Using savR

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```
> library(savR)

> fc <- savR(system.file("extdata", "MiSeq", package="savR"))

> fc
savProject instance with 1 lanes, 82 total cycles and 1 sequencing runs.

> pfBoxplot(fc)
```

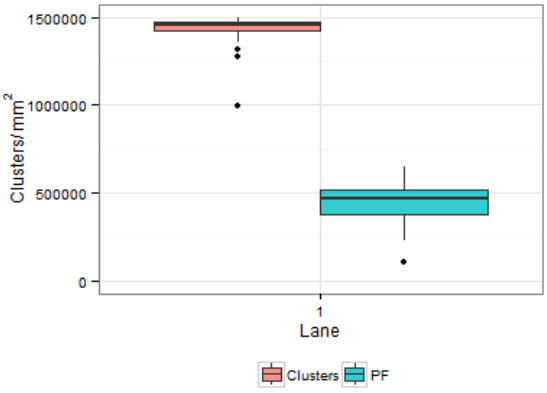

Figure 1: Boxplot of total vs. PF clusters

Introduction

The Illumina Sequence Analysis Viewer (SAV) is a Windows application provided by Illumina that presents graphs made in real time from data collected over the course of basecalling. This data was previously also made available in HTML format for inspection after the run; however, it is now preserved in binary format and not simply parsed by users who wish to perform automated quality assessment. Here is presented *savR*, an R package to parse the binary output, generate QC assessment plots and make the data available to users of Illumina sequencing instruments. For more information about Illumina SAV, please consult the Illumina iCom website and the Sequencing Analysis Viewer User's Guide, available *online*.

Description

The `savR` function is passed a path to an Illumina HiSeq or MiSeq run, and returns a `savProject` object, containing the parsed data. Accessor methods are available for information in the `RunInfo.xml` file as well as the parsed SAV Metrics files. These include corrected intensities, quality metrics, tile metrics, and extraction metrics. The *savR* package comes with an example MiSeq data set which can be loaded thusly:

```
> fc <- savR(system.file("extdata", "MiSeq", package="savR"))
```

RunInfo.xml

The `RunInfo.xml` file is parsed and stored in the slots of the `savProject` object. There are accessor methods for the project's `location`, `reads`, number of "ends" or `directions`, the `run` ID, the number of `cycles`, and a description of the `flowcellLayout`.

```
> directions(fc)
[1] 1
> reads(fc)
[[1]]
An object of class "illuminaRead"
Slot "number":
[1] 1

Slot "cycles":
[1] 76

Slot "index":
[1] FALSE


[[2]]
An object of class "illuminaRead"
Slot "number":
[1] 2

Slot "cycles":
[1] 6

Slot "index":
[1] TRUE
> cycles(fc)
[1] 82
> flowcellLayout(fc)
An object of class "illuminaFlowCellLayout"
Slot "lanecount":
[1] 1

Slot "surfacecount":
[1] 2
```

```
Slot "swathcount":
[1] 1

Slot "tilecount":
[1] 19
```

Corrected intensitites

Corrected intensity metrics (obtained from `CorrectedIntMetricsOut.bin`) can be inspected by the `correctedIntestites` accessor method:

```
> head(correctedIntensities(fc), n=1)
  lane tile cycle avg_intensity avg_cor_A avg_cor_C avg_cor_G avg_cor_T
2    1 1101     1            80        72        17       116       101
  avg_cor_called_A avg_cor_called_C avg_cor_called_G avg_cor_called_T num_none
2              212              266              283              277      339
  num_A num_C  num_G  num_T sig_noise
2 97572 17051 136607 127150  6.704378
```

This is a `data.frame` of intensity metrics; one line for each set of lane, tile and cycle measurements. Reported statistics include average intensity, corrected intensity (for cross-talk between bases and phasing/pre-phasing), called corrected intensities, number of called bases and signal to noise ratio. There are methods which act upon `savProject` objects to produce QC plots, for example plotIntensity to assess signal intensity for each channel as in figure 2.

