DATA2001

Data Science, Big Data and Data Variety

Week 3

Introduction to SQL

THE UNIVERSITY OF SYDNEY

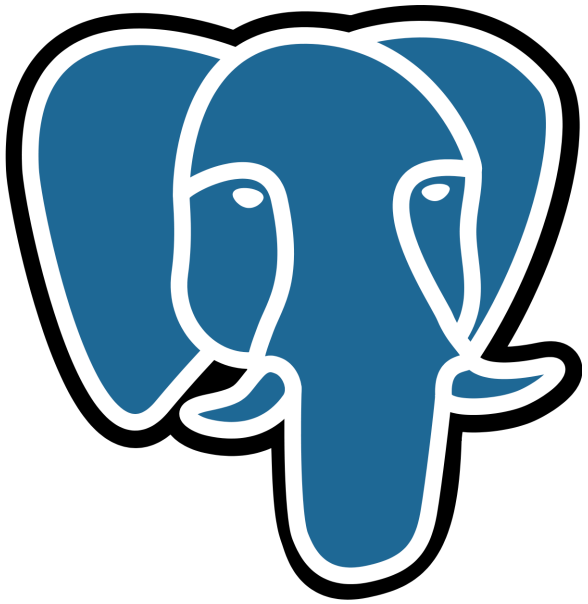
Outline

- Introduction – 10 mins
- Installing and familiarising with pgAdmin – 20 mins
- SQL exercises – 1 hour 15 minutes

pgAdmin

pgAdmin

- Development platform for PostgreSQL, which is an SQL-compliant relational database management system (RDBMS)
- Install through the instructions on Canvas
  (*download link here*)

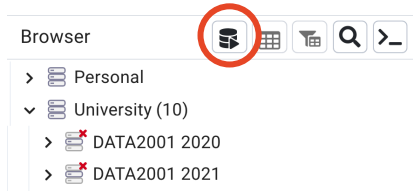


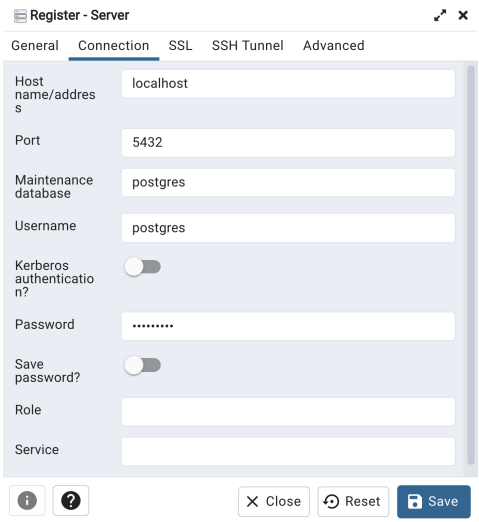
Did You Know?

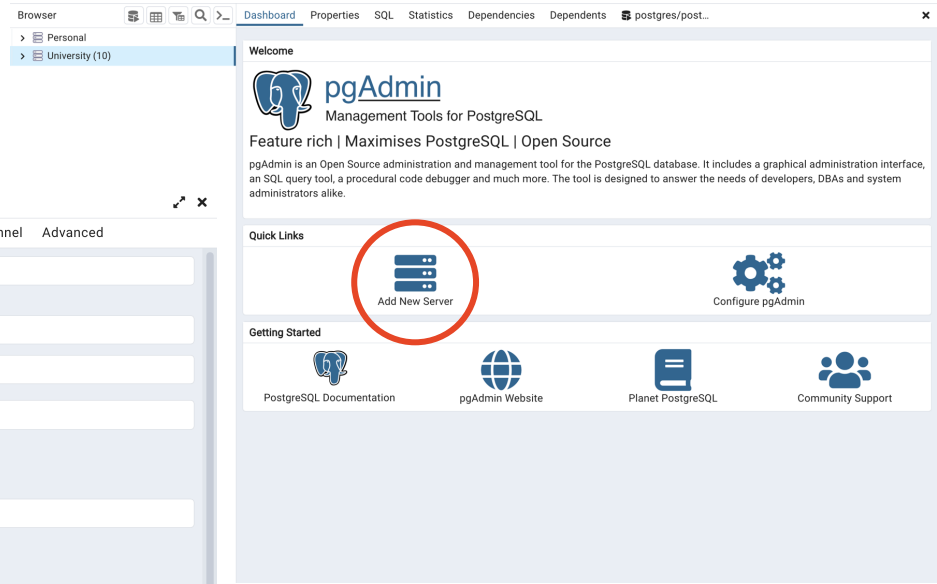
- The elephant logo is named Slonik
- In Japan, the logo is a turtle, originally because "its slow but it gets there"
- Early iterations involved a cheetah (to represent something fast) and a devil penguin (as a spoof of Linux)

