README

CS4010 Project

In this project we have been working on gathering, transforming, storing and visualizing traffic data from the Norwegian Public Roads Administration, with the goal of seeing how speed, traffic volume and weather conditions affect each other and accidents.

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Setup Guide

Prerequisites

You need to have this installed.

- Git
- Docker
- Docker Compose
- Python
  - Dependencies are listed here
- Docker desktop (Optional, if you want a GUI)
- MongoDB Compass (Optional, if you want to GUI to connect to DB)

Setup

Clone this repository. Do this with:

- `git clone git@github.com:hevos93/CS4010.git`

> **Warning!**
> If you are using linux, prepend the docker commands with "sudo", unless you will encounter permission issues.

Navigate to the cloned git folder using a shell on Linux or by using Powershell on Windows. When you are in the project folder, navigate to the directory "prod" and enter the following command (If you want to start the containers at a later point again, use the same command):

- `docker compose up -d --build`

After the images has been downloaded and started, it is possible to check the status of the containers using:

- `docker compose ps -a`

Or by entering docker desktop and looking at the running containers using the GUI.

When you want to shut down the running containers, navigate to the same directory as before and enter the following command:

- `docker compose down`

If something problematic happens, and it may be beneficial to restart containers with this command:

- `docker compose restart`

Notes about the containers

There are several containers that should be up and running.

Container Name	Container Image	Notes	Access URI
mongodb	Mongo:7.0.0	Official MongoDB image	mongodb://localhost:27017, this is accessible through MongoDB Compass
mongo-seed	Custom	Based on Mongo:7.0.0 which has data inserted into, this imports the correct data into	None

Container Name	Container Image	Notes	Access URI
		mongodb and then turns off	
grafana	Custom	Based on Grafana/Grafana-OSS:10.0.0. This image has a prepoulated database which is configured correctly	http://localhost:3000, web browser
jupyter	Custom	Based on Jupyter/Pyspark-notebook:latest, and has the notebook included	http://localhost:8888/lab, web browser
spark	bitnami/spark:3.4	Spark master	http://localhost:8080
spark-worker	bitnami/spark:3.4	Spark master, this container can be scaled into multiple containers	None

Usage

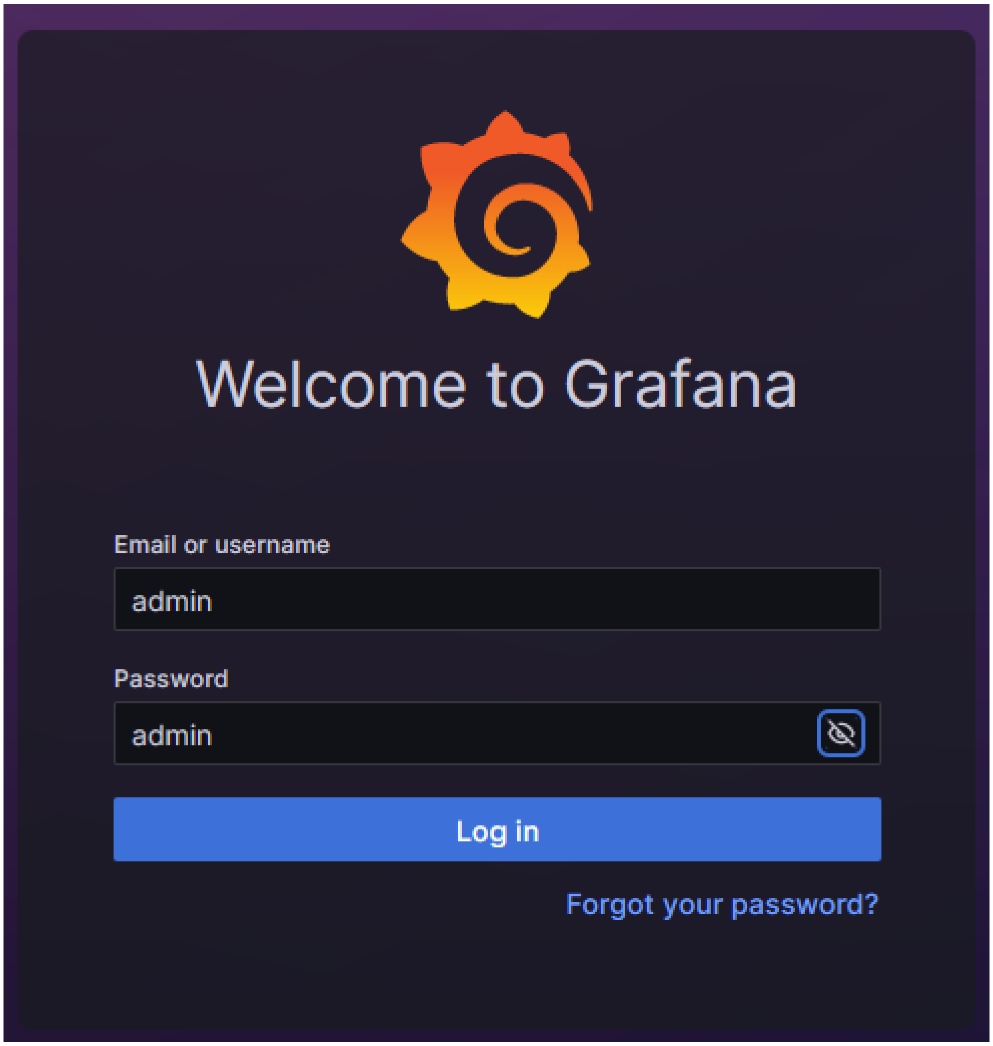
After you have confirmed that the containers are running, you can start to use the containers.

