Prof. Dr. Holger Hoos
Chair for AI Methodology
RWTH Aachen University

Open Project:

AutoTSRC: Automated Time Series Representations Classroom

Type:

Bachelor Thesis	☐	
Master Thesis	☐	
Student Assistant	☒	

Daily Supervisor:

Wadie Skaf, M.Sc.
skaf@aim.rwth-aachen.de
Theaterstrasse 35-39, 52062 Aachen, Room 321

Description

Time Series Representations Classroom (TSRC) [1] is a framework that bridges the gap between performance and interpretability in time series representation learning. It leverages specific learning techniques to transfer knowledge from a superior, non-interpretable teacher model to an inferior, interpretable student model using a specific curriculum. The current limitation of this framework is manual design, as it requires the manual setting of both student and teacher models in addition to the manual design of the curriculum, which requires excessive domain knowledge.

The aim of this project is to make the framework more user friendly by utilising Automated Machine Learning (AutoML) methods to minimise manual selection and design, resulting in a package (AutoTSRC) that can be easily installed and used.

Tasks

1. Implement suitable AutoML techniques and methods in the TSRC framework to automate both the curriculum design and the selection of student and teacher models.

2. Refactor the current research code to a production-ready, modular code.

3. Write unit (and integration) tests to achieve full coverage of the base code (TSRC) and the potential library (AutoTSRC).

4. Write comprehensive and standard documentation for the AutoTSRC library.

5. Participate in packaging the AutoTSRC library into a standard package and publish it to PyPI and Conda.

Required Skills

1. Very good Python programming skills.

2. Good understanding of the basics of time series analysis.

3. Familiarity with best coding practices, such as DRY, SOLID, and design patterns.

4. Good knowledge of Git commands and best practices.

5. Good knowledge of Python deep learning frameworks, specifically PyTorch and Lightning.

6. Hands-on experience using AutoML concepts and frameworks is a plus.

7. Experience or familiarity with Rust is a plus.

Employment Conditions

This is a wissenschaftliche Hilfskraft (HiWi) job on "mini-job" basis. The working conditions are as follows:

1. Weekly working hours: between 7.5 and 8.5 hours. Working hours will be fixed on exact weekly days and hours upon agreement with the supervisor (typically 2–3 days/week).

2. Workplace: The workplace is at the Chair for AI Methodology (Theaterstrasse 35-39, 52062 Aachen).

3. Compensation: This position is compensated at the "mini-job" limit as defined by the German laws.

4. Project Timeline: This project has a timeline of 6 months. Therefore, the contract for this project is limited to 6 months. The contract terms will be discussed with the candidate after the interview process.

5. Starting date: The starting date is flexible and can be discussed during and after the interview process.

Application Documents

To apply for this position, please send the following documents (**in one PDF file**) via email to (**skaf@aim.rwth-aachen.de**) with the subject (**HiWi-AutoTSRC-00126**):

1. A CV (or Resume) that includes:

   (a) Full details of your work history and experience.
   (b) Full details of the skills related to this project.
   (c) Link to your GitHub account.
   (d) Links to any piece of code or projects that you are proud of.
   (e) Details about solo projects (if applicable).

2. A brief motivation letter (1 page maximum) that highlights your experience and how you are a good fit for this project. This letter can include, but is not limited to, the following:

   (a) The courses and seminars you attended during your studies that are related to this project and how exactly they are related.
   (b) The experience you obtained from previous jobs or projects that are related to this project.

3. Transcripts for all completed and ongoing degrees (undergraduate and postgraduate).

On the last page of the PDF file, please specify both the earliest possible starting month and the preferred starting month.

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General Notes

1. The TSRC framework is developed through a joint collaboration between the Chair for AI Methodology (AIM) and the Leiden Institute of Advanced Computer Science (LIACS). The paper is published in the Machine Learning journal and can be accessed using the following link: https://github.com/ADA-research/TSRC.

2. Incomplete applications will not be considered. Only shortlisted candidates will be contacted.

3. Applications that have 100% AI-generated text will not be considered (It is completely fine to use AI to proofread and polish your text. However, copying everything from AI-generated texts is not a good practice).

4. Upon completion of this project, there <u>might</u> be an opportunity to work on a different project (i.e., new contract).

References

[1] Wadie Skaf, Mitra Baratchi, and Holger Hoos. "Time Series Representations Classroom (TSRC): A Teacher-Student-based Framework for Interpretability-enhanced Unsupervised Time Series Representation Learning". In: *Machine Learning* (2025). DOI: 10.1007/s10994-025-06895-x.