Setup

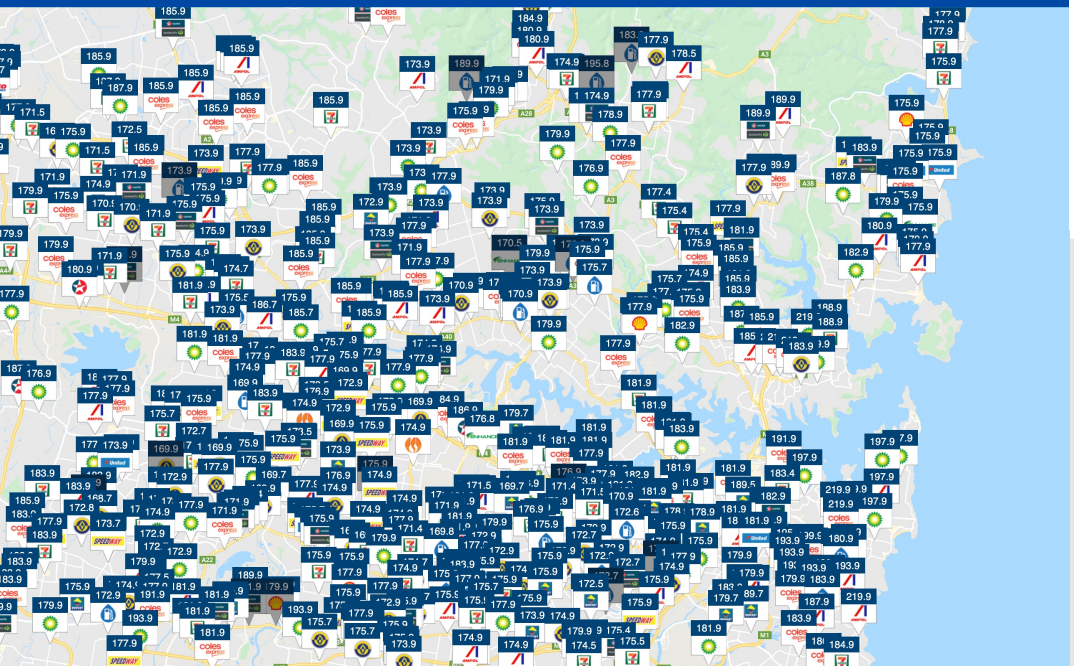
- Once installed, open pgAdmin and select "Add New Server"
  - Name: Your choice (e.g. "DATA2001")
  - Switch to the ”Connection” tab
  - Host/name address: localhost
  - Username is postgres, and password is the one you set on installation
- Scroll down and click on your tab, then press the "Query Tool" button to get started!







FuelCheck



Data.NSW

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Explore Metadata

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JSON | RDF | ISO19115/ISO19139 XML

Data and Resources

FuelCheck FuelCheck provides real-time information about fuel prices at service...	Explore
FuelCheck FAQ	Explore
FuelCheck Data Quality Statement - PDF	Explore
FuelCheck Data Quality Statement - XML	Explore
Fuelcheck Price History September 2016	Explore
Fuelcheck Price History August 2016	Explore
Fuelcheck Price History October 2016	Explore
Fuelcheck Price History November 2016	Explore
Fuelcheck Price History December 2016	Explore
Fuelcheck Price History January 2017	Explore

Publicly available through web API, or in monthly data dumps

Real-time data of fuel prices "at every station across NSW"

