. NUMBER OF PAGES 19a. NAME OF RESPONSIBLE PERSON Peter Corier, Traffic Records Program Mar 19b. TELEPHONE NUMBER (Include area code)									
15. SUBJECT TERMS text mining, machine learning, syndromic surveillance, emergency department records, traffic records, motor vehicle of 16. SECURITY CLASSIFICATION OF: 17. LIMITATION OF ABSTRACT a. REPORT b. ABSTRACT c. THIS PAGE 17. LIMITATION OF ABSTRACT 18. NUMBER OF PAGES 19a. NAME OF RESPONSIBLE PERSON Peter Corier, Traffic Records Program Mar 19b. TELEPHONE NUMBER (Include area code)									
text mining, machine learning, syndromic surveillance, emergency department records, traffic records, motor vehicle of the syndromic surveillance, emergency department records, traffic records, motor vehicle of the syndromic surveillance, emergency department records, traffic records, motor vehicle of the syndromic surveillance, emergency department records, traffic records, motor vehicle of the syndromic surveillance, emergency department records, traffic records, motor vehicle of the syndromic surveillance, emergency department records, traffic records, motor vehicle of the syndromic surveillance, emergency department records, traffic records, motor vehicle of the syndromic surveillance, emergency department records, traffic records, motor vehicle of the syndromic surveillance, emergency department records, traffic records, motor vehicle of the syndromic surveillance, emergency department records, traffic records, motor vehicle of the syndromic surveillance, emergency department records, traffic records, motor vehicle of the syndromic surveillance, emergency department records, traffic records, motor vehicle of the syndromic surveillance, emergency department records, traffic records, motor vehicle of the syndromic surveillance, emergency department records, traffic records, motor vehicle of the syndromic surveillance, emergency department records, traffic records, motor vehicle of the syndromic surveillance, emergency department records, traffic records, motor vehicle of the syndromic surveillance, emergency department records, traffic records, motor vehicle of the syndromic surveillance, emergency department records, traffic records, motor vehicle of the syndromic surveillance, emergency department records, traffic records, motor vehicle of the syndromic surveillance, emergency department records, traffic reco	2021 - August 31, 2021.								
text mining, machine learning, syndromic surveillance, emergency department records, traffic records, motor vehicle of the syndromic surveillance, emergency department records, traffic records, motor vehicle of the syndromic surveillance, emergency department records, traffic records, motor vehicle of the syndromic surveillance, emergency department records, traffic records, motor vehicle of the syndromic surveillance, emergency department records, traffic records, motor vehicle of the syndromic surveillance, emergency department records, traffic records, motor vehicle of the syndromic surveillance, emergency department records, traffic records, motor vehicle of the syndromic surveillance, emergency department records, traffic records, motor vehicle of the syndromic surveillance, emergency department records, traffic records, motor vehicle of the syndromic surveillance, emergency department records, traffic records, motor vehicle of the syndromic surveillance, emergency department records, traffic records, motor vehicle of the syndromic surveillance, emergency department records, traffic records, motor vehicle of the syndromic surveillance, emergency department records, traffic records, motor vehicle of the syndromic surveillance, emergency department records, traffic records, motor vehicle of the syndromic surveillance, emergency department records, traffic records, motor vehicle of the syndromic surveillance, emergency department records, traffic records, motor vehicle of the syndromic surveillance, emergency department records, traffic records, motor vehicle of the syndromic surveillance, emergency department records, traffic records, motor vehicle of the syndromic surveillance, emergency department records, traffic records, motor vehicle of the syndromic surveillance, emergency department records, traffic reco		EDME							
16. SECURITY CLASSIFICATION OF: 17. LIMITATION OF ABSTRACT 18. NUMBER 19a. NAME OF RESPONSIBLE PERSON a. REPORT b. ABSTRACT c. THIS PAGE 17. LIMITATION OF ABSTRACT 18. NUMBER OF RESPONSIBLE PERSON Job Abstract c. THIS PAGE 17. LIMITATION OF ABSTRACT 18. NUMBER OF RESPONSIBLE PERSON Job Abstract c. THIS PAGE 17. LIMITATION OF ABSTRACT 19. NAME OF RESPONSIBLE PERSON Job Abstract c. THIS PAGE 19. TELEPHONE NUMBER (Include area code)									
a. REPORT b. ABSTRACT c. THIS PAGE ABSTRACT OF PAGES Peter Corier, Traffic Records Program Mar 19b. TELEPHONE NUMBER (Include area code)	text mining, n	lachine learnin	g, synaronic	surveillance, emerg	gency d	lepani	ment record	is, tranic records, motor venicle crash,	
a. REPORT b. ABSTRACT c. THIS PAGE ABSTRACT OF PAGES Peter Corier, Traffic Records Program Mar 19b. TELEPHONE NUMBER (Include area code)									
a. REPORT b. ABSTRACT c. THIS PAGE ABSTRACT OF PAGES Peter Corier, Traffic Records Program Mar 19b. TELEPHONE NUMBER (Include area code)									
a. REPORT b. ABSTRACT c. THIS PAGE PAGES Peter Corier, Traffic Records Program Mar 19b. TELEPHONE NUMBER (Include area code)						OF			
19b. TELEPHONE NUMBER (Include area code)	a. REPORT	b. ABSTRACT	c. THIS PAGE				Peter Cori	er, Traffic Records Program Manager	
None None None 13 (360) 725-9879							19b. TELEP	HONE NUMBER (Include area code)	
	None	None	None	None	13		(360) 725-	9879	

