What
effect does
Weather
have on
Melbourne Trams

Today's Agenda

1. Motivation to choose this topic
2. Datasets used
3. Data Wrangling techniques
4. Results from Investigation so far
5. Challenges faced up till now

Why is it **worth tackling**?

Has
700 tweets
about
Disruptions
in a month

My analysis aims to depict the extent to which weather causes disruptions to the normality of the tram system especially which routes.

My reliability based analysis will be useful to

1

VICTORIA State Government

PUBLIC TRANSPORT VICTORIA PT>

to help reduce Traffic Congestion.

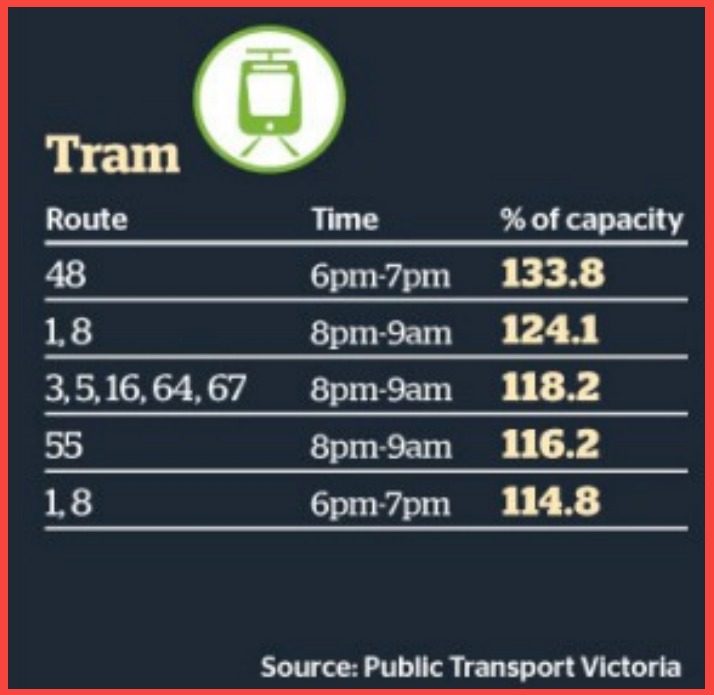
Victorian Gov. can Improve Sustainability, reduce $C0_2$ Emissions

2

By encouraging people to choose reliable Public transport as their primary commute option

The issue of Trams being over crowded is getting worse.

3



Tram

Route	Time	% of capacity
48	6pm-7pm	**133.8**
1, 8	8pm-9am	**124.1**
3, 5, 16, 64, 67	8pm-9am	**118.2**
55	8pm-9am	**116.2**
1, 8	6pm-7pm	**114.8**

Source: Public Transport Victoria

My analysis will recognize if Weather causes regular delays that increase Over Crowdedness.

Which **Datasets** were used and Why?

Tram – Daily Operational Report (2015)

Data Format : XLSX

This data contains Daily Route level Punctuality and Delivery Percentages.

Trams - route level - daily punctuality (% services on-time over length of route) - Jan to Dec 2015