We'll be using a 'normalised' version of February 2023's data

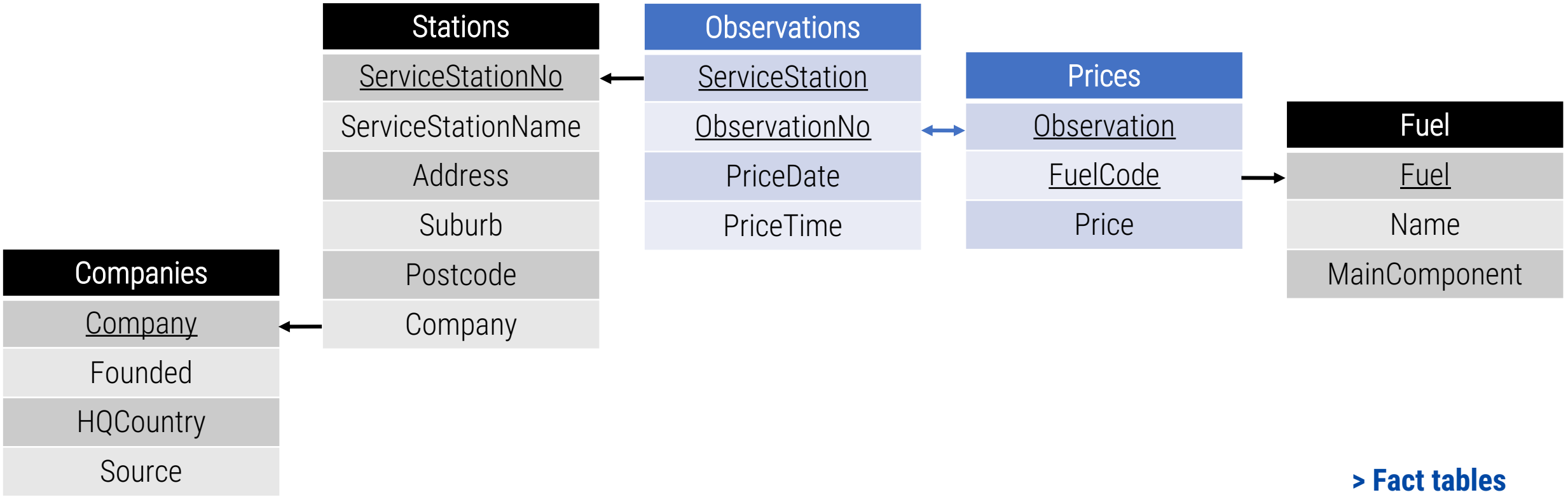
Thought Questions

What benefits are there in analysing this data?

What other information would improve your analysis?

What are the potential implications of this data being publicly available?

Data Schema

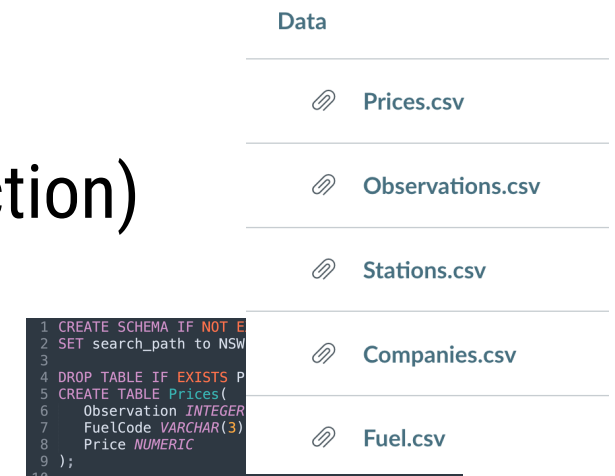


> Fact tables

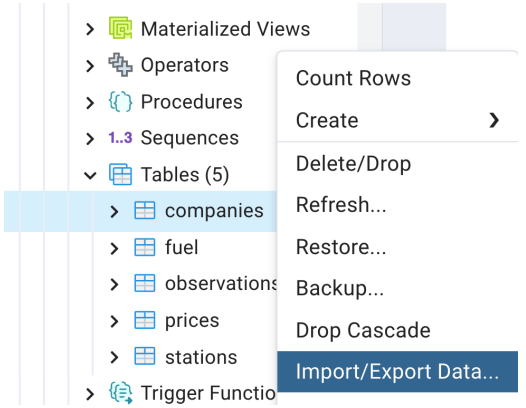
> Dimension tables

Populating the Data

- Download the 5 CSV files on Canvas (Wk 3 Tutorial section)
- Also download the “NSWFuelSchema.sql” file
  - This defines the data types and structure of our tables
- Run the SQL file in your pgAdmin window
  - This can be done by either opening the file, or copy-pasting its contents
- Right-click your server in the left sidebar and “Refresh”
- Find the tables (“Databases > postgres > Schemas > nswfuel > Tables”)
- Right-click each one at a time and import the data
  - Select “Import/Export Data” and load in the matching CSV