Grafana

Logging in

Go to http://localhost:3000 in your web browser. You are then greeted by a sign-in page.

- Username is "admin"
- Password is "admin"

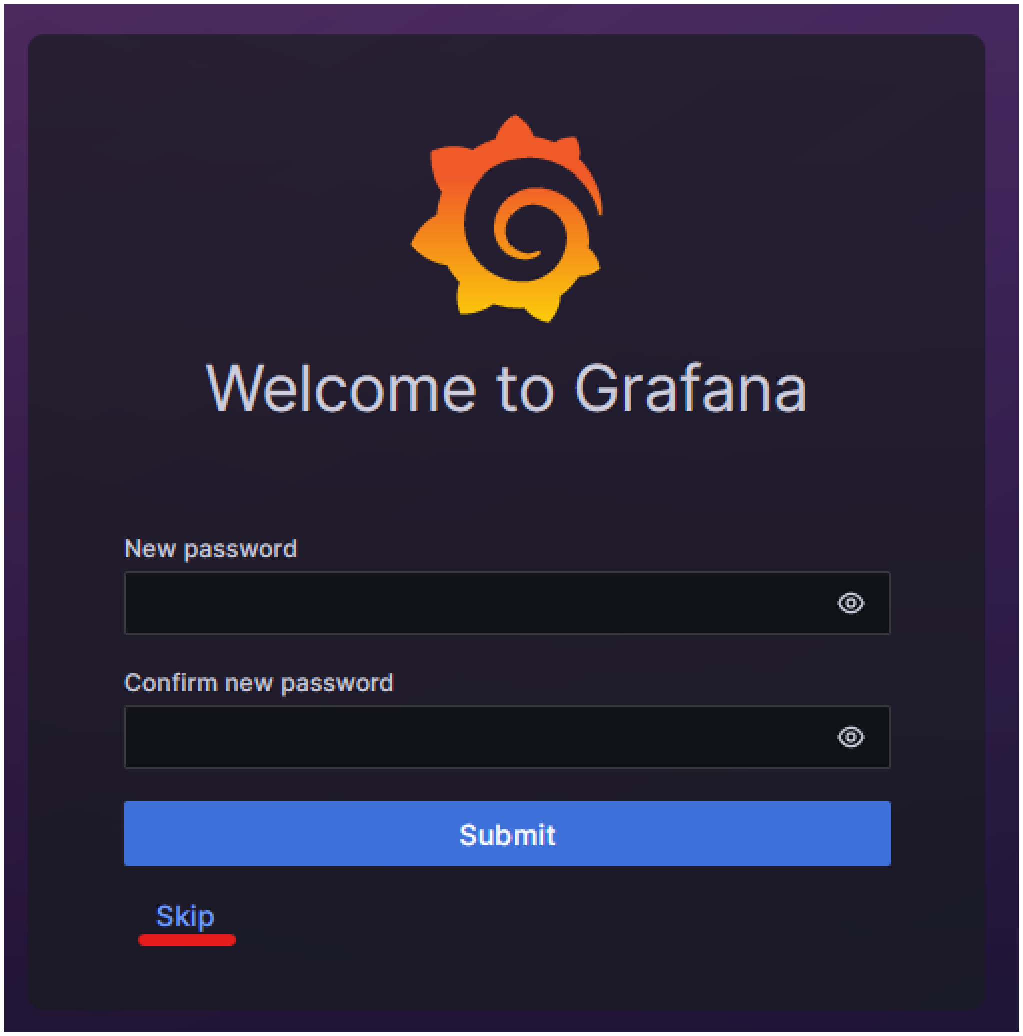


Welcome to Grafana

Email or username: admin

Password: admin

After logging in you are prompted to change the password, you can do so if you like, but remember it. If you change it will be reverted to "admin" when the container restarts.



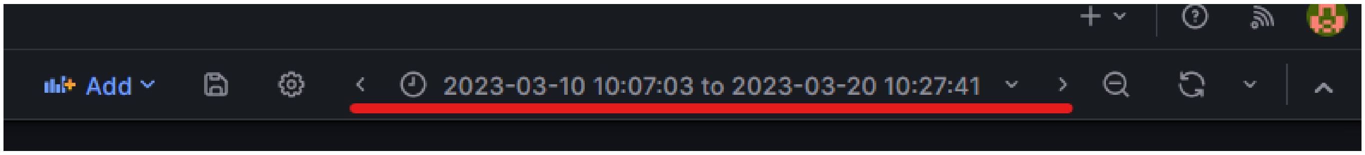
After completing the log in you should be greeted with the correct dashboard.

Using the dashboard

There are several graphs and maps in this dashboard, you can look at each of them by scrolling up and down. With the maps you can drag the map around and zoom in and out if you find something interesting. There are several dots around, by hovering and pressing theses you will find additional information.

