Energy efficiency for high performance computing is a current hot topic in scientific research. Many Android(tm) devices have an integrated GPU and a vendor supplied OpenCL shared C library on the device. Although not directly supported by Android, these OpenCL libraries allow to address onboard GPUs by application developers. In a former project a comfortable development environment for Android studio has been created. A C wrapper library serves as link between the Java/JNI/C part of an application and the OpenCL library on the device. Locking mechanisms allow to use the GPU in a safe manner and free resources timely after the application has been stopped externally (by the user or the operating system).

For this project the wrapper library already developed should be used to implement data mining algorithms with OpenCL and compare runtimes on the GPU with those achieved on the device (Java and C with SIMD instructions). Candidate algorithms are DBSCAN, KNN, Subclu and Optics. Students may implement further algorithms at their pleasure. An application stub with the OpenCL wrapper library will be provided.

Prerequisites:
(1) Good knowledge of Java, C and OpenCL (Kotlin only upon agreement)
(2) Knowledge of GPU design
(3) The student should be familiar with the IDE (Android Studio) for the application development.
(4) The student must have an Android device (tablet or mobile phone) with an integrated GPU and the OpenCL library must be available on the device (please check directories /system/lib, /system/lib64, /vendor/lib, /vendor/lib64 and technical documentation of the device). The application can NOT be developed with the AVD manager (GPU not supported)! If the Android OS version on the tablet is 7.0 or later (API>=24), please check if the name of the OpenCL library is listed in the files /vendor/etc/public.libraries.txt or /system/etc/public.libraries-COMPANYNAME.txt on the device, because if not, Android does not allow to dynamically load the library at runtime. This is a mandatory prerequisite for the use of the wrapper library.
(5) For the use of SIMD instructions, either knowledge of (inline) assembler (depending on the students tablet CPU architecture arm-v7, aarch64, x86 or x86_64) or knowledge of the use of SIMD intrinsics (NEON or SSE) in C.