Month	Day	Tram route																						
		1	109	11	12	16	19	3	48	5	55	57	59	6	64	67	70	72	75	78	8	82	86	96
January	1	87.9%	94.2%	97.3%	91.7%	88.3%	87.4%	88.1%	93.9%	89.0%	96.3%	95.0%	98.2%	89.6%	92.3%	88.1%	94.6%	91.0%	96.3%	83.5%	88.7%	94.0%	95.4%	88.8%
	2	87.4%	95.0%	92.0%		77.5%	93.1%	82.0%	92.2%	84.2%	93.5%	95.8%	95.5%	85.0%	85.1%	85.4%	93.2%	89.7%	94.6%	75.6%	85.6%	93.4%	91.8%	86.8%
	3	83.7%	92.2%	94.2%		89.7%	92.0%	85.5%	94.4%	88.5%	93.3%	96.5%	95.2%	85.8%	88.3%	81.5%	95.7%	90.8%	96.0%	67.1%	88.4%	95.0%	94.1%	92.0%
	4	81.9%	93.2%	94.9%		87.9%	93.9%	84.6%	88.4%	91.5%	82.6%	91.0%	93.1%	90.6%	87.1%	86.3%	97.9%	87.4%	93.4%	82.7%	81.7%	96.4%	84.1%	94.2%
	5	78.3%	92.5%	93.2%		76.3%	93.3%	80.2%	92.9%	80.4%	92.2%	93.6%	95.0%	84.9%	80.6%	81.6%	94.5%	83.4%	93.0%	82.5%	78.6%	95.9%	88.1%	89.0%
	6	82.0%	92.2%	93.0%		78.6%	92.2%	76.8%	92.1%	77.7%	90.4%	90.5%	91.7%	82.0%	81.0%	82.8%	94.2%	83.3%	93.0%	90.5%	79.2%	90.7%	86.1%	88.1%
	7	78.3%	93.2%	93.8%		69.1%	92.6%	68.1%	89.2%	73.4%	86.9%	91.1%	93.0%	79.3%	75.7%	75.1%	92.1%	73.9%	88.7%	85.6%	79.5%	96.1%	87.3%	84.2%
	8	78.8%	95.2%	91.7%		66.3%	90.4%	67.0%	89.7%	66.8%	89.9%	87.8%	94.0%	75.2%	72.7%	64.7%	94.0%	71.3%	94.3%	84.8%	72.3%	93.9%	88.8%	93.3%
	9	79.3%	94.8%	92.4%		73.5%	89.7%	70.3%	95.5%	74.3%	92.3%	88.2%	90.7%	78.3%	69.4%	73.6%	83.3%	78.6%	90.4%	76.4%	78.7%	94.8%	84.2%	83.2%
	10	84.5%	95.4%	93.9%		90.2%	92.0%	85.2%	94.0%	89.4%	93.6%	96.0%	96.0%	87.7%	86.0%	85.9%	96.0%	89.2%	90.7%	77.3%	89.4%	96.9%	92.0%	95.8%
	11	80.2%	94.4%	95.9%		90.2%	91.4%	78.8%	89.6%	88.5%	77.1%	94.0%	95.1%	92.1%	85.6%	84.0%	90.9%	90.1%	86.4%	85.9%	89.4%	96.4%	90.0%	89.7%
	12	80.6%	76.0%	93.4%	75.9%	77.2%	90.5%	76.4%	88.0%	80.8%	92.1%	90.2%	94.7%	79.8%	75.6%	77.9%	89.0%	79.4%	90.8%	89.3%	78.5%	96.4%	88.3%	77.4%
	13	78.7%	78.6%	92.9%	74.0%	71.1%	82.4%	72.4%	88.5%	81.9%	93.1%	90.4%	94.4%	76.9%	72.7%	75.8%	87.5%	75.2%	84.7%	80.6%	74.8%	95.4%	84.1%	81.8%
	14	80.4%	79.3%	91.5%	78.7%	73.5%	76.7%	74.2%	87.3%	73.9%	77.6%	84.0%	86.9%	77.1%	72.7%	72.0%	78.2%	75.0%	80.8%	70.8%	67.3%	96.6%	86.4%	72.8%
	15	84.3%	78.5%	90.3%	75.7%	73.5%	78.7%	79.0%	87.8%	82.8%	89.7%	90.7%	88.4%	80.7%	79.9%	79.2%	79.4%	75.7%	86.4%	84.6%	70.9%	93.2%	81.6%	76.3%
	16	75.5%	77.4%	86.0%	70.2%	61.1%	79.6%	72.4%	80.6%	69.2%	74.3%	70.9%	69.6%	70.1%	69.3%	77.1%	69.1%	71.9%	77.9%	76.7%	69.2%	88.5%	83.3%	67.5%