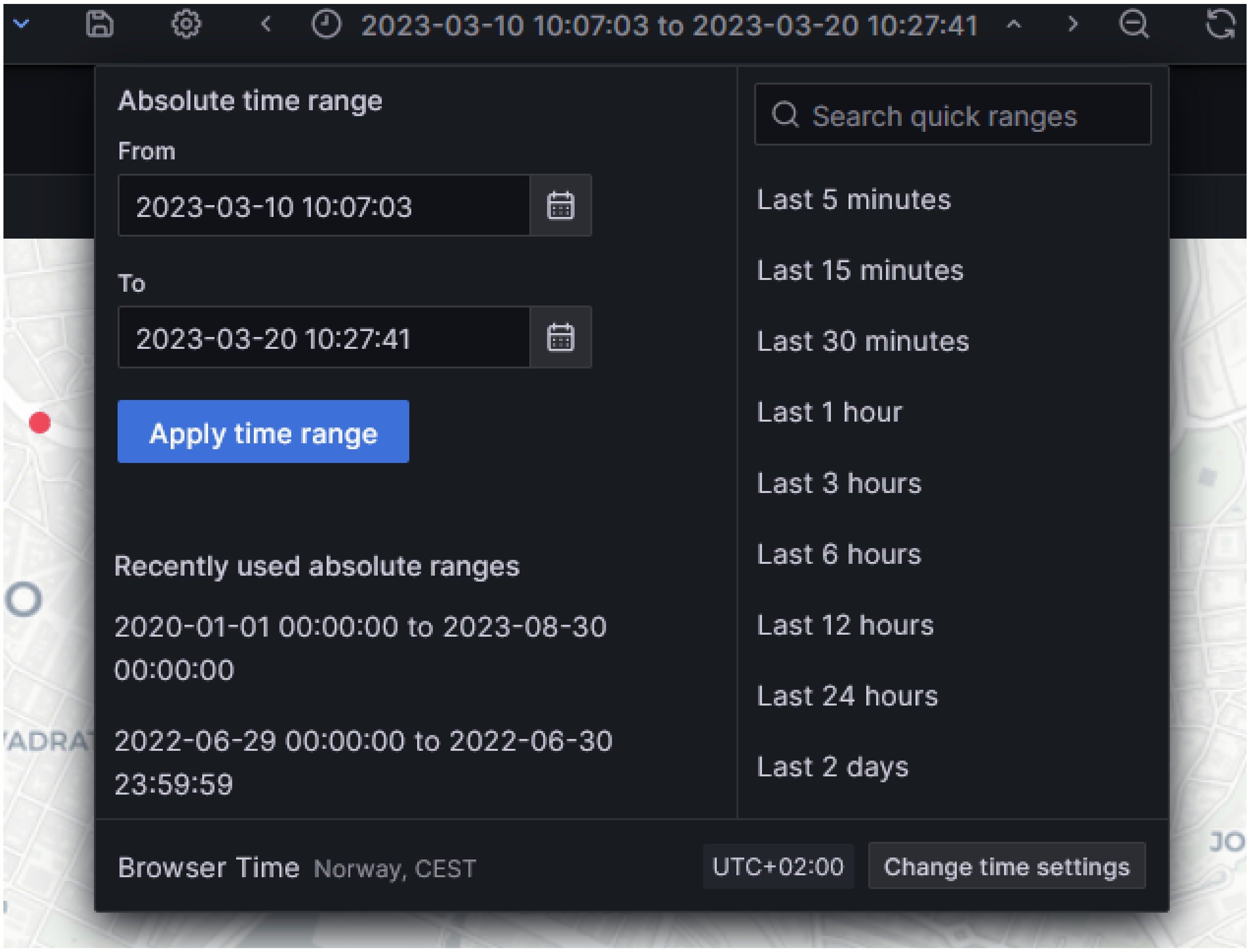
When looking at graphs you should notice your cursor gets tracked, if you press at one point in the graph and drag the cursor, either forward or backward, in time and release. The time should be adjusted to that time interval.

To adjust the global time interval without using graphs, you can look in the top right corner, and find the time widget.



2023-03-10 10:07:03 to 2023-03-20 10:27:41