WTSC Data Mining and ML Report

RHINO Team

9/29/2021

Summary

To further the accuracy of insights gained from ED records, a pair of Machine Learning algorithms were applied to 3,247 records gathered from the ESSENCE All Traffic Query for the purposes of validation and custom categorization as directed by WTSC staff. In validation, it was shown that the samples garnered an average of 98.21% accuracy across three key fields. In Categorization efforts, results were extremely mixed and point to a need of further examination and discussion of classification criteria for a range of injury severities involving Motor Vehicle Collisions (MVCs).

The Machine Learning algorithms, once trained, were applied to 36,744 records, from January 1, 2021 to August 31, 2021, to allow for text mining and categorical insights. From the 34,172 (93%) confirmed records, text mining of key fields was performed to determine similarties and differences between custom criteria as informed by WTSC staff. Results of this text mining included insights that inferred that the 4 categories as described (1 = "suspected injury", 2 = "minor injury", 3 = "major injury", 4 = "death") may need some exclusion or additional criteria to perform as well as other categorizations such as scooter related collisions or pedestrian involved collisions.

Lastly, given the limitations of ED data (which is to say, current unavailability of crash or injury site information), it can be assumed that ED data alone may not be sufficient for spatiotemporal cluster detection. However, some insights into time of day and distance from home patterns may be uncovered with some limitations. Further synthesis with other data sources, name EMS data, may provide further insights.

Machine Learning and Text Mining Results

As stated within the introduction, the application of Machine Learning on traffic records was performed with two primary goals in mind. The first of these can be defined as a "Binary Classification" problem, where we wished to test if the records being pulled from ESSENCE's All Traffic Related query were truly traffic related. The second goal was to examine the possibility of using a custom criteria to assess severity of ED visits related to Traffic Injuries, which is defined as a "Multi-Classification" problem.

To solve the Binary Classification problem, it was determined that a Deep Learning Binary Classification algorithm would be the most successful across multiple fields found in records (namely, Discharge Diagnosis, Triage Notes, and Chief Complaint fields). After training and testing on a sample set of 3,427 manually tagged records, it was found that Chief Complaint based selection retained a 97.85% selection accuracy, Discharge Diagnosis 98.82%, and Triage Notes, 97.96% after 24 epochs (training periods). Graphs of both accuracy and loss (how much information is "lost" while the neural layers adapt and train) are displayed below in the graphics pages at the end of this report.

The resulting Deep Learning models were used to filter the original manually tagged samples and later a new sample set of 36,744 visits to ensure the best possible chance of success with Multi-Classification modeling.

