

# **FLAQ\_SC2\_Meta**

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Advanced Molecular Detection  
Southeast Region Bioinformatics

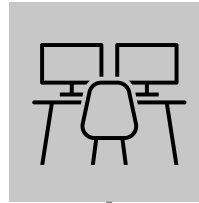
December 09, 2024

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# Updates

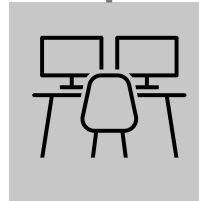
## Office Hours

2024



December 23  
Daytona Dengue

January 6  
Amelia



2025



# Overview

## Purpose

Analyze SARS-CoV-2 genetic data from environmental metagenomic samples (such as wastewater) and generates detailed reports

## Usage

To support public health and researchers to provide insights into viral genetic diversity and prevalence within samples

## Dependencies

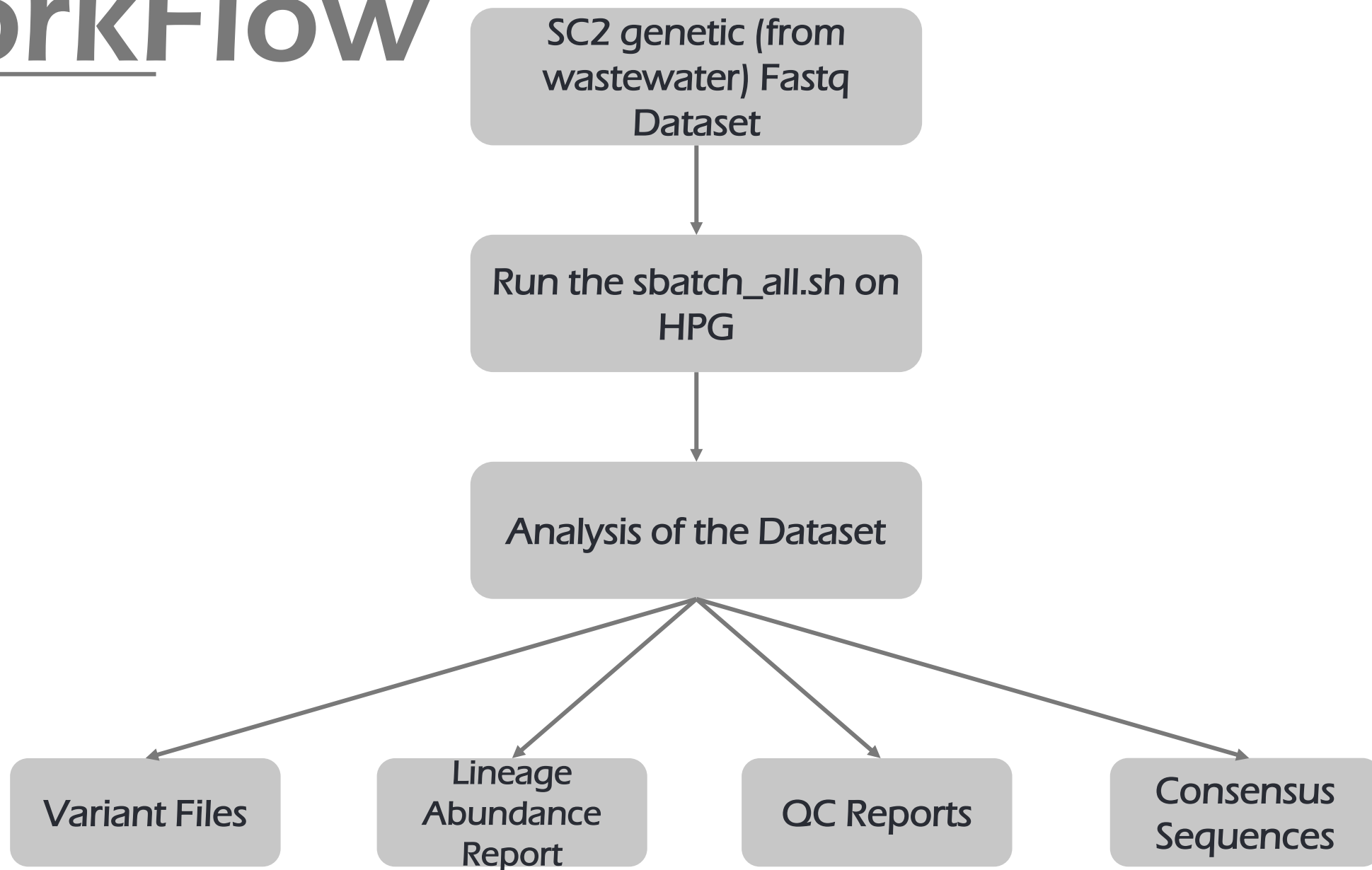
Python3

Singularity

Freyja



# WorkFlow



# Application

## Objective

Use SC2 genetic dataset (wastewater) and analyze the dataset using **FLAQ\_SC2\_Meta** pipeline.



# Application Cont.

```
cd /blue/bphl-<state>/<user>/repos/bphl-molecular/  
git clone https://github.com/BPHL-Molecular/flaq_sc2_meta  
mkdir analysis/  
cd analysis/  
cp /blue/bphl-<state>/<user>/repos/bphl-molecular/  
  flaq_sc2_meta /*  
mkdir fastqs_ww/  
cp /path/to/fastqs_ww/*.fastq.gz fastqs_ww/
```

/blue/bphl-florida/n.yengalareddy/repos/bphl-molecular/analysis/flaq\_sc2\_meta1202/\*.\*

Name	Size	Changed
..		12/2/2024 8:54:45 AM
2024-12-02-122021_flaq_ww_run		12/2/2024 9:36:29 AM
fastqs_ww		12/2/2024 9:15:25 AM
primers		12/2/2024 8:42:42 AM
reference		12/2/2024 8:42:44 AM
flaq_sc2_meta.51605080.err	21 KB	12/2/2024 9:37:04 AM
