Applying Data Science Methods to Better Prepare Portlanders for a Cascadia M9.0 Earthquake

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Abstract

Data science can help make sense of technical datasets to provide individualized earthquake plans to all Portlanders. By creating a website where Portlanders can learn how to respond to an earthquake based on their unique place of residence we hope to reduce the number of people injured or killed during a Cascadia Subduction Zone Earthquake. Complicated geological and government data exists which benefit city planners and scientists. Creating a classification machine learning model can digest the dense datasets into individualized plans for Portland residents using a user-friendly website.

Design

This project will address two main problems: Informing Portlanders what to do during an earthquake and where to receive help after an earthquake. Not everyone should simply “duck and cover” in the event of an earthquake. In homes where there is high potential for collapse residents should leave the building immediately when shaking begins. To get an idea about the scale of at risk homes the most simple classification to implement first was dividing houses by year built. Homes built before 1974 will suffer the worst damage in a serious earthquake; 54.8% of all Portland homes were built before 1974. This percentage is a way to highlight the magnitude of the number of homes at risk in Portland and the residents who would benefit from safety recommendations and individualized plans.

Additionally, Portlanders need to know where the city has pre-planned locations of emergency services stationed around the city after an earthquake event. This information will be included in the individualized plan based on address. Last, Portlanders may not be aware that it will take a minimum of 1 month to get water, electricity and healthcare facilities working again. The estimate is it will be closer to 3 months. It’s important for Portlanders to stock up on food and water in order to care for the people in their home if the city, state, or federal government is not able to. The ideal situation would be for the government to subsidize earthquake preparedness kits or long term food kits.

Data

Five datasets will be used in the first iteration of the model:

1) **FEMA Tier 1 Critical Facilities:** Buildings identified by Portland Bureau of Emergency Management have Tier I importance in a post-disaster situation. The attribute information includes which agency is responsible for an initial inspection and a follow-up safety inspection
2) **BEECN Locations:** Basic Earthquake Emergency Communication Nodes Sites (BEECN), 48 sites that may be set up and staffed following a major earthquake where citizens can respond, report damage, and receive safety information
3) **PortlandcityGIS.gov Housing information**
4) **Zillow housing information**
5) **Predicted utilities outages based on the state geological survey and emergency managers.**

Algorithms

Data Science Solution(s):

1) Create a classification machine learning model that determines the dangers of a specific
2) Portland home during an earthquake.
3) Create a website for Portland residents which:
    a) Classifies the potential for their home/place of residence to collapse.
    b) Based on the number of residents in their homes, Informs them about how much food and water to have stocked up. This will be implemented by a simple regression model. Features would include number of adults, number of children, number of infants (and if they bottle feed) and location of their home.
    c) Details the closest FEMA Tier 1 Critical Facility where they can receive medical attention and aid.
    d) Details the closest "Basic Earthquake Emergency Communication Node" (BEECN)
        i) A Basic Earthquake Emergency Communication Node or BEECN is a place to go in Portland after a major earthquake to ask for emergency assistance if phone service is down, or to report severe damage or injury.
        ii)

Tools

- **OpenGIS software**
- **Google Sheets**
- **Tableau**

Communication

- **Slides submitted to Github repo.**