Universal Platform to Extract and Analyze QC Data

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Benjamin Ramcharitar [1], Kathleen Daniels[2], Rui Gardner [1]

[1] Flow Cytometry Core Facility, Memorial Sloan Kettering Cancer Center, New York, NY, United States,

[2] Flow Cytometry Core Facility, Whitehead Institute for Biomedical Research, Massachusetts, MA, United States

Flow Cytometry Core Facility — Memorial Sloan Kettering Cancer Center 1884

Whitehead Institute

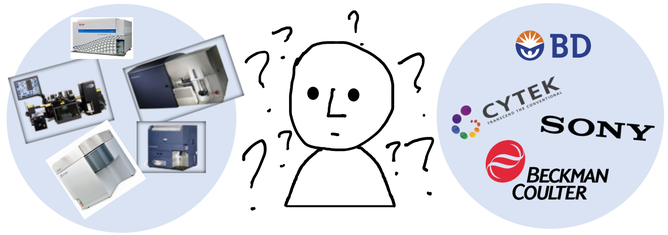
Objectives

a) Develop a universal, open-source QC platform in R
b) Automatically gate and calculate QC statistics from FCS files
c) Display QC statistics with interactive plots to generate predictive outcomes of maintenance or repair

Why?

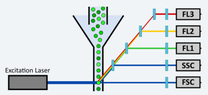
There are many different:

- Flow cytometer manufacturers
- Instruments, lasers, and detectors
- QC Beads and acquisition software



Difficult to track performance and predict problems in labs with multiple flow cytometers

Pipeline



- Run QC beads
- Export FCS files

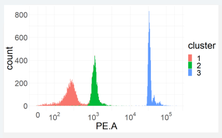
- **Read FCS files from cloud/ server**
- Perform k-means clustering
- Calculate summary statistics for each autogated peak
- Export raw clustered data and summary statistics

- **Pull statistics and clustered raw data from cloud/server**
- Create interactive plots using Plotly and Shiny.
- **Export to shinyapps.io, website, or run Shiny App locally in R.**

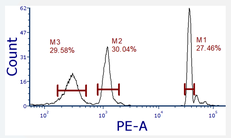
Validation

Automated vs. Manual Gating

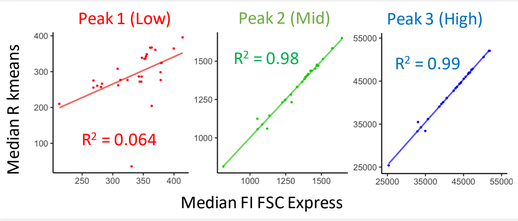
R k-means



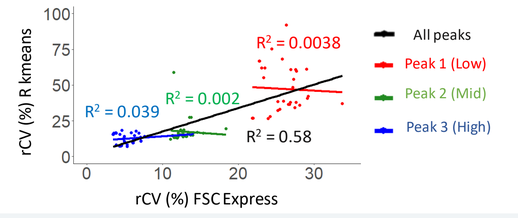
FCS Express



Median Fluorescence Intensity

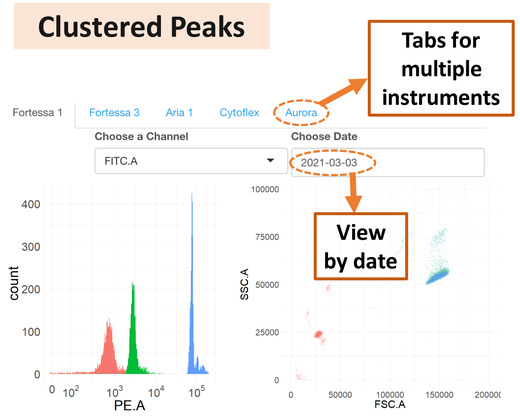


rCVs

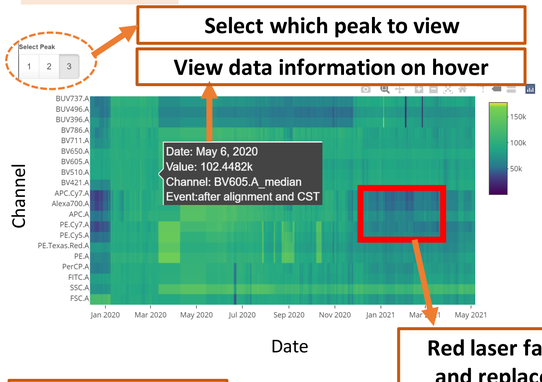


Shiny App Output

Clustered Peaks



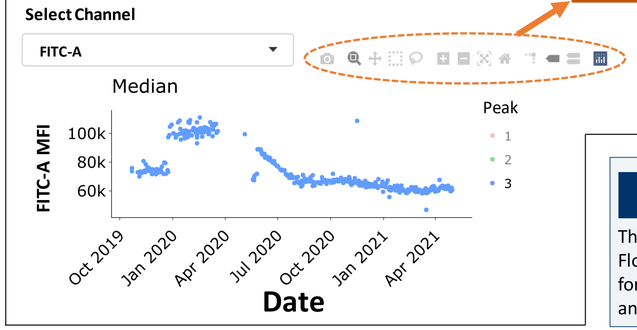
Heatmaps



Red laser failed and replaced, note decrease MFIs

Levey–Jennings Plots

Interactive Plotly plot. Can zoom, pan, screenshot, etc.



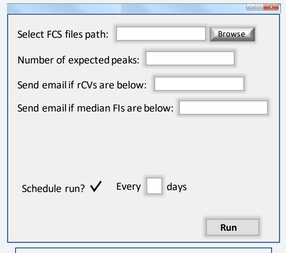
Demo App, Poster, More info

Acknowledgments

Thank you to the amazing Flow Cytometry Core team at MSK for their feedback on this project and poster

Future Work

User Friendliness



Demo model of application GUI

Automatic alerts for when specs (ie. rCVs, MFIs) are out of range.

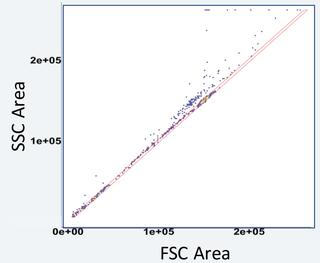
Build GUI as an alternative to hard coding in R for customizing clustering and data analysis

Automate based on QC schedule

Improve Clustering

How do we automatically gate out Doublets/Debris?

Singlet gate: flowStats package



Mixture Model Clustering: flowClust package

Assigns probability that datapoint belongs to cluster