Reproducible analysis of nanoparticle tracking data

Sean L. Nguyen [1] , Margaret G. Petroff [1] *

1 Program in Cell and Molecular Biology, 474 S Shaw Ln, East Lansing, MI, 48824
1 Department of Pathobiology and Diagnostic Investigation, 784 Wilson Rd, East Lansing, MI, 48824

* Corresponding author: petrof10@msu.edu

Abstract

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Author summary

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Text based on plos sample manuscript, see
http://journals.plos.org/ploscompbiol/s/latex

Introduction

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A list

- Item 1
- Item 2

```r
library(tidyverse)

file <- "nanosight_data.csv"


raw_data <- read_csv(file)
raw_data %>%
  head()
```

```
## # A tibble: 6 x 37
##   particle_size mG15.5_yes_500_00 mG15.5_yes_500_01 mG15.5_yes_500_02
##           <dbl>             <int>             <int>             <int>
## 1         0.500                 0                 0                 0
## 2         1.50                  0                 0                 0
## 3         2.50                  0                 0                 0
## 4         3.50                  0                 0                 0
## 5         4.50                  0                 0                 0
## 6         5.50                  0                 0                 0
## # ... with 33 more variables: mG15.5_no_500_00 <int>,
## #   mG15.5_no_500_01 <int>, mG15.5_no_500_02 <int>, `400_yes_50_00` <int>,
## #   `400_yes_50_01` <int>, `400_yes_50_02` <int>, `400_no_50_00` <int>,
## #   `400_no_50_01` <int>, `400_no_50_02` <int>, `200_yes_125_00` <int>,
## #   `200_yes_125_01` <int>, `200_yes_125_02` <int>, `200_no_125_00` <int>,
## #   `200_no_125_01` <int>, `200_no_125_02` <int>,
## #   fluorx100_no_125_00 <int>, fluorx100_no_125_01 <int>,
## #   fluorx100_no_125_02 <int>, fluorx100_yes_125_00 <int>,
## #   fluorx100_yes_125_01 <int>, fluorx100_yes_125_02 <int>,
## #   fluor_no_125_00 <int>, fluor_no_125_01 <int>, fluor_no_125_02 <int>,
## #   fluor_yes_125_00 <int>, fluor_yes_125_01 <int>,
## #   fluor_yes_125_02 <int>, `100_no_125_00` <int>, `100_no_125_01` <int>,
## #   `100_no_125_02` <int>, `100_yes_125_00` <int>, `100_yes_125_01` <int>,
## #   `100_yes_125_02` <int>
```

```r
raw_data %>%
  gather(ID,values,2:37)
```

```
## # A tibble: 36,000 x 3
##    particle_size ID                values
##            <dbl> <chr>              <int>
##  1         0.500 mG15.5_yes_500_00      0
##  2         1.50  mG15.5_yes_500_00      0
##  3         2.50  mG15.5_yes_500_00      0
##  4         3.50  mG15.5_yes_500_00      0
##  5         4.50  mG15.5_yes_500_00      0
##  6         5.50  mG15.5_yes_500_00      0
##  7         6.50  mG15.5_yes_500_00      0
##  8         7.50  mG15.5_yes_500_00      0
##  9         8.50  mG15.5_yes_500_00      0
## 10         9.50  mG15.5_yes_500_00      0
## # ... with 35,990 more rows
```

```
raw_data %>%
  gather(ID,values,2:37) %>%
  separate(ID, into = c("sample", "filter", "dilution_factor","tech_rep"), sep =
```

```
## # A tibble: 36,000 x 6
##    particle_size sample filter dilution_factor tech_rep values
##            <dbl> <chr>  <chr>  <chr>           <chr>     <int>
##  1         0.500 mG15.5 yes    500             00            0
##  2         1.50  mG15.5 yes    500             00            0
##  3         2.50  mG15.5 yes    500             00            0
##  4         3.50  mG15.5 yes    500             00            0
##  5         4.50  mG15.5 yes    500             00            0
##  6         5.50  mG15.5 yes    500             00            0
##  7         6.50  mG15.5 yes    500             00            0
##  8         7.50  mG15.5 yes    500             00            0
##  9         8.50  mG15.5 yes    500             00            0
## 10         9.50  mG15.5 yes    500             00            0
## # ... with 35,990 more rows
```

