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OpenHRD - an open source platform for calculation of homologous recombination deficiency scores from OncoScan microarrays

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Homologous recombination deficiency is an important biomarker for PARP inhibitor therapy in ovarian cancer. Existing open-source tools lack standardized parameters and require IT expertise. This project aims to establish a web-based bioinformatic analysis system for robust assessment of genomic instability. OncoScan-CNV data was obtained from the DNA of ovarian cancer formalin fixed embedded specimens under the ethics approved project 33-113 ex 20/21. The cohort is composed of 20 training and 12 validation samples. The analysis platform uses raw OncoScan microarray images and applies the open source "Allele-specific copy number analysis of tumors" pipeline to perform window segmentation. Calculation of HRD was performed by combination of custom R-scripts, "scarHRD" and "oncoscanR" pipelines. Additionally commercial diagnostic HRD test by Myriad myChoice CDx was obtained. It was observed the penalty value affects the HRD score. Where at a higher penalty value, the correlation to Myriad myChoice CDx improved. For this reason penalty of 70 was selected as default for the analysis. Based on the results of the training cohort and considering the accepted HRD threshold of 42, a correction method based on the linear regression model was applied and tested in the validation cohort. Subsequently, the application of the fully automated OpenHRD pipeline with standardized parameters revealed a high correlation to results obtained with the commercial Myriad myChoiceCDx test. The OpenHRD web application runs with Django Python and Celery Task Queue web frameworks. It takes the OncoScan .CEL files as input and generates a zip archive with HRD results. Its is currently available under registration. Several studies have shown that HRD is a reliable marker for treatment decisions in PARPi therapy. In this study we provided a simple, standardized, web based system to analyse HRD, which is able to process the microarray scan raw image data and generate reliable HRD score values.