# Forecasting of Staffing Needs

## Team Members:

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# Agenda

- Introduction
- The Data
- Data Science Approaches
- Timeline

# Introduction

# The Partner - Providence Health Care

- Providence Health Care (PHC) is a non-profit organization.
- Almost 9,000 people working at their 16 facilities - 6,000 staff, 1,000 medical staff/physicians, 200 researchers, 1,600 volunteers.
- PHC is the provincial centre for the care of six groups of people with often-intensive health needs:
    - heart and/or lung diseases;
    - kidney disease;
    - mental illnesses;
    - Older British Columbians (residential care, seniors, & geriatrics);
    - HIV/AIDS; and
    - urban health issues (homelessness, drug & alcohol-related issues & malnutrition).

## Objective

The purpose of this project is to forecasting staffing needs in healthcare on a weekly basis, providing insight on how many back up staff PHC needs to have a full staff.

## Final Product

The final product will consist of:

- a dashboard (developed in R Shiny or Tableau);
- the scripts containing the code used to proceed with the analysis; and
- a report outlining the methodologies and findings.

# The Data

# Data Description

| EXCEPTION_CREATION_DATE | EXCEPTION_GROUP | JOB_FAMILY_DESCRIPTION | JOB_TITLE | PROGRAM | SUB_PROGRAM | SHIFT_DATE | EARNING_CATEGORY |
|---|---|---|---|---|---|---|---|
| 2017-10-25 | Leave of Absence | Registered Nurse-DC1 | RN Vacation Relief | HEART LUNG | BARBARA HALL | 2018-01-01 | Relief Not Needed |
| 2018-01-01 | Casual Sick or Cancelled | Licensed Practical Nurse | Licensed Practical Nurse | MEDICINE | MSJ NURSING UNITS | 2018-01-01 | Relief Not Needed |
| 2017-11-15 | Swap | Registered Nurse-DC1 | Registered Nurse | HEART LUNG | MELANIE MULDER | 2018-01-01 | PT Over FTE |
| 2017-11-30 | Vacancy | Care Aide (Resident) | Resident Rehab Care Attendant | SENIORS CARE | RES SVCS LAN | 2018-01-01 | Regular Relief Utilized |
| 2016-10-04 | Vacancy | Clerical Other | Clerk IV | SURGERY | OR PAR SPH | 2018-01-01 | PT Over FTE |

# Data Wrangling

- Raw data is based on exception record: one entry per record
- To apply linear regression: make each row a day, summarise the related variables
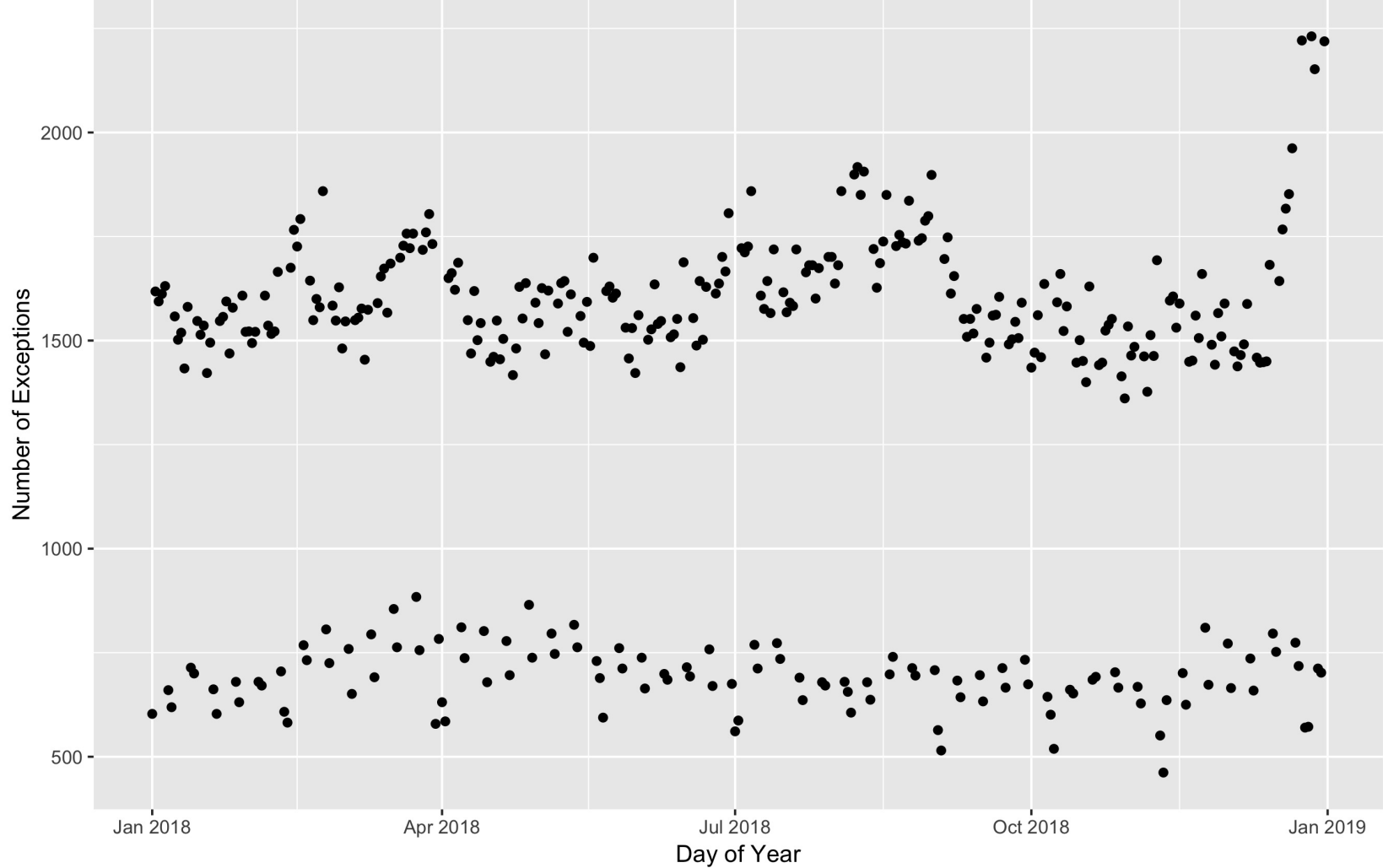- Feature selection needed