flaq_sc2_meta.51605080.out	0 KB	12/2/2024 9:20:10 AM
flaq_sc2_meta_all.py	15 KB	11/26/2024 9:32:41 AM
Guide_for_installation.txt	1 KB	11/26/2024 9:32:41 AM
LICENSE	2 KB	11/26/2024 9:32:41 AM
README.md	4 KB	11/26/2024 9:32:41 AM
sbatch_all.sh	1 KB	12/2/2024 9:18:04 AM

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# Application Cont.

`nano sbatch_all.sh`

```
GNU nano 2.9.8 sbatch_all.sh

#!/bin/bash
#SBATCH --account=bph1-umbrella
#SBATCH --qos=bph1-umbrella
#SBATCH --job-name=flaq_sc2_meta
#SBATCH --mail-type=END,FAIL
#SBATCH --mail-user=nikhil.yengala@flhealth.gov
#SBATCH --ntasks=1
#SBATCH --cpus-per-task=15
#SBATCH --mem=100gb
#SBATCH --time=24:00:00
#SBATCH --output=flaq_sc2_meta.%j.out
#SBATCH --error=flaq_sc2_meta.%j.err

module load apptainer

#Run script/command and use $SLURM_CPUS_ON_NODE

primers="4.1"
```



# Application Cont.

**activate** conda environment containing freyja  
&  
**sbatch** sbatch\_all.sh

↓

/blue/bphl-florida/n.yengalareddy/repos/bphl-molecular/analysis/flaq_sc2_meta1202/*		
Name	Size	Changed
2024-12-02-122021_flaq_wv_run		12/2/2024 8:54:45 AM
fastqs_wv		12/2/2024 9:36:29 AM
primers		12/2/2024 9:15:25 AM
reference		12/2/2024 8:42:42 AM
flaq_sc2_meta.51605080.err	21 KB	12/2/2024 9:37:04 AM
flaq_sc2_meta.51605080.out	0 KB	12/2/2024 9:20:10 AM
flaq_sc2_meta_all.py	15 KB	11/26/2024 9:32:41 AM
Guide_for_installation.txt	1 KB	11/26/2024 9:32:41 AM
LICENSE	2 KB	11/26/2024 9:32:41 AM
README.md	4 KB	11/26/2024 9:32:41 AM
sbatch_all.sh	1 KB	12/2/2024 9:18:04 AM

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# Application Cont.