When you left click on the widget, the time editor pops out. With this you can use on of the preset times at the right side, or choose a custom time by using the timestamps.



2023-03-10 10:07:03 to 2023-03-20 10:27:41

Absolute time range

From: 2023-03-10 10:07:03

To: 2023-03-20 10:27:41

Recently used absolute ranges

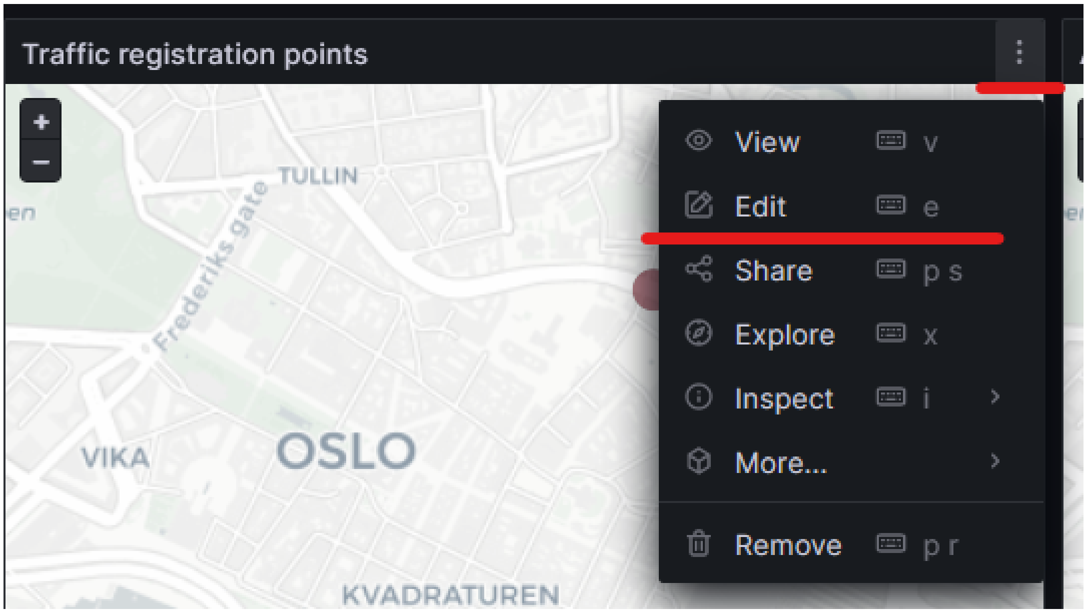
2020-01-01 00:00:00 to 2023-08-30 00:00:00