```
> plotIntensity(fc)
```

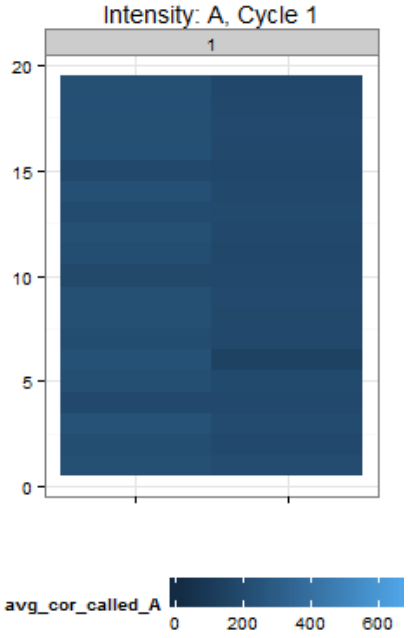

Figure 2: Corrected intensity plot: cycle 1, base "A".

Quality Metrics

The quality metrics (`QMetricsOut.bin`) file contains per-lane/tile/cycle metrics for the number of clusters with quality at each PHRED value from 1-50.

```
> head(qualityMetrics(fc), n=1)
  lane tile cycle Q1 Q2 Q3 Q4 Q5 Q6 Q7 Q8 Q9 Q10 Q11   Q12 Q13 Q14 Q15 Q16 Q17
1    1 1101     1  0  0  0  0  0  0  0  0  0   0   0 17087   0   0   0   0   0
  Q18 Q19 Q20  Q21 Q22  Q23  Q24 Q25 Q26   Q27 Q28 Q29 Q30   Q31   Q32   Q33
1   0   0   0 6562   0 5323 5901   0   0 13362   0   0 250 22276 13477 12757
     Q34 Q35 Q36 Q37 Q38 Q39 Q40 Q41 Q42 Q43 Q44 Q45 Q46 Q47 Q48 Q49 Q50
1 281724   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0

> qualityHeatmap(fc,1,1)
```

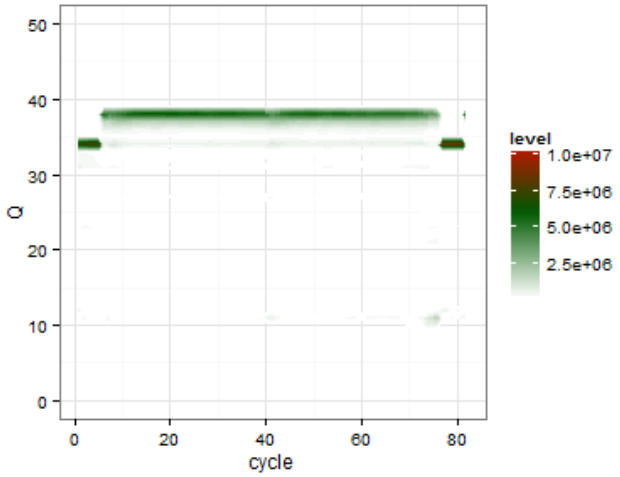

Figure 3: Quality heatmap: lane 1, read 1.

Tile Metrics

The tile metrics (`TileMetricsOut.bin`) file contains coded information about per-lane/cycle/tile cluster density, pass-filter clusters, phasing and pre-phasing data. Consult the `tileMetrics` help page for more information.

```
> head(tileMetrics(fc), n=4)
   lane tile code     value
39    1 1101  100 1271891.8
41    1 1102  100 1455525.0
43    1 1103  100  995404.6
45    1 1104  100 1463691.8
```

Extraction Metrics

The extraction metrics (`ExtractionMetricsOut.bin`) file contains per-lane/cycle/tile information about per-base FWHM (full width pixel size of clusters at half maximum) and 90th %-ile intensity of signal intensity.

```
> head(extractionMetrics(fc), n=1)
  lane tile cycle   FWHM_A   FWHM_C  FWHM_G   FWHM_T int_A int_C int_G int_T
2    1 1101     1 2.235387 2.308783 1.86132 2.174398   180   326   357   400
```

Coda

There is a convenience function (`buildReports`), which partially reconstructs the Illumina reports folder that was previously generated by the Illumina instrument software and which was superseded by SAV and InterOp files.