# Feature Selection

- Select correlated variables among 33 columns and other wrangled variables
- Some pontential related variables:
    - Numbers/Hours of exceptions that are filed ahead
    - Exception Group
    - Job Family
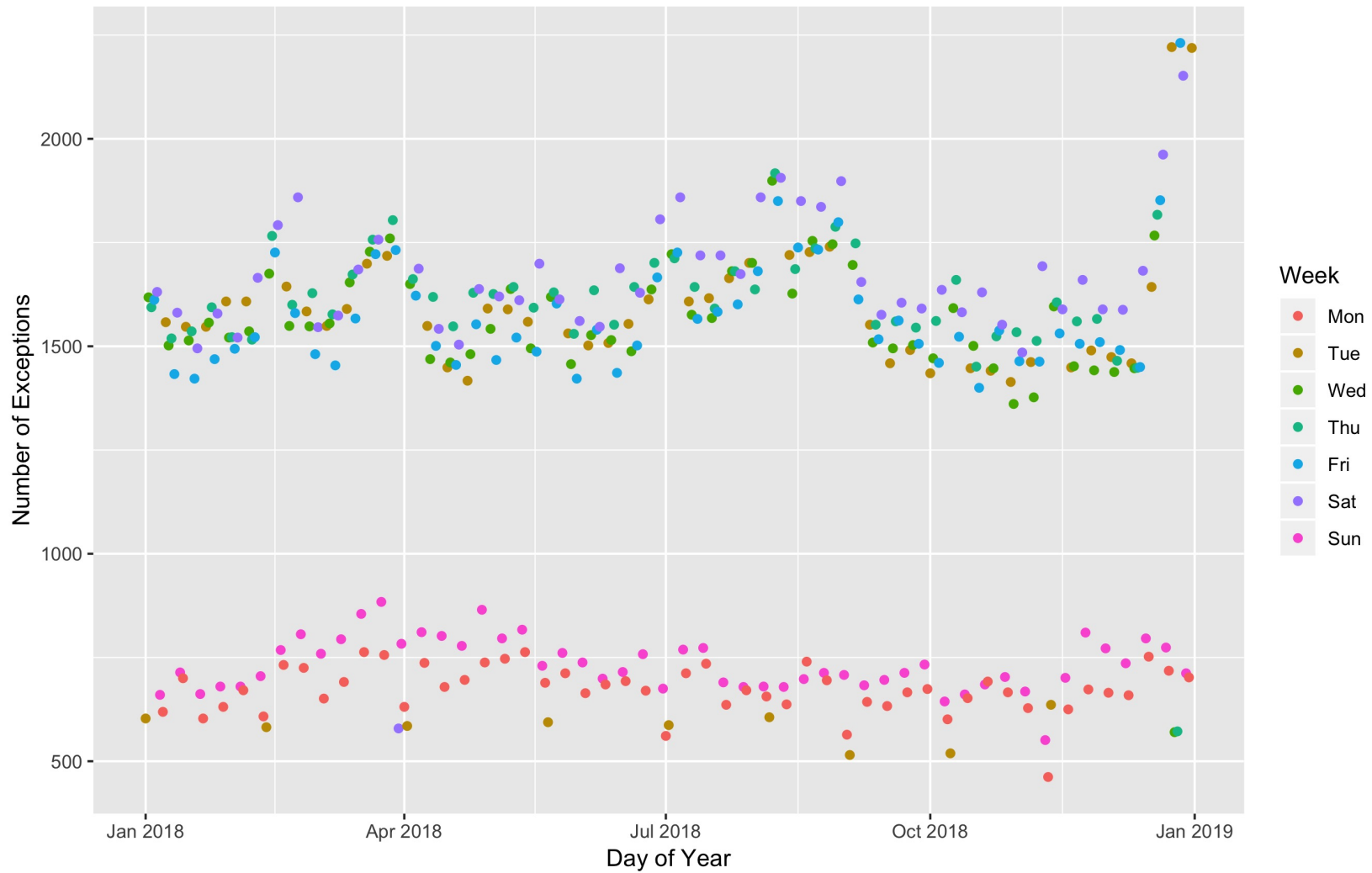    - Program