Mutli-Classification Modeling was performed after initial filtering by a Support Vector Machine algorithm. This algorithm "clusters" visits together by most likely category and creates "borders" by which one can determine most likely grouping. In this instance, "borders" were produced based on the following criteria:

- Class 1: Individuals with no apparent visible injuries, but come to the ED seeking care.
- Class 2: Individuals with minor apparent visible injuries (scrapes, cuts, bruises, etc.).
- Class 3: Individuals with major injuries or injuries in particularly critical parts of the body (fractures, concussions, etc).
- Class 4: Individuals who died as a result of injuries sustained.

In the examination of these records based on the criteria, it was discovered there was fairly extreme and common cross-over of Triage Notes details, Discharge Diagnosis codes, and Chief Complaint details.

For Triage Notes, cross-group accuracy was noted at 42%, Discharge Diagnosis maintained a cross-group accuracy of 48.9%, and Chief Complaint cross-accuracy of 39.2%.

This leads one to the conclusion that further refinement of definitions of these categories is needed to provide the model with a successful framework with which to train another model to allow for high-volume classification and further insights.

At time of writing, text analysis that differentiates based on these results provided no meaningful results. However, frequency of Discharge Diagnosis codes in singles and pairs are reported as general trends, as well as Triage Notes and Chief Complaint unigram and bigrams based on ED visit without admission (Not Severe), ED visit with inpatient admission (Severe), and those who died while in the ED or during inpatient status (Died). These can be found in the Graphics pages at the end of this report.

Spatiotemporal Characteristics in Traffic Related Injuries

Spatial Characteristics of Traffic Related Injuries

While we do not get frequent information about where a traffic related injury may have occured, RHINO does receive information about location at which the patient sought care, and the patients home zip code. For the map displayed in the graphics pages, patient zip code was used to map out the Per 10,000 rate of Traffic Injuries as it relates to total ED visits. It's worth noting that most of the zip codes that have higher rates of injury are either very rural (low overall visit count), or near major interstate systems (I-5 and I-90).

Time of day and day of week trends in Traffic Related Injuries

It should be noted that a significant number of visits (notably, those who fall under a 2 or 1 in the custom categories) would come into an ED hours or even days after an event. As such, clustering may not be seen as the most conducive action at this time. Furthermore, this issue points to a need to integrate with near-real-time EMS data into ED analysis to provide a more comprehensive view of traffic related events within Washington State.

However, there are some insights that still may be gleaned from our data, namely that over the time period examined (January 1, 2021 to August 30, 2021), Motor Vehicle Collisions and other related injuries were most common on Thursday evenings between 6 P.M. and 8 P.M., with Wednesdays at the same time being the second most prevalent block of time. This roughly corresponds to Twilight Hours during a majority of the months examined, in which commuting may be considered more difficult due to variance in light conditions. A heatmap of these results are presented in the graphics pages.