```
raw_data %>%
  gather(ID,values,2:37) %>%
  separate(ID, into = c("sample", "filter", "dilution_factor","tech_rep"), sep =
  mutate_at(vars(sample,filter,tech_rep),as.factor) %>%
  mutate_at(vars(dilution_factor),as.numeric)
```

```
## # A tibble: 36,000 x 6
##    particle_size sample filter dilution_factor tech_rep values
##            <dbl> <fct>  <fct>            <dbl> <fct>     <int>
##  1         0.500 mG15.5 yes                500 00            0
##  2         1.50  mG15.5 yes                500 00            0
##  3         2.50  mG15.5 yes                500 00            0
##  4         3.50  mG15.5 yes                500 00            0
##  5         4.50  mG15.5 yes                500 00            0
##  6         5.50  mG15.5 yes                500 00            0
##  7         6.50  mG15.5 yes                500 00            0
##  8         7.50  mG15.5 yes                500 00            0
##  9         8.50  mG15.5 yes                500 00            0
## 10         9.50  mG15.5 yes                500 00            0
## # ... with 35,990 more rows
```

```
data <- raw_data %>%
  gather(ID,values,2:37) %>%
  separate(ID, into = c("sample", "filter", "dilution_factor","tech_rep"), sep =
  mutate_at(vars(sample,filter,tech_rep),as.factor) %>%
  mutate_at(vars(dilution_factor),as.numeric)
data
```

```
## # A tibble: 36,000 x 6
##    particle_size sample filter dilution_factor tech_rep values
##            <dbl> <fct>  <fct>            <dbl> <fct>     <int>
##  1         0.500 mG15.5 yes                500 00            0
##  2         1.50  mG15.5 yes                500 00            0
```

```
##  3         2.50  mG15.5 yes                 500 00             0
##  4         3.50  mG15.5 yes                 500 00             0
##  5         4.50  mG15.5 yes                 500 00             0
##  6         5.50  mG15.5 yes                 500 00             0
##  7         6.50  mG15.5 yes                 500 00             0
##  8         7.50  mG15.5 yes                 500 00             0
##  9         8.50  mG15.5 yes                 500 00             0
## 10         9.50  mG15.5 yes                 500 00             0
## # ... with 35,990 more rows
```

```
data %>%
  count(sample)
```

```
## # A tibble: 6 x 2
##   sample        n
##   <fct>     <int>
## 1 100        6000
## 2 200        6000
## 3 400        6000
## 4 fluor      6000
## 5 fluorx100  6000
## 6 mG15.5     6000
```

```
data %>%
  group_by(tech_rep) %>%
  count(sample)
```

```
## # A tibble: 18 x 3
## # Groups:   tech_rep [3]
##    tech_rep sample        n
##    <fct>    <fct>     <int>
##  1 00       100        2000
##  2 00       200        2000
##  3 00       400        2000
##  4 00       fluor      2000
##  5 00       fluorx100  2000
##  6 00       mG15.5     2000
##  7 01       100        2000
##  8 01       200        2000
##  9 01       400        2000
## 10 01       fluor      2000
## 11 01       fluorx100  2000
## 12 01       mG15.5     2000
## 13 02       100        2000
## 14 02       200        2000
## 15 02       400        2000
## 16 02       fluor      2000
## 17 02       fluorx100  2000
## 18 02       mG15.5     2000
```