/blue/bphl-florida/n.yengalareddy/repos/bphl-molecular/analysis/flag\_sc2\_meta1202-12-02-122021\_flag\_ww\_run/\*

Name	Size	Changed
..		12/2/2024 9:20:21 AM
I289		12/2/2024 9:21:23 AM
I290		12/2/2024 9:22:29 AM
I291		12/2/2024 9:26:40 AM
I292		12/2/2024 9:27:51 AM
I293		12/2/2024 9:29:00 AM
I294		12/2/2024 9:30:08 AM
I295		12/2/2024 9:31:25 AM
I296		12/2/2024 9:32:36 AM
I297		12/2/2024 9:33:48 AM
I298		12/2/2024 9:34:56 AM
I299		12/2/2024 9:36:12 AM
I300		12/2/2024 9:37:22 AM
report.txt	2 KB	12/2/2024 9:37:49 AM

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/blue/bphl-florida/n.yengalareddy/repos/bphl-molecular/analysis/flag\_sc2\_meta1202/\*

Name	Size	Changed
..		12/2/2024 8:54:45 AM
2024-12-02-122021_flag_ww_run		12/2/2024 9:36:29 AM
fastqs_ww		12/2/2024 9:15:25 AM
primers		12/2/2024 8:42:42 AM
reference		12/2/2024 8:42:44 AM
flag_sc2_meta.51605080.err	21 KB	12/2/2024 9:37:04 AM
flag_sc2_meta.51605080.out	0 KB	12/2/2024 9:20:10 AM
flag_sc2_meta_all.py	15 KB	11/26/2024 9:32:41 AM
Guide_for_installation.txt	1 KB	11/26/2024 9:32:41 AM
LICENSE	2 KB	11/26/2024 9:32:41 AM
README.md	4 KB	11/26/2024 9:32:41 AM
sbatch_all.sh	1 KB	12/2/2024 9:18:04 AM

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# Application Cont.

blue/bphl-florida/n.yengalareddy/repos/bphl-molecular/analysis/flaq\_sc2\_meta1202/2024-12-02-122021\_flgq\_ww\_run/\*.\*

Name	Size	Changed
.		12/2/2024 9:20:21 AM
j289		12/2/2024 9:21:23 AM
j290		12/2/2024 9:22:29 AM
j291		12/2/2024 9:26:40 AM
j292		12/2/2024 9:27:51 AM
j293		12/2/2024 9:29:00 AM
j294		12/2/2024 9:30:08 AM
j295		12/2/2024 9:31:25 AM
j296		12/2/2024 9:32:36 AM
j297		12/2/2024 9:33:48 AM
j298		12/2/2024 9:34:56 AM
j299		12/2/2024 9:36:12 AM
j300		12/2/2024 9:37:22 AM
report.txt	2 KB	12/2/2024 9:37:49 AM

