

Network Screening for Derailments in Canada

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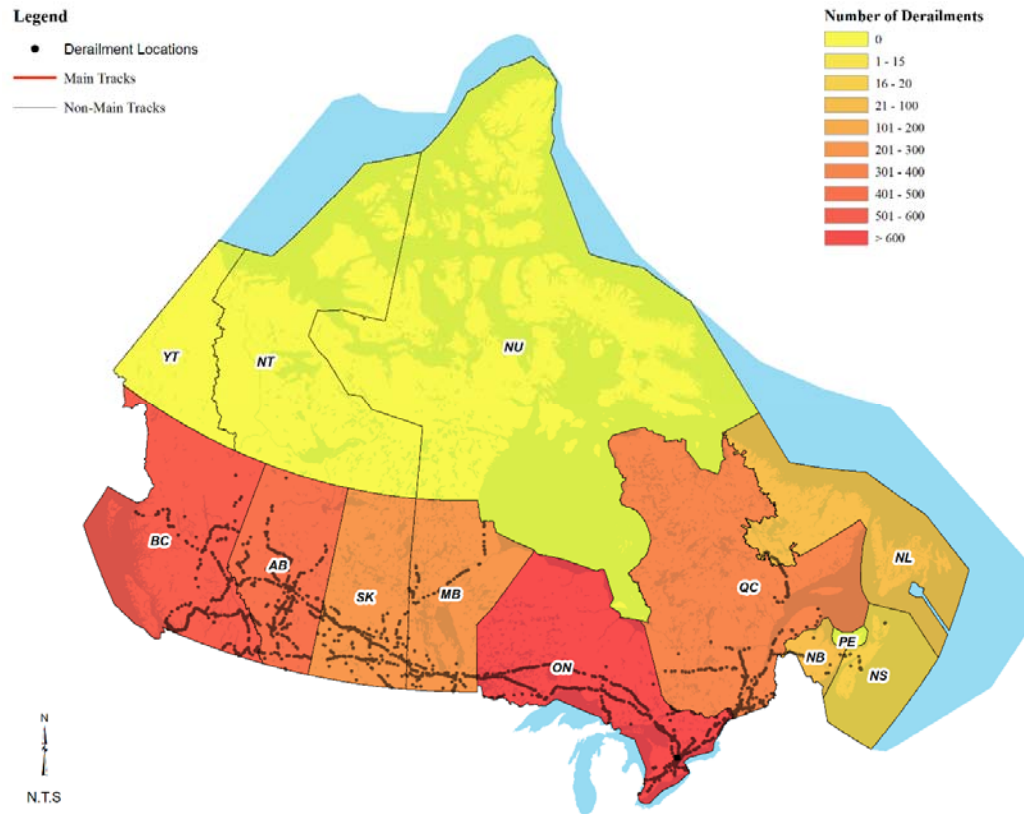
Network Screening for Derailments in Canada

- 1** *Establish focus*
- 2** *Identify network and establish reference populations*
- 3** *Select performance measures*
- 4** *Select screening method*
- 5** *Screen and evaluate results*

Network Screening for Derailments in Canada



Research Background



Top: A tragic derailment incident in Quebec (2013: 63 derailed cars and 47 deaths)

Left: Derailments by Province in Canada, 1999-2018

Research Methodology (Study Process)



Literature Review

on state-of-the-art methodologies, tools and practices for derailment risk management.



Integrated Database

Integration of rail track, rail traffic, and derailment incident datasets. (23 databases)



Risk Estimation Models

predict the number of derailments for each segment owned/managed by different companies.

$$\mu_i = \text{Seg_Length} \times \exp^{\beta_0 + \beta_1 \text{VL_Count} + \beta_2 \text{VL_TrainSpeed} + \beta_3 \text{Stn_Count} + \beta_4 (\text{VL_Count} \times \text{VL_TrainSpeed})}$$



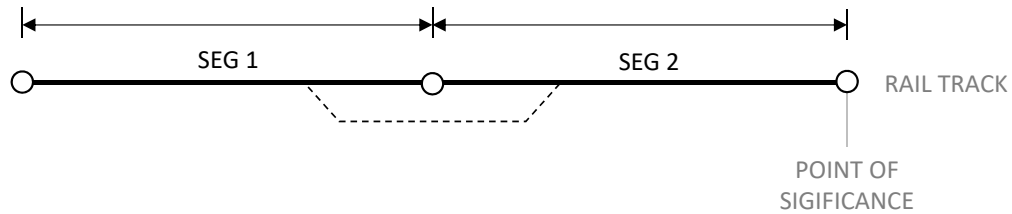
Hotspots

Identify the riskiest segments based on Empirical Bayes estimates.

