T4C: A Framework For Time-Series Clustering-As-A-Service

Code & Paper

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TL;DR

Time-series clustering is hard; T4C is a Python framework which can automatically ingest and cluster time-series datasets, using various models/tools, presenting the results on a web dashboard.

Background

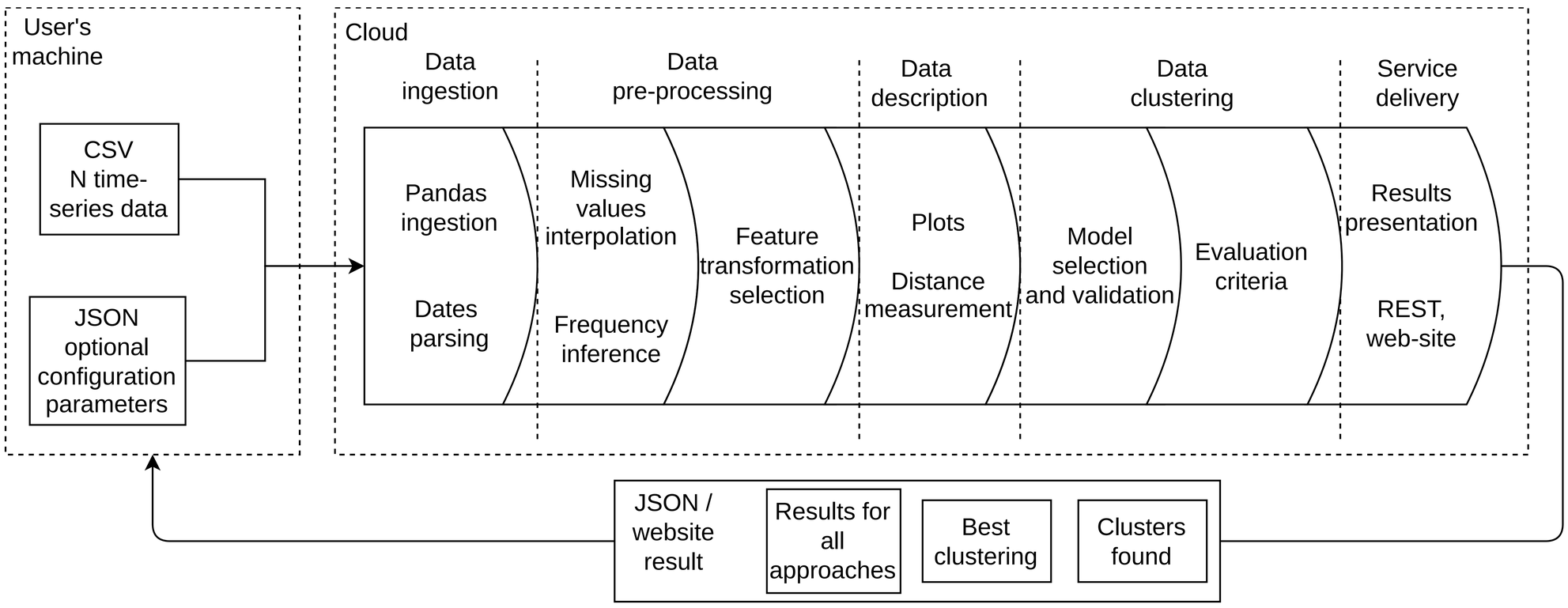
- Time-series clustering is an unsupervised data mining technique whose goal is to organize time-series into groups based on their similarity;
- Different methods for time-series clustering exist, according to the way in which they consider the input data (i.e., *shape* or *observation* based, *feature* based, *model-based);*
- Several distance measures can be used to give a quantifiable indicator on the similarity of two time-series;
- T4C includes all these aspects in a single framework.

Introduction

- T4C is a Python framework being a general and user-friendly solution to offer “time-series clustering as-a-service”.
- T4C can be used providing a JSON file containing a set of parameters and a time-series dataset. T4C will automatically cluster the time-series dataset, showing the results either through a web dashboard or a REST endpoint;
- T4C can also be served interactively, through a website.

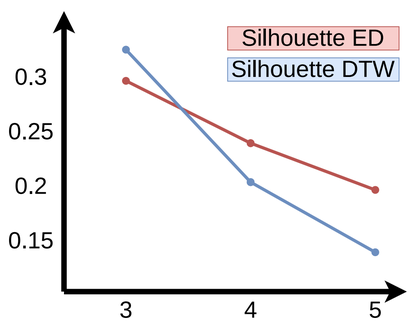
T4C, which is released to the scientific community as an open-source project, has been applied with promising results to the COVID-19 pandemic spread in Italy.

Architecture

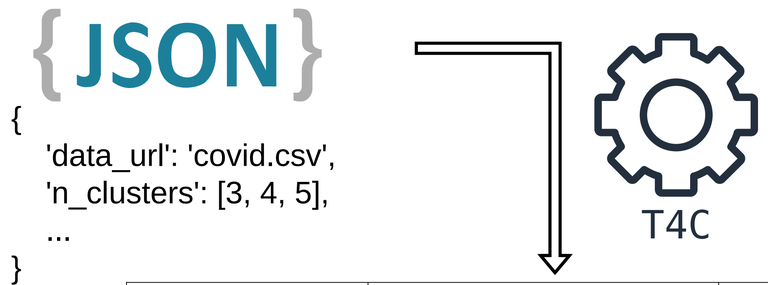


Results

1. Data on the daily "New cases" of Covid-19 have been taken for a large number of countries;
2. The time-series are clustered using T4C;
3. The results show how different countries can be grouped, according to the behaviour of the Covid-19 spread



The number of clusters impacts the clustering metrics!



Cluster 1	Cluster 2	Cluster 3
Argentina	Afghanistan	Albania
Brazil	Andorra	Algeria
France	Angola	Armenia
Germany	Antigua and Barbuda	Australia
India	Bahamas	Austria
Italy	Barbados	Azerbaijan
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Future works

The future works will encompass the use of new clustering models, the application on T4C on industrial use-cases, and the extension on different time-series tasks (e.g., classification).

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