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sampleID	reference	start	end	num_raw_reads	num_clean_reads	num_mapped_reads	cov_bases_mapped	percent_genome_cov_map	mean_depth	mean_base_qual	mean_map_qual	freyja_summary	freyja_lineage	freyja_lineage_abund
J289	MN908947.3	1	29903	732162	605762	1531	9698	32.4315	9.87536	37.8	60	[('Omicron', 0.9999999999993279)]	BA.2.86	1
J290	MN908947.3	1	29903	481512	380672	1339	12007	40.1532	8.92462	37.8	60	[('Other', 0.9599999999960572), ('XBB*', ('XBB.X', 0.039999999999651294)]	Misc(3) FW.3	0.96000000 0.04000000
J291	MN908947.3	1	29903	7034546	5373614	9138	21954	73.4174	61.7148	37.8	60	[('Omicron', 0.9999999999997757)]	BA.2.86	1
J292	MN908947.3	1	29903	456732	339100	1345	12773	42.7148	9.4336	37.8	60	[('Omicron', 0.9999999999998744)]	BA.2.86	1
J293	MN908947.3	1	29903	505188	388982	10097	22406	74.9289	71.8924	37.8	60	[('Omicron', 0.9999999999996849)]	BA.2.86	1
J294	MN908947.3	1	29903	509984	401620	2089	10540	35.2473	14.0039	37.8	59.7	[('Omicron', 0.9999999999996887)]	BA.2.86	1
J295	MN908947.3	1	29903	645836	519726	3831	16461	55.048	25.7244	37.8	60	[('Omicron', 0.9999999999996009)]	BA.2.86	1
J296	MN908947.3	1	29903	602970	482166	1348	13439	44.942	8.77601	37.8	60	[('Omicron', 0.9999999999999883)]	BA.2.86	1
J297	MN908947.3	1	29903	578962	454888	5675	20750	69.391	40.7982	37.8	60	[('Omicron', 0.9999999999997226)]	BA.2.86	1
J298	MN908947.3	1	29903	527304	412700	11703	23424	78.3333	86.9987	37.8	60	[('Omicron', 0.9999999999992387)]	BA.2.86	1
J299	MN908947.3	1	29903	524950	394188	1216	11047	36.9428	8.62733	37.8	60	[('Omicron', 0.9999999999999623)]	BA.2.86	1
J300	MN908947.3	1	29903	530160	406042	14546	26132	87.3892	107.853	37.8	60	[('Omicron', 0.9999999999999696)]	BA.2.86	1



# Application Cont.

/blue/bphi-florida/n.yengalareddy/repos/bphi-molecular/analysis/flag\_sc2\_meta1202/2024-12-02-122021\_flag\_wv\_run/j289/alignment/

Name	Size	Changed
...		12/2/2024 9:21:23 AM
j289.coverage.txt	1 KB	12/2/2024 9:21:21 AM
j289.dedup.bam	106 KB	12/2/2024 9:21:11 AM
j289.fixmate.bam	143 KB	12/2/2024 9:21:08 AM
j289.markdup.bam	112 KB	12/2/2024 9:21:10 AM
j289.namesorted.bam	137 KB	12/2/2024 9:21:07 AM
j289.positionsort.bam	112 KB	12/2/2024 9:21:09 AM
j289.primertrim.bam	84 KB	12/2/2024 9:21:17 AM
j289.primertrim.sorted.bam	84 KB	12/2/2024 9:21:19 AM
j289.sorted.bam	106 KB	12/2/2024 9:21:14 AM
j289.sorted.bam.bai	1 KB	12/2/2024 9:21:16 AM

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/blue/bphi-florida/n.yengalareddy/repos/bphi-molecular/analysis/flag\_sc2\_meta1202/2024-12-02-122021\_flag\_wv\_run/j289/

Name	Size	Changed
alignment		12/2/2024 9:36:29 AM
multitqc_data		12/2/2024 9:20:58 AM
variants		12/2/2024 9:21:23 AM
j289.adapters.stats.txt	2 KB	12/2/2024 9:20:45 AM
j289.err	12 KB	12/2/2024 9:21:36 AM
j289.log	57,288 KB	12/2/2024 9:20:39 AM
j289.out	6 KB	12/2/2024 9:21:41 AM
j289_1.fq.gz	22,393 KB	12/2/2024 9:20:48 AM
j289_1_clean_fastqc.html	254 KB	12/2/2024 9:20:54 AM
j289_1_clean_fastqc.zip	291 KB	12/2/2024 9:20:54 AM
j289_1_original_fastqc.html	251 KB	12/2/2024 9:20:30 AM
j289_1_original_fastqc.zip	286 KB	12/2/2024 9:20:30 AM
j289_2.fq.gz	24,484 KB	12/2/2024 9:20:48 AM
j289_2_clean_fastqc.html	254 KB	12/2/2024 9:20:54 AM
j289_2_clean_fastqc.zip	292 KB	12/2/2024 9:20:54 AM
j289_2_original_fastqc.html	256 KB	12/2/2024 9:20:30 AM
j289_2_original_fastqc.zip	296 KB	12/2/2024 9:20:30 AM
j289_matchedphix.fq	0 KB	12/2/2024 9:20:47 AM
j289_phistats.txt	1 KB	12/2/2024 9:20:48 AM
j289_trimstats.txt	0 KB	12/2/2024 9:20:33 AM
multitqc_report.html	1,129 KB	12/2/2024 9:20:58 AM