# Data Science Approaches

- Time Series
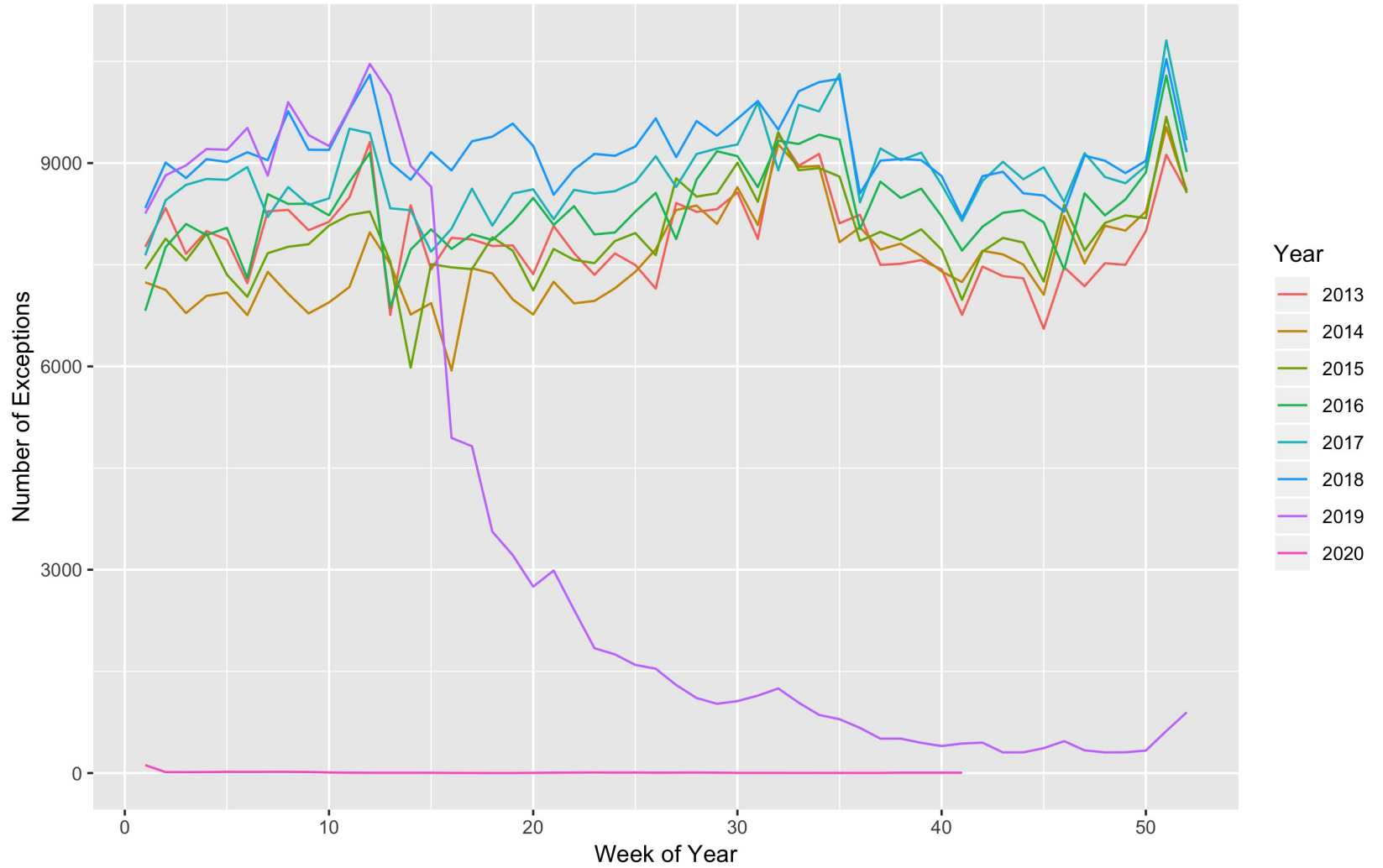- Linear Regression
- Neural Network