2022-06-29 00:00:00 to 2022-06-30 23:59:59

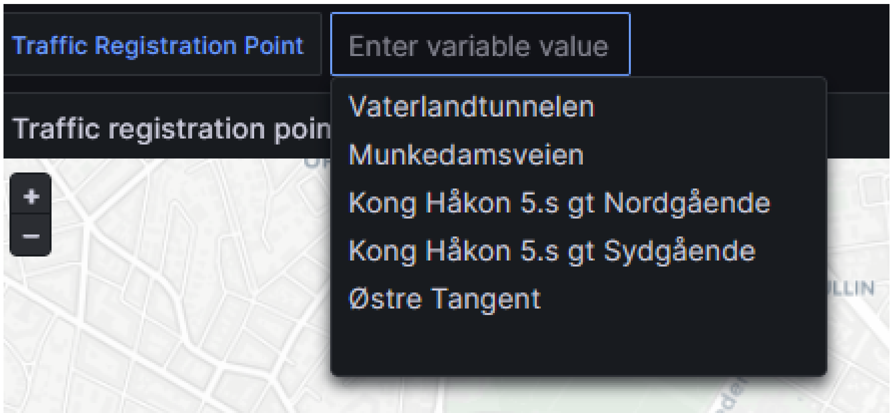
Browser Time Norway, CEST UTC+02:00

> **Info!**
> The total timerange in this project are 2020-01-01 00:00:00 to 2023-08-30 11:00:00

To look at the queries used towards MongoDB you need to press the options in the graph. This button is found by hovering over the title pane of the graph and is located in the top right corner. Furthermore, pressing the edit button in the drop-down menu brings you to the query editor.

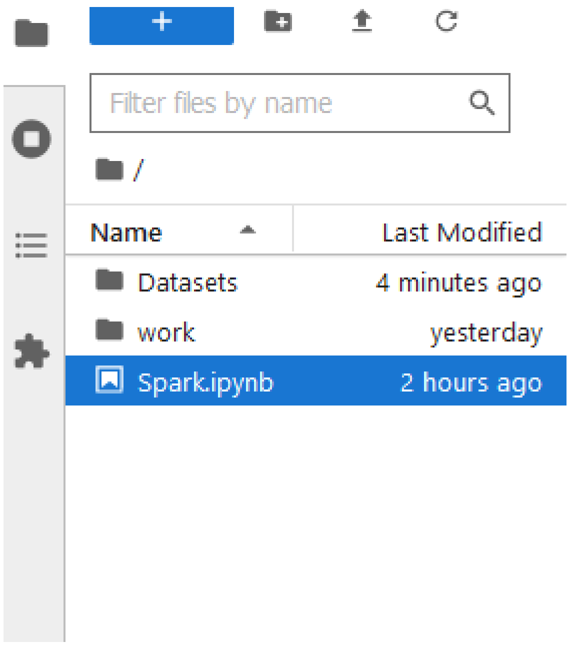


There is one global variable to the Traffic dashboard which can be changed. This is which Traffic Registration Point the dashboard focus on. This can be changed in the upper left corner.