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/blue/bphi-florida/n.yengalareddy/repos/bphi-molecular/analysis/flag\_sc2\_meta1202/2024-12-02-122021\_flag\_wv\_run/\*

Name	Size	Changed
j289		12/2/2024 9:20:21 AM
j290		12/2/2024 9:21:23 AM
j291		12/2/2024 9:22:29 AM
j292		12/2/2024 9:26:40 AM
j293		12/2/2024 9:27:51 AM
j294		12/2/2024 9:29:00 AM
j295		12/2/2024 9:30:08 AM
j296		12/2/2024 9:31:25 AM
j297		12/2/2024 9:32:36 AM
j298		12/2/2024 9:33:48 AM
j299		12/2/2024 9:34:56 AM
j300		12/2/2024 9:36:12 AM
report.txt	2 KB	12/2/2024 9:37:22 AM

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#rname	startpos	endpos	numreads	covbases	coverage	meandepth	meanbaseq	meanmapq
MN908947.3	1	29903	1531	9698	32.4315	9.87536	37.8	60



# Application Cont.

./bphl-florida/n.yengalareddy/repos/bphl-molecular/analysis/flaq\_sc2\_meta1202/2024-12-02-122021\_flaq\_vw\_run/j289/multiqc\_data/

Name	Size	Changed
.		12/2/2024 9:21:23 AM
multiqc.log	17 KB	12/2/2024 9:20:58 AM
multiqc_data.json	140 KB	12/2/2024 9:20:58 AM
multiqc_fastqc.txt	1 KB	12/2/2024 9:20:58 AM
multiqc_general_stats.txt	1 KB	12/2/2024 9:20:58 AM
multiqc_qualimap_barcode_genome_results.txt	1 KB	12/2/2024 9:20:58 AM
multiqc_sources.txt	1 KB	12/2/2024 9:20:58 AM

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./blue/bphl-florida/n.yengalareddy/repos/bphl-molecular/analysis/flaq\_sc2\_meta1202/2024-12-02-122021\_flaq\_vw\_run/j289/

Name	Size	Changed
.		12/2/2024 9:36:29 AM
alignment		12/2/2024 9:21:29 AM
multiqc_data		12/2/2024 9:20:58 AM
variants		12/2/2024 9:21:23 AM
j289_adapters_stats.txt	2 KB	12/2/2024 9:20:45 AM
j289_err	12 KB	12/2/2024 9:21:36 AM
j289_log	57,288 KB	12/2/2024 9:20:39 AM
j289_out	6 KB	12/2/2024 9:21:41 AM
j289_1.fq.gz	22,393 KB	12/2/2024 9:20:48 AM
j289_1_clean_fastqc.html	254 KB	12/2/2024 9:20:54 AM
j289_1_clean_fastqc.zip	291 KB	12/2/2024 9:20:54 AM
j289_1_original_fastqc.html	251 KB	12/2/2024 9:20:30 AM
j289_1_original_fastqc.zip	286 KB	12/2/2024 9:20:30 AM
j289_2.fq.gz	24,484 KB	12/2/2024 9:20:48 AM
j289_2_clean_fastqc.html	254 KB	12/2/2024 9:20:54 AM
j289_2_clean_fastqc.zip	292 KB	12/2/2024 9:20:54 AM
j289_2_original_fastqc.html	256 KB	12/2/2024 9:20:30 AM
j289_2_original_fastqc.zip	296 KB	12/2/2024 9:20:30 AM
j289_matched_phix.fq	0 KB	12/2/2024 9:20:47 AM
j289_phixstats.txt	1 KB	12/2/2024 9:20:48 AM
j289_trimstats.txt	0 KB	12/2/2024 9:20:33 AM
multiqc_report.html	1,129 KB	12/2/2024 9:20:58 AM

