

At LIACS, Research Software Engineers (RSEs) help to develop and maintain research software. Some of the projects and products our RSEs have been involved in are listed below.

AutodiffCT

This project aims to provide primitive operations and algorithms for Computer Tomography (CT) reconstruction for the PyTorch computational ecosystem. This enables connecting classical CT reconstruction algorithms with deep learning algorithms. It also allows using optimization algorithms from PyTorch for solving various parameter optimization problems in CT, such as geometric calibration, in an end-to-end fashion. This project is a collaboration of LIACS with CWI.

Thialf High-speed Camera Array

The LIACS Sports Data Mining group has installed six high-speed cameras in one of the corners of the Thialf ice skating stadium, and is aiming to track the speed and trajectory of ice skaters through the corner to provide more data for training. A LIACS RSE is assisting with the software pipeline behind this effort.

Affordable Localization Systems (Project)

In various research initiatives, localisation systems play a crucial role. Through supervision of student research projects, we explore various possible solutions for affordable localization systems, where accurate localisation is offered with limited hardware and other costs. Also these systems should be easy to configure and deploy. Among others, we explored the use of Ultra-wideband (UWB), ultrasound, and GPS:

- [Refinement of GPS with GPS beaconing for small-scale environments](#),
- [Ultrasound Indoor Positioning System for Localization of a Moving Object](#)
- [Classification of Pre-defined Movement Patterns: A Comparison between GNSS and UWB Technology](#)

A LIACS RSE supervises software development, mainly carried out by thesis students.

WEARDA

The WEARDA package is a mobile app and background service to capture sensor data with the Samsung Gear Fit2 Pro wearable, running on Tizen OS (version 2.3.1:13). This OS is developed by Samsung and is based on the Linux OS. WEARDA was developed as part of the [Dementia project](#) at LIACS, Leiden University. The WEARDA package has been ported to the Android OS to support the [Schoolyard project](#) of the [Focus on Emotions Lab](#).

A LIACS RSE was responsible for the design, initial development of WEARDA, both on Tizen OS and Android OS.

Website: <https://github.com/liacsprojects/wearda>

RSD: <https://research-software-directory.org/software/wearda>

Publication: [WEARDA: Recording Wearable Sensor Data for Human Activity Monitoring](#)

Q-Sylvan

Q-Sylvan extends the parallel decision diagram library Sylvan (v1.8.0) with QMDDs (i.e. multiplicative AADDs), as well as functionality to simulate quantum circuits.

Since 2023, a LIACS RSE assists in the development of a new software layer between the typical linear algebra operators for Quantum circuit simulators and the MTBDD (i.e. multi-terminal binary decision diagram). Furthermore, this decision diagram type was extended with multiprecision complex numbers to mitigate numerical instability.

Website: <https://sebastiaanbrand.nl/q-sylvan/>

Linking University, City and Diversity (Project)

The project Linking University, City and Diversity is an interdisciplinary project that applies data science techniques to qualitatively and quantitatively visualize the interaction between Leiden University and the city of Leiden from 1575 onwards.

Since 2021, a LIACS RSE has been involved in creating a web application that allows historians and the general public to access, explore, and visualize various historical data sets. Several of the components of the web application have been developed in collaboration with bachelor and master students of LIACS.

Website: [Linking University, City and Diversity](#)

Kansrijke Start (Project)

This project investigates how relevant datasets, for example from Statistics Netherlands (CBS), can be used to support (vulnerable) children and (expectant) parents with timely referral to services that meet their needs, and municipalities to create relevant policies.

In 2023, a LIACS RSE assisted CBS and Erasmus Medical Center in developing an automated pipeline for retrieving and analyzing large data sets in a secured environment.

Website: [Kansrijke Start](#), [Project description LIACS](#)

The ASTRA Toolbox

The ASTRA Toolbox is a MATLAB and Python toolbox of high-performance GPU primitives for 2D and 3D tomography. The ASTRA Toolbox was developed by CWI and Antwerp University.

Since 2023, a LIACS RSE has been involved in the maintenance and continued development of the ASTRA Toolbox.

Website: <https://github.com/astra-toolbox/astra-toolbox>

Website: <https://astra-toolbox.com/>

SubDisc

SubDisc is a data mining tool for subgroup discovery: discovering local patterns in data.

In 2021, a LIACS RSE assisted the Sports Data Analytics group in refactoring and consolidating SubDisc (previously known as Cortana) and adding a R API.

In 2023, a LIACS RSE assisted in adding a Python API.

Website: <https://github.com/SubDisc/SubDisc>

Sparkle

Sparkle is a problem solving and competition platform providing easy access to automatic algorithm selection and automatic algorithm configuration for experts and non-experts.

In 2021, a LIACS RSE assisted the ADA group in refactoring the Sparkle code base and preparing it for future development.

Website: <https://ada.liacs.nl/projects/sparkle/>