Graphics

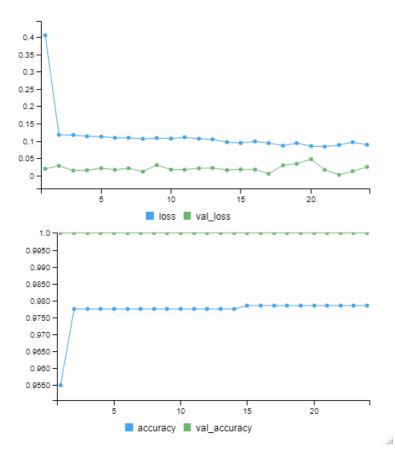


Figure 1: Graph of Loss and Accuracy for Chief Complaint

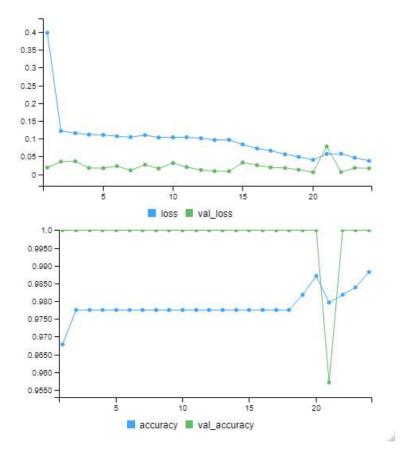


Figure 2: Graph of Loss and Accuracy for Discharge Diagnosis

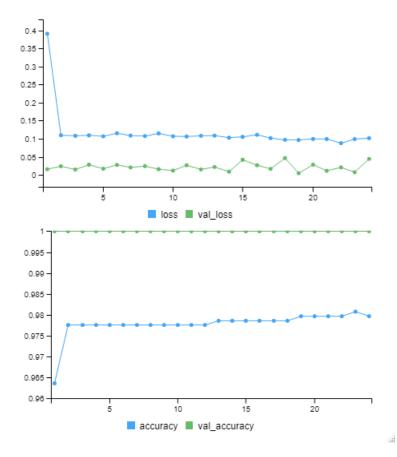
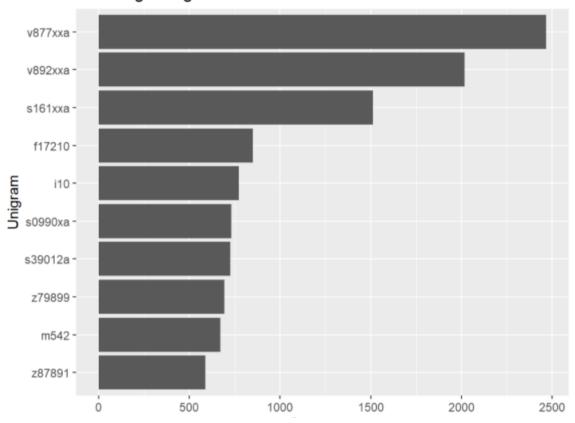
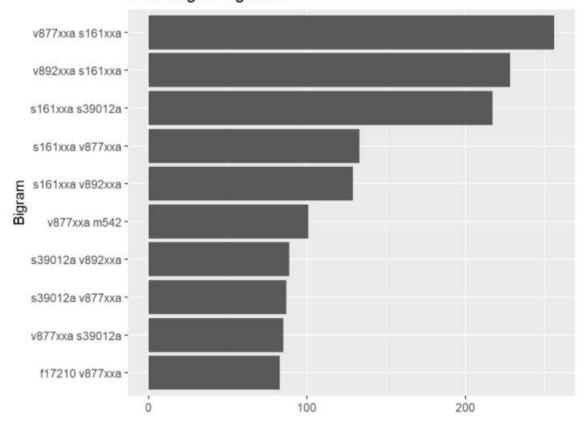