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Sample	FastQC_mqc-generalstats-fastqc-percent_gc	FastQC_mqc-generalstats-fastqc-percent_duplicates	FastQC_mqc-generalstats-fastqc-percent_fails	FastQC_mqc-generalstats-fastqc-avg_sequence_length	FastQC_mqc-generalstats-fastqc-total_sequences
J289_1	48	80.71710906	36.36363636	237.1937986	366081
J289_2	48	77.63609693	27.27272727	237.2073667	366081



# Application Cont.

/blue/bphl-florida/n.yengalareddy/repos/bphl-molecular/analysis/flaq\_sc2\_meta1202/2024-12-02-122021\_flg\_ww\_run/1289/variants/\*.\*

Name	Size	Changed
		12/2/2024 9:21:23 AM
1289.variants.tsv	2 KB	12/2/2024 9:21:24 AM

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/blue/bphl-florida/n.yengalareddy/repos/bphl-molecular/analysis/flaq\_sc2\_meta1202/2024-12-02-122021\_flg\_ww\_run/1289/

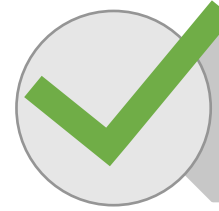
Name	Size	Changed
		12/2/2024 9:36:29 AM
alignment		12/2/2024 9:21:29 AM
multitqc_data		12/2/2024 9:20:58 AM
variants		12/2/2024 9:21:23 AM
1289.adapters.stats.txt	2 KB	12/2/2024 9:20:45 AM
1289.err	12 KB	12/2/2024 9:21:36 AM
1289.log	57,288 KB	12/2/2024 9:20:39 AM
1289.out	6 KB	12/2/2024 9:21:41 AM
1289_1.fq.gz	22,393 KB	12/2/2024 9:20:48 AM
1289_1_clean_fastqc.html	254 KB	12/2/2024 9:20:54 AM
1289_1_clean_fastqc.zip	291 KB	12/2/2024 9:20:54 AM
1289_1_original_fastqc.html	251 KB	12/2/2024 9:20:30 AM
1289_1_original_fastqc.zip	286 KB	12/2/2024 9:20:30 AM
1289_2.fq.gz	24,484 KB	12/2/2024 9:20:48 AM
1289_2_clean_fastqc.html	254 KB	12/2/2024 9:20:54 AM
1289_2_clean_fastqc.zip	292 KB	12/2/2024 9:20:54 AM
1289_2_original_fastqc.html	256 KB	12/2/2024 9:20:30 AM
1289_2_original_fastqc.zip	296 KB	12/2/2024 9:20:30 AM
1289_matchedphix.fq	0 KB	12/2/2024 9:20:47 AM
1289_phixstats.txt	1 KB	12/2/2024 9:20:48 AM
1289_trimstats.txt	0 KB	12/2/2024 9:20:33 AM
multitqc_report.html	1,129 KB	12/2/2024 9:20:58 AM