	17	90.9%	70.8%	91.4%	92.9%	85.8%	90.4%	77.1%	96.3%	93.3%	87.9%	94.4%	93.9%	90.9%	86.9%	83.6%	82.8%	93.6%	93.7%	81.5%	78.1%	93.8%	88.4%	75.6%
	18	83.2%	81.8%	96.7%	90.9%	88.4%	85.5%	81.6%	83.2%	88.1%	80.7%	91.0%	94.2%	85.3%	84.0%	86.5%	76.1%	83.3%	78.6%	80.7%	72.2%	96.1%	85.7%	78.4%
	19	85.6%	86.7%	94.7%	88.1%	75.3%	80.3%	86.8%	91.5%	86.8%	91.1%	92.0%	90.0%	86.9%	81.2%	74.3%	69.2%	82.5%	85.2%	83.0%	85.2%	98.8%	90.6%	82.1%
	20	86.3%	87.0%	92.6%	87.1%	75.3%	83.5%	82.2%	86.8%	82.4%	91.2%	90.8%	90.4%	82.7%	80.8%	73.6%	63.6%	80.5%	83.1%	75.2%	79.9%	96.9%	88.9%	76.5%
	21	78.9%	81.2%	88.9%	83.6%	65.1%	77.0%	74.6%	81.4%	76.4%	92.1%	89.9%	89.9%	77.5%	75.2%	69.5%	57.3%	74.0%	74.5%	69.8%	70.7%	98.8%	82.7%	62.4%
	22	84.2%	86.1%	89.6%	83.7%	69.9%	91.7%	85.4%	85.6%	79.7%	87.3%	87.8%	87.2%	82.9%	77.4%	71.0%	64.1%	75.8%	79.7%	74.2%	70.2%	95.9%	82.4%	74.6%
	23	81.6%	91.1%	91.9%	82.5%	69.5%	74.7%	74.9%	86.7%	76.9%	86.1%	74.5%	84.9%	77.4%	69.2%	64.7%	70.0%	76.4%	79.8%	80.9%	70.0%	91.7%	80.9%	75.3%
	24	84.1%	91.6%	96.9%	91.8%	89.1%	90.3%	79.3%	93.6%	84.7%	89.6%	93.1%	94.1%	91.7%	82.9%	82.6%	68.4%	87.8%	90.5%	76.0%	84.0%	94.0%	92.9%	81.5%
	25	80.8%	90.1%	94.0%	90.5%	83.6%	91.8%	87.6%	88.2%	90.1%	75.3%	93.0%	89.8%	92.3%	84.6%	90.3%	60.2%	93.4%	84.1%	77.8%	85.1%	98.5%	83.8%	75.4%
	26	84.4%	92.6%	97.9%	90.2%	82.3%	86.6%	75.3%	95.7%	79.0%	94.1%	96.2%	96.5%	88.1%	79.9%	83.1%	72.2%	84.9%	88.0%	90.6%	81.5%	91.6%	92.4%	88.0%
	27	88.0%	84.7%	93.2%	89.3%	70.4%	82.5%	83.8%	89.4%	77.7%	90.2%	93.2%	75.7%	77.2%	78.9%	70.8%	82.4%	76.1%	86.7%	83.3%	77.2%	89.1%	87.1%	89.2%
	28	84.9%	81.6%	94.0%	86.4%	66.7%	77.1%	77.4%	86.9%	79.2%	87.2%	86.9%	81.3%	76.0%	70.9%	68.1%	68.7%	62.2%	78.6%	72.7%	64.7%	92.9%	81.1%	80.2%
	29	85.7%	84.2%	92.6%	88.6%	59.5%	80.3%	82.1%	79.1%	79.8%	80.9%	91.4%	79.7%	77.3%	75.5%	68.8%	69.4%	63.8%	77.3%	69.8%	54.3%	91.8%	84.7%	82.0%
	30	75.1%	76.9%	84.8%	81.5%	56.9%	80.1%	74.4%	76.2%	78.2%	86.8%	89.9%	81.5%	69.9%	72.0%	63.7%	71.7%	52.8%	77.3%	57.9%	51.9%	92.0%	75.1%	82.1%
	31	89.7%	87.0%	92.2%	90.6%	85.2%	82.3%	86.0%	87.8%	83.9%	88.5%	87.4%	87.5%	87.1%	82.4%	79.5%	69.9%	87.4%	87.0%	72.2%	88.0%	87.3%	85.1%	79.1%
February	1	96.2%	97.0%	95.9%	82.6%	78.0%	83.0%	79.4%	86.3%	85.2%	88.9%	87.3%	91.3%	92.1%	82.6%	77.5%	79.8%	88.6%	86.7%	57.8%	87.5%	98.5%	73.9%	83.8%