Key Challenges






RAIL SEGMENTATION



Potential Segmentation Methods:

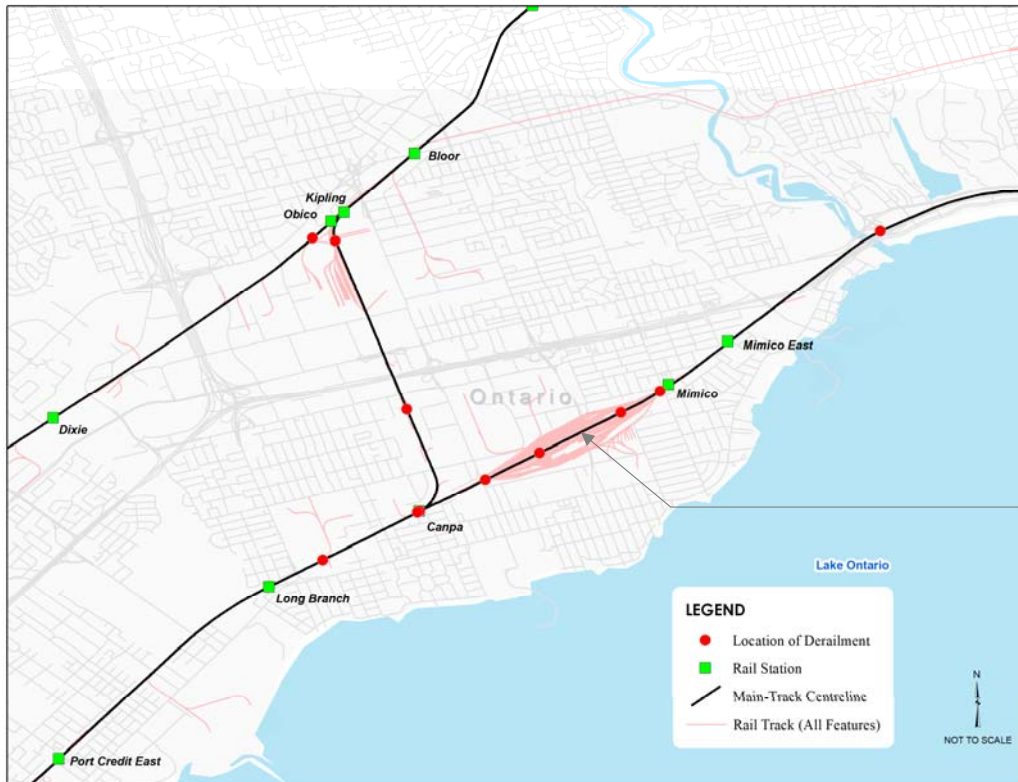


-  STATION
-  JUNCTION
-  AT-GRADE CROSSING

Key Challenges



RAIL NETWORK REPRESENTATION



The network screening model would treat the rail track segment as a single feature for predicting train incident probability.

RAIL TRACK CENTRELINE

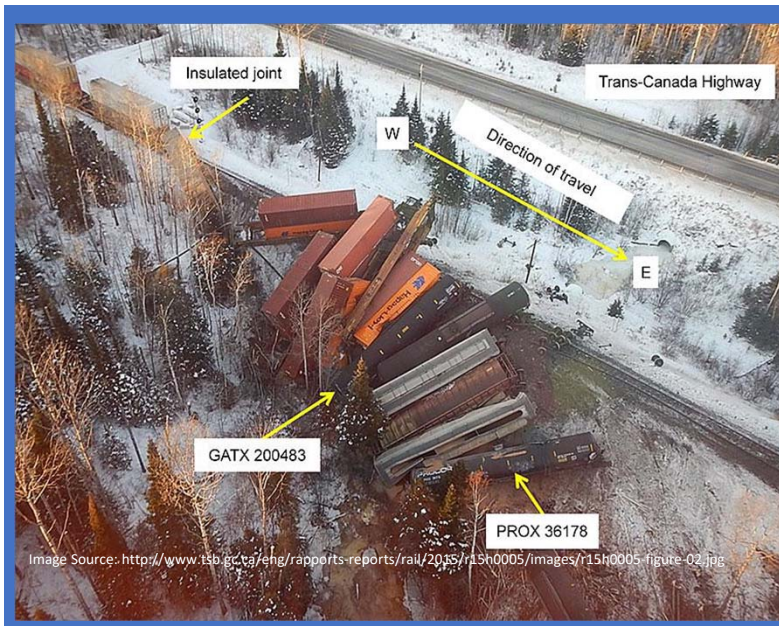
Key Challenges



MEASURE OF SEVERITY



NUMBER OF CARS INVOLVED



Implications for Safety Practice



Develop a **segment-specific derailment prediction model** which enables rail operators and/or owners to identify safety deficiencies and prioritize main tracks that may require more attention *prior* to an incident.



Constitutes a need for developing the best practices of **rail segmentation** for safety network screening purposes.



A collaborative effort amongst government agencies (e.g. Transport Canada) and rail companies is essential to maintain **good quality data** for future research/studies

Thank You!

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