Traffic Registration Point
Enter variable value
Traffic registration poin
Vaterlandtunnelen
Munkedamsveien
Kong Håkon 5.s gt Nordgående
Kong Håkon 5.s gt Sydgående
Østre Tangent

Jupyter Notebook

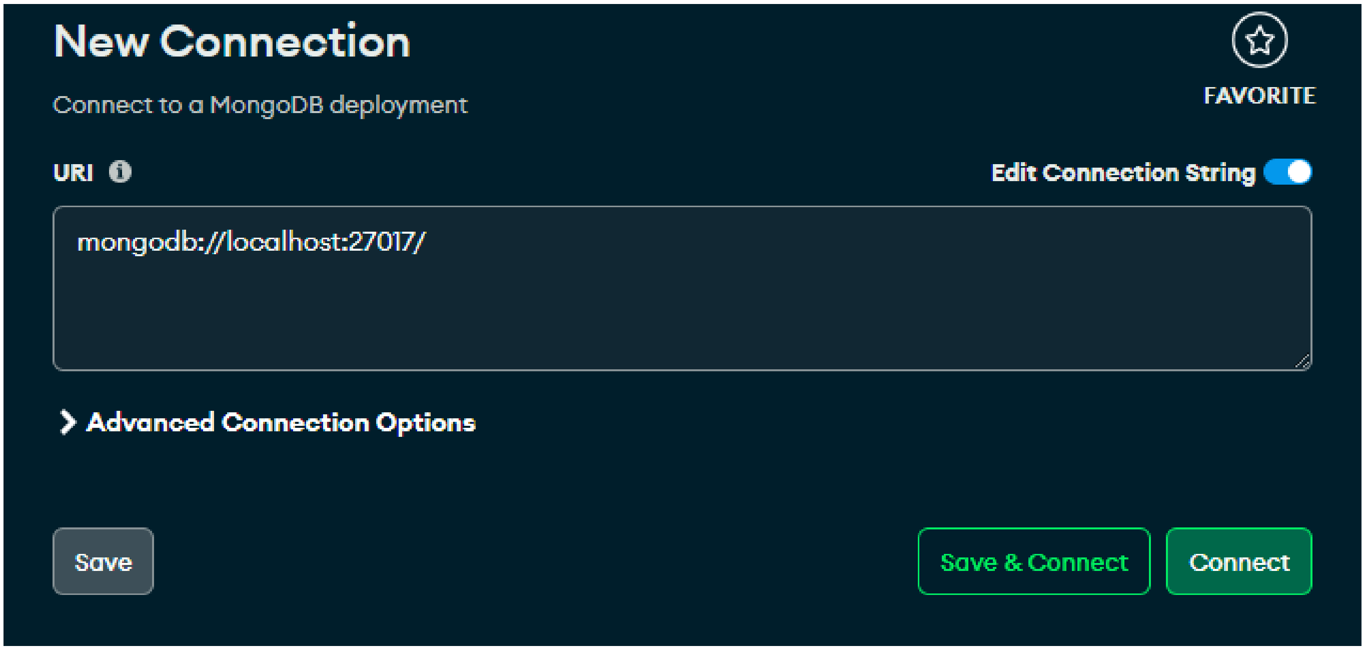
To access the notebook, navigate to http://localhost:8888/lab in you web browser.
In the list to the left you will see Spark.ipynb, this is the python file used to connect to the database, transform data and insert the datasets. There is also a folder called "Datasets" which contains CSV files.



Name	Last Modified
Datasets	4 minutes ago
work	yesterday
Spark.ipynb	2 hours ago

MongoDB

To access MongoDB you need to use a NoSQL viewer, such as "MongoDB Compass" or "NoSQL Booster for MongoDB" and connect to mongodb://localhost:27017.


New Connection

Connect to a MongoDB deployment

URI: mongodb://localhost:27017/

Tools and Technologies

- Python
- MongoDB
- Spark
- Grafana

Traffic Registration Points

Name	Road Reference	TRPID
VATERLANDTUNNELEN	RV162 S1D1 m2975	29403V625517
Kong Håkon 5.s gt Nordgående	RV162 S1D1 m827	71241V2460301
MUNKEDAMSVEIEN	RV162 S1D1 m4949	64557V625518
Kong Håkon 5.s gt Sydgående	RV162 S1D1 m1064	29852V2460300
Østre Tangent	RV162 S1D1 m2015	73840V2041694