Only 2015 - to keep my analysis relevant according to the upgrades and improvements that have been made.

** Obtained by Yarra Trams via Email since it wasn't available on their website

Daily Rainfall and Max. Temperature

Data Format : CSV

Station Used :
Melbourne Olympic Park
- Great Data Quality
and only 1 Missing Value

Why Rain ? Wet Weather makes gripping difficult and thus slows down tram speeds.

Why Max. Temperature ? Extreme heat causes tracks to swell up and increases pressure on trams air-conditioning system.

Which **Data Wrangling techniques** are used ?

Data Missing

Types of Missing values - Blanks

1 Missing Rainfall Data – 0mm
Because previous and next day was 0mm

No Missing Data for Max. Temperature

Missing Route Level Punctuality and Delivery Data – Average values over the Entire Network on that day.

Data Format/ Data Merging

Redundant fields like
Product Code, Station Id, Quality
were deleted from Rainfall and Temperature Data.

City Circle Tram data was deleted–
Too many missing values and
not central to my analysis

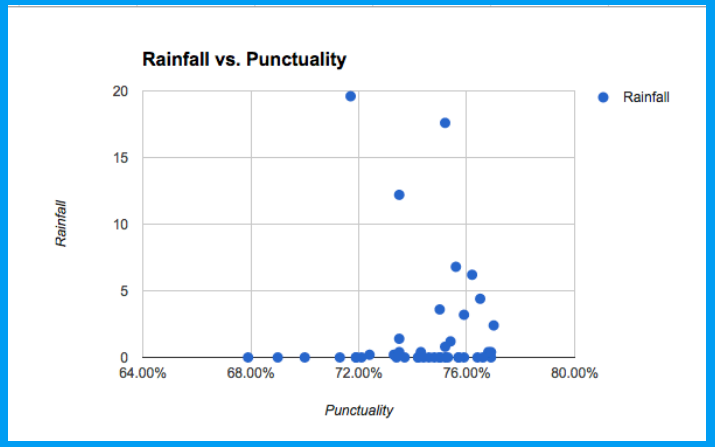
Datasets were merged over Year, Month, Day