Figure 3: Graph of Loss and Accuracy for Triage Notes



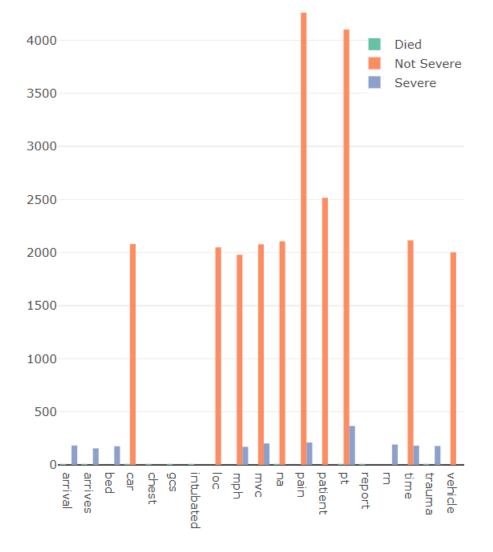
Discharge Diagnosis

Figure 4: Discharge Diagnosis Frequency - Singular



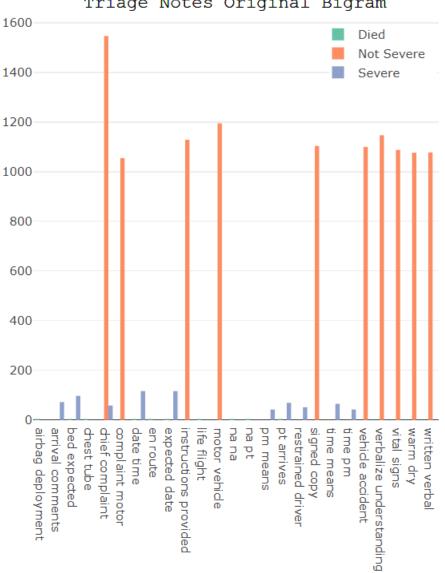
Discharge Diagnosis

Figure 5: Discharge Diagnosis Frequency - Pair



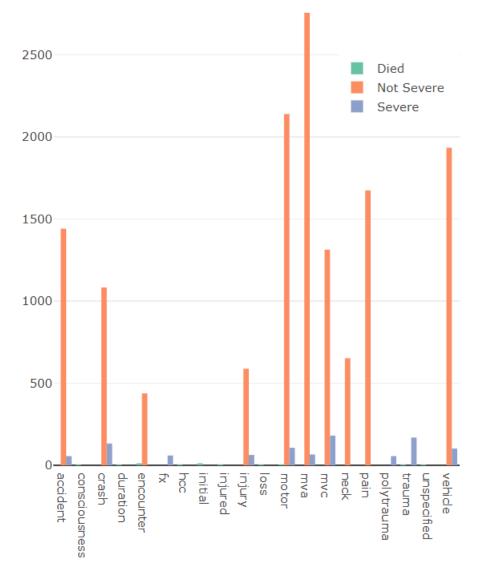
Triage Notes Original Unigram

Figure 6: Triage Notes Frequency - Unigram



Triage Notes Original Bigram

Figure 7: Triage Notes Frequency - Bigram



Chief Complaint Original Unigram



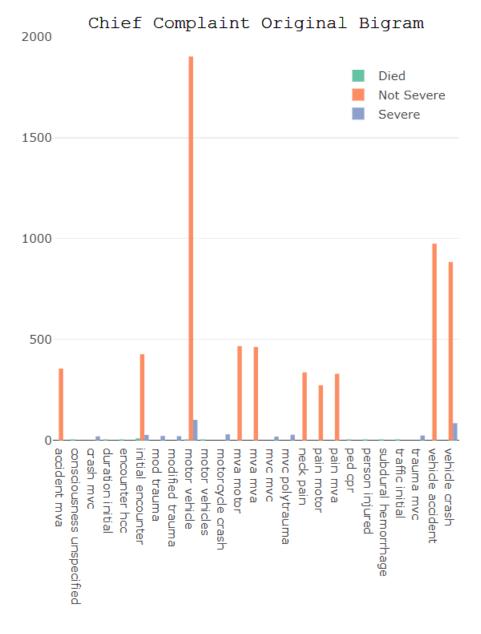


Figure 9: Chief Complaint Frequency - Bigram

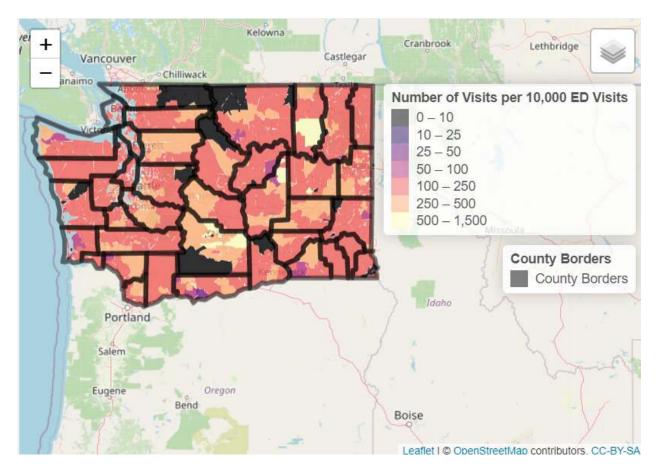


Figure 10: Map of Washington State Traffic Related Visits, Visits per 10,000 ED Visits