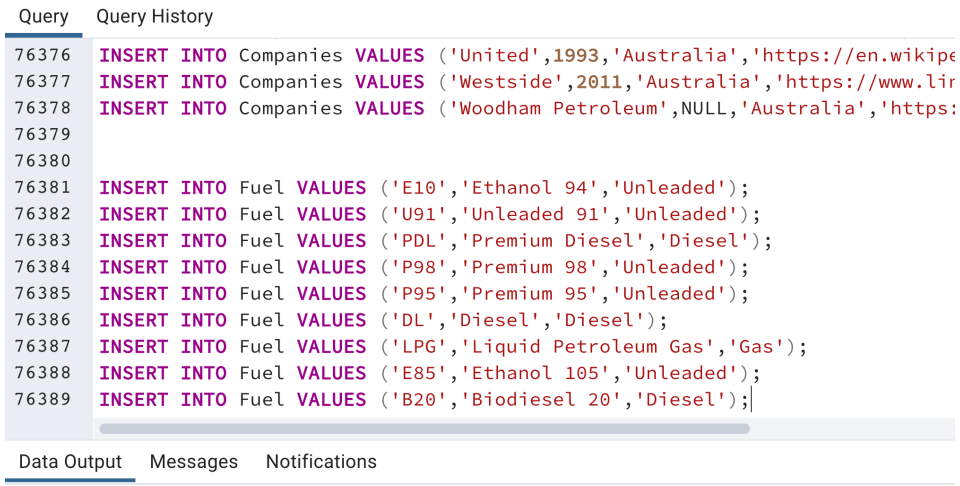



```
CREATE SCHEMA IF NOT E
SET search_path to NSW

DROP TABLE IF EXISTS P
CREATE TABLE Prices(
   Observation INTEGER
   FuelCode VARCHAR(3)
   Price NUMERIC
);

DROP TABLE IF EXISTS Observations;
CREATE TABLE Observations(
   ServiceStation INTEGER,
   ObservationNo INTEGER,
   PriceDate DATE,
   PriceTime TIME,
   PRIMARY KEY (ServiceStation, ObservationNo)
);

DROP TABLE IF EXISTS Stations;
CREATE TABLE Stations(
   ServiceStationNo INTEGER PRIMARY KEY,
   ServiceStationName VARCHAR(100),
   Address VARCHAR(100),
   Suburb VARCHAR(50),
```



Populating the Data

- ALTERNATIVELY: There's also a "NSWFuelData.sql" on Canvas, which can be run in pgAdmin instead of loading in the CSVs sequentially
  - The NSWFuelSchema.sql file must be run first to establish the table structures
  - It's a larger file, filled with "INSERT" values that represent the CSV rows from each file
  - This can be executed by copy-pasting in its contents, or using the "Open file" button
- Run the query using the "Execute/Refresh" button



Using the Data

- The SQL file establishes a schema called "NSWFuel" to hold the data
- First define a 'search_path', to indicate which schema will be used, then try a simple query from one of the five tables
  - Note some are fairly large!

Query Editor | Query History

```
1  set search_path to NSWFuel;
2
3  select * from Fuel;
```

Data Output | Explain | Messages | Notifications

	fuel [PK] character varying (3)	name character varying (50)	maincomponent character varying (50)
1	E10	Ethanol 94	Unleaded
2	U91	Unleaded 91	Unleaded
3	PDL	Premium Diesel	Diesel
4	P98	Premium 98	Unleaded
5	P95	Premium 95	Unleaded
6	DL	Diesel	Diesel

1. Dimension Tables

a) List all recorded stations in your **surrounding suburbs**.

e.g. for stations near Redfern (2016), try searching for stations between postcodes 2014 and 2018

b) What **fuel types** are available in Premium?

If you drive, note the fuel you typically use from the list, we'll use it later.

c) Name the **five oldest** Australian fuel companies listed.

The oldest – Ampol – is itself an interesting case study of potential data quality issues, given its merge, and eventual departure from, Caltex.

2. Prices

a) Return **all occurrences** where the price exceeded 235 cents per litre.

b) Provide the distinct list of **fuel codes** that exceeded this price.

c) Of these fuel codes, **how many times** were each recorded at above this price?

d) While **excluding premium** fuels, list the 10 most expensive occurrences of fuel prices.

3. Observations

a) List all observations made between **2am and 3am**.

b) Of stations in the suburbs you investigated in Q1a), what was the **earliest and latest time** for which observations were made?

c) For these stations and for a selected fuel type (e.g. 'PDL'), list all observations in ascending order of price, with a column indicating whether each observation was made on a **weekday or weekend**.

d) **BONUS:** Order each of these stations by **average price** for your selected fuel type, and also note the total observations for each.

Break 10 minutes