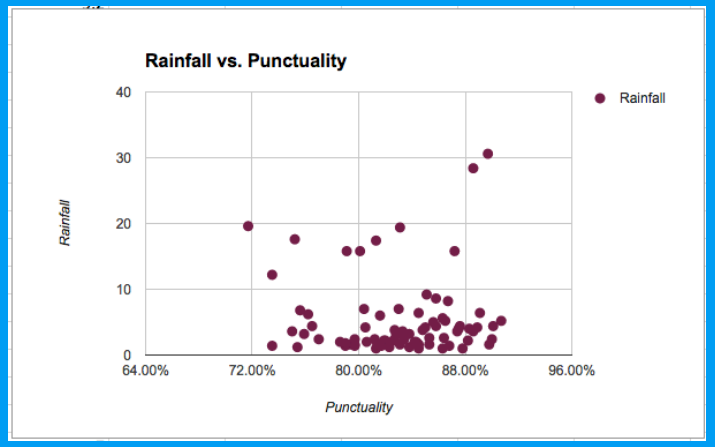
Final Data Format : CSV

Data Visualization

Initial Investigation

Scatter Plots : Network level Percentages VS Rainfall / Temperature





Type 1 : Blue
Punctuality <= 77% or Delivery <= 98 %

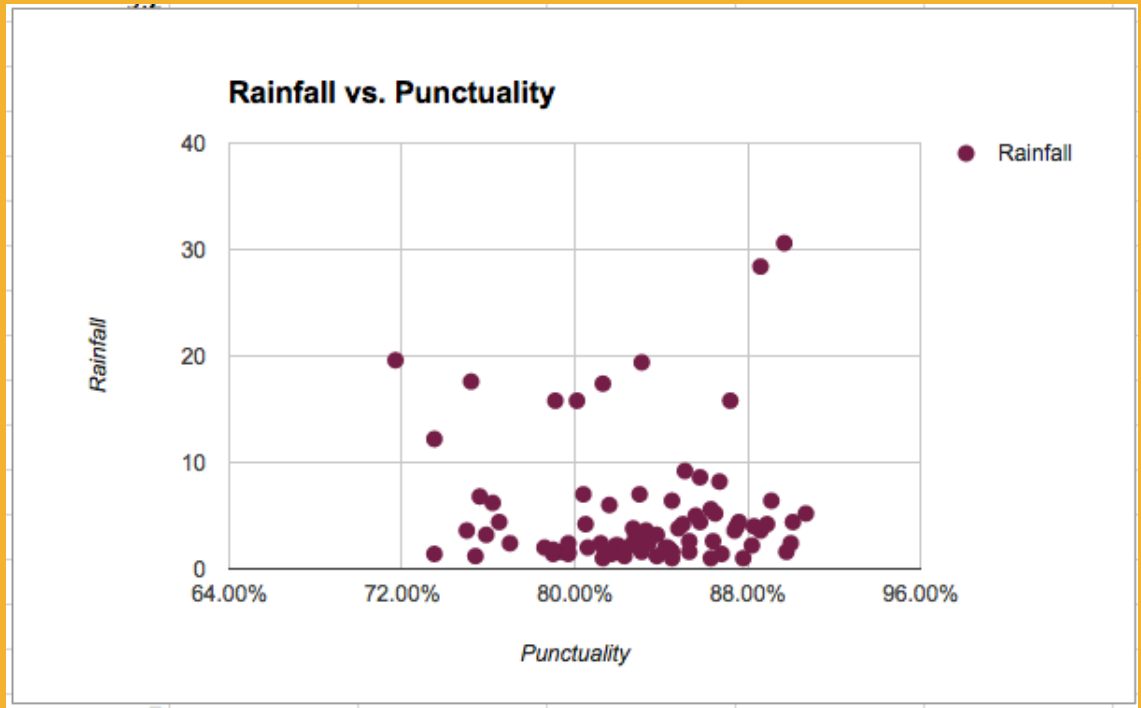
Type 2 : Red
Rainfall >= 1.0 mm or Temperature >= 30°C

What are the **Results** of Initial Investigation ?