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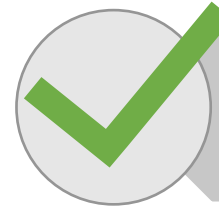
REGION	POS	REF	ALT	REF_DP	REF_RV	REF_QUAL	ALT_DP	ALT_RV	ALT_QUAL	ALT_FREQ	TOTAL_DP	PVAL	PASS	GFF_FEATURE	REF_CODON	REF_AA	ALT_CODON	ALT_AA	POS_AA
MN908947.3	241	C	T	0	0	0	7	4	70	1	7	0.000582751	TRUE	NA	NA	NA	NA	NA	NA
MN908947.3	9424	A	G	0	0	0	1	0	76	1	1	1	FALSE	NA	NA	NA	NA	NA	NA
MN908947.3	10029	C	T	0	0	0	5	2	76	1	5	0.00793651	TRUE	NA	NA	NA	NA	NA	NA
MN908947.3	10198	C	T	0	0	0	2	1	54	1	2	0.333333	FALSE	NA	NA	NA	NA	NA	NA
MN908947.3	10752	T	#NAME?	2	1	38	2	0	20	1	2	0.6	FALSE	NA	NA	NA	NA	NA	NA
MN908947.3	12101	T	A	0	0	0	1	1	75	1	1	1	FALSE	NA	NA	NA	NA	NA	NA
MN908947.3	15714	C	T	0	0	0	2	0	57	1	2	0.333333	FALSE	NA	NA	NA	NA	NA	NA
MN908947.3	15756	T	A	0	0	0	2	0	57	1	2	0.333333	FALSE	NA	NA	NA	NA	NA	NA
MN908947.3	17223	A	G	3	0	74	2	1	76	0.4	5	0.277778	FALSE	NA	NA	NA	NA	NA	NA
MN908947.3	17230	A	T	3	1	74	1	0	76	0.25	4	0.571429	FALSE	NA	NA	NA	NA	NA	NA
MN908947.3	17410	C	T	0	0	0	5	3	60	1	5	0.00793651	TRUE	NA	NA	NA	NA	NA	NA
MN908947.3	17803	T	C	64	41	58	1	1	76	0.0153846	65	0.503876	FALSE	NA	NA	NA	NA	NA	NA
MN908947.3	17809	A	#NAME?	64	42	58	1	0	20	0.015625	64	0.507813	FALSE	NA	NA	NA	NA	NA	NA
MN908947.3	18492	G	A	0	0	0	38	10	50	1	38	2.90E-22	TRUE	NA	NA	NA	NA	NA	NA
MN908947.3	18582	C	T	125	46	60	2	1	24	0.015748	127	0.502976	FALSE	NA	NA	NA	NA	NA	NA
MN908947.3	18692	C	A	132	69	72	1	1	74	0.0075188	133	0.501887	FALSE	NA	NA	NA	NA	NA	NA
MN908947.3	18701	C	T	137	73	72	1	0	48	0.00724638	138	0.501818	FALSE	NA	NA	NA	NA	NA	NA
MN908947.3	18716	G	T	138	73	72	1	0	76	0.00719424	139	0.501805	FALSE	NA	NA	NA	NA	NA	NA
MN908947.3	18719	G	A	138	73	71	1	1	76	0.00719424	139	0.501805	FALSE	NA	NA	NA	NA	NA	NA
MN908947.3	18735	A	#NAME?	139	81	67	1	0	20	0.00719424	139	0.754487	FALSE	NA	NA	NA	NA	NA	NA
MN908947.3	18756	C	#NAME?	139	81	67	1	0	20	0.00719424	139	0.754487	FALSE	NA	NA	NA	NA	NA	NA



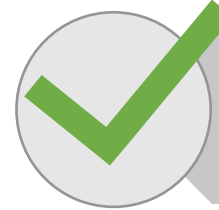
# Conclusion



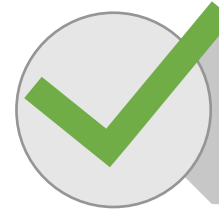
Fundamentals of  
FLAQ\_SC2\_Meta



Installation and setup of  
FLAQ\_SC2\_Meta in HPG



Successfully executed  
Job query for  
FLAQ\_SC2\_Meta



Generated Output Files





# Advanced Molecular Detection

## Southeast Region Bioinformatics

# Questions?

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