# Time Series
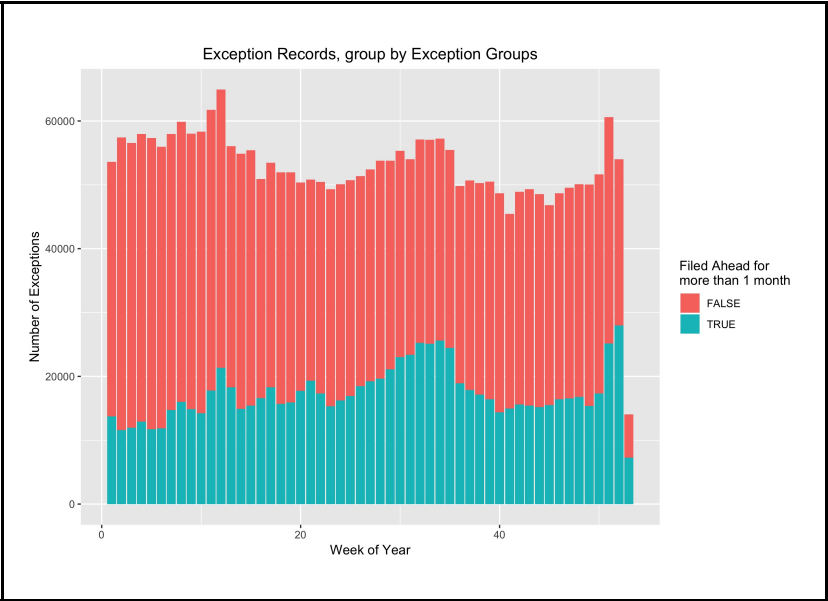
Exception Records by Day, 2018

Exception Records by Day, 2018

Exception Records by Week for each Year

# Linear Regression

**Exception Records, Filed Ahead or Not**

Number of Exceptions — Week of Year

Exception Filed Ahead
- FALSE
- TRUE

**Exception Records, group by Exception Groups**

Number of Exceptions — Week of Year

Filed Ahead for more than 1 month
- FALSE
- TRUE
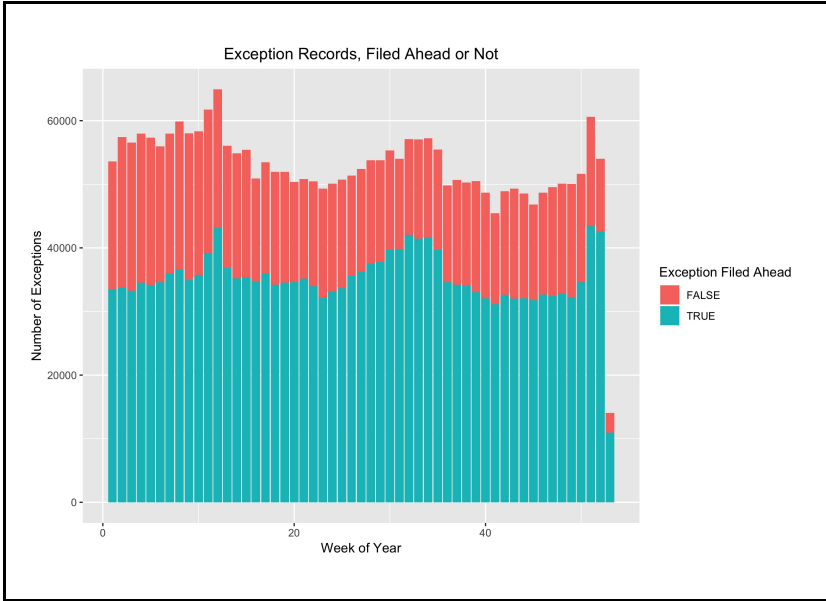
# Neural Network

# Timeline

| Time Period | Milestone |
|---|---|
| Week 1 | Finalize the proposal report to send to our mentor and partner |
| Week 2 | Data wrangling and feature selection (and more EDA) |
| Weeks 3 - 4 | Explore different approaches to fit the models |
| Week 5 | Build algorithms, testing, adjusting |
| Week 6 | Improve the dashboard, wrapping up |
| Week 7 | Presentations and reports |

Thank you!