Rain hasn't had a consistent effect on Punctuality

Highest rainfall of 30mm had a good punctuality rate of 88% and 99.5 % delivery

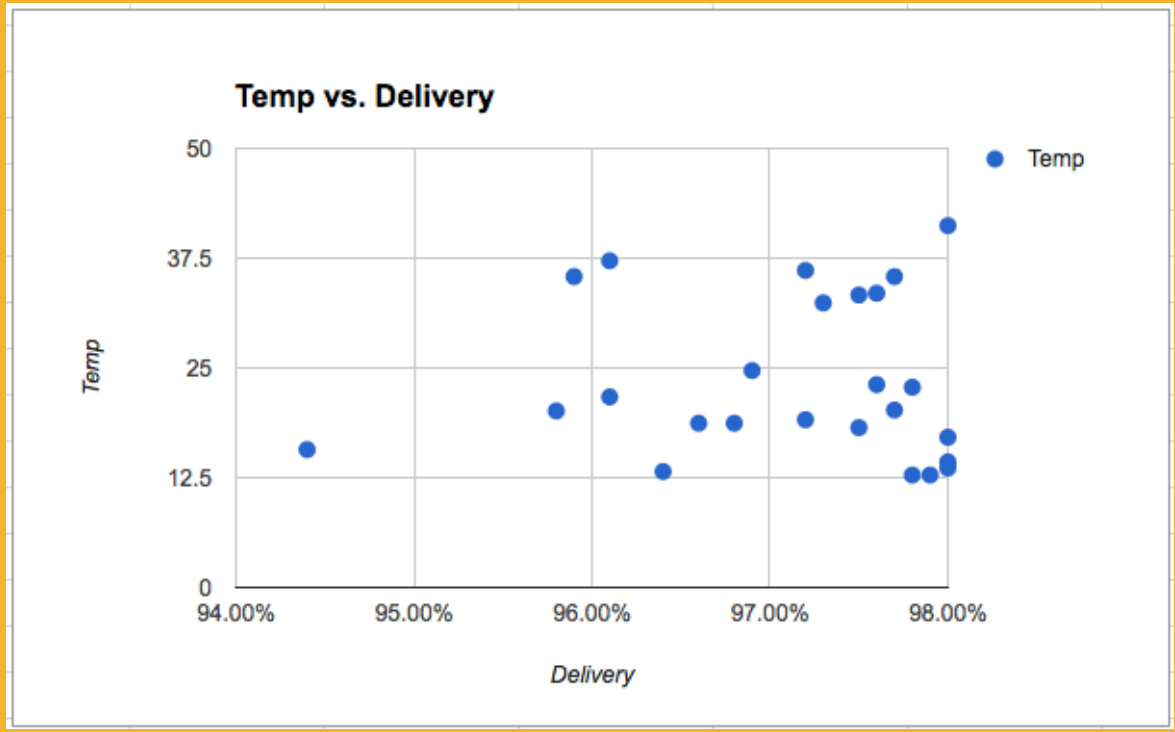
Poor delivery and punctuality when rainfall is between 0 – 7mm



Even for weather, most points on the scatter plot that have low punctuality lie between 15 – 25 °C

But the lowest punctuality rate was on a high temperature day of 33

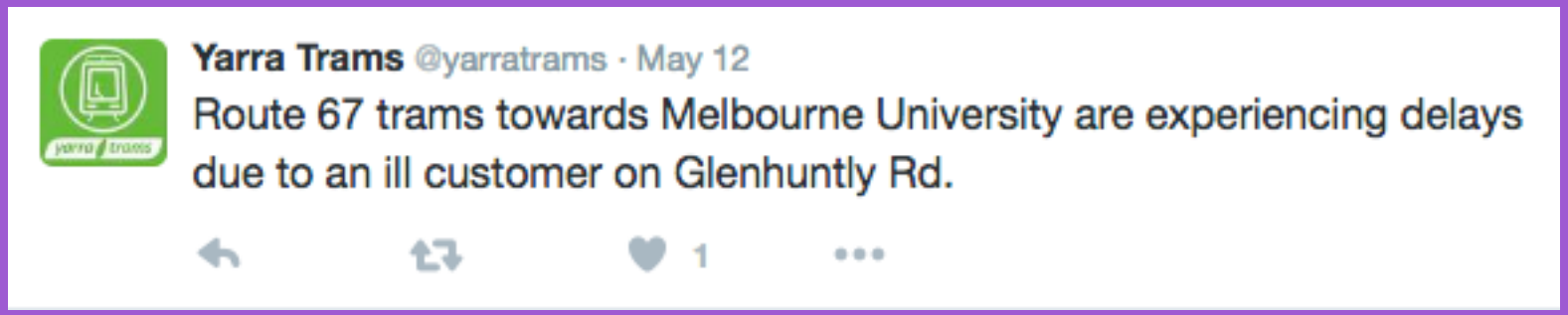
Consistently low deliveries for temp. between 35-40°C



What **Challenges** did I face?

Challenging to get data from PTV

Unable to Eliminate Data caused by Planned Disruptions, Accidents, or ill customers.



Difficult to get different more accurate weather data for each tram route.

Presented By

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