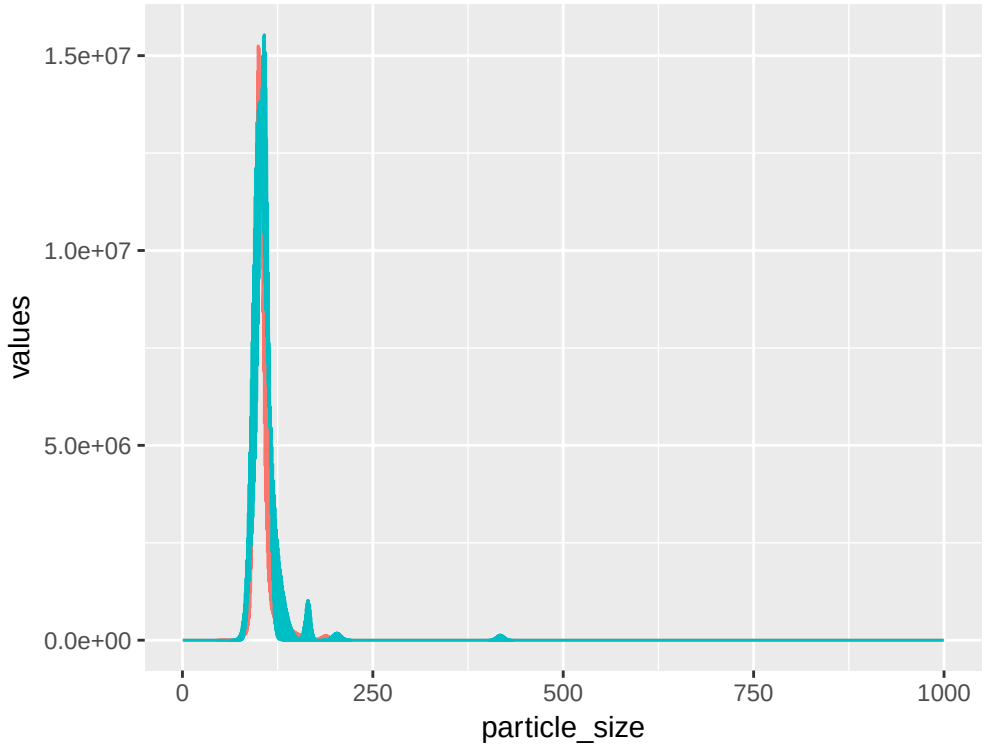
```
data %>%
  group_by(tech_rep, filter) %>%
  count(sample)
```

```
## # A tibble: 36 x 4
## # Groups:   tech_rep, filter [6]
##    tech_rep filter sample        n
##    <fct>    <fct>  <fct>     <int>
##  1 00       no     100        1000
##  2 00       no     200        1000
##  3 00       no     400        1000
##  4 00       no     fluor      1000
##  5 00       no     fluorx100  1000
##  6 00       no     mG15.5     1000
##  7 00       yes    100        1000
##  8 00       yes    200        1000
##  9 00       yes    400        1000
## 10 00       yes    fluor      1000
## # ... with 26 more rows
```

```
data %>%
  filter(sample == "fluor")
```

```
## # A tibble: 6,000 x 6
##    particle_size sample filter dilution_factor tech_rep values
##            <dbl> <fct>  <fct>            <dbl> <fct>     <int>
##  1         0.500 fluor  no                 125 00            0
##  2         1.50  fluor  no                 125 00            0
##  3         2.50  fluor  no                 125 00            0
##  4         3.50  fluor  no                 125 00            0
##  5         4.50  fluor  no                 125 00            0
##  6         5.50  fluor  no                 125 00            0
##  7         6.50  fluor  no                 125 00            0
##  8         7.50  fluor  no                 125 00            0
##  9         8.50  fluor  no                 125 00            0
## 10         9.50  fluor  no                 125 00            0
## # ... with 5,990 more rows
```

```
data %>%
  filter(sample == "fluor") %>%
  ggplot(aes( x = particle_size, y = values, color = filter))+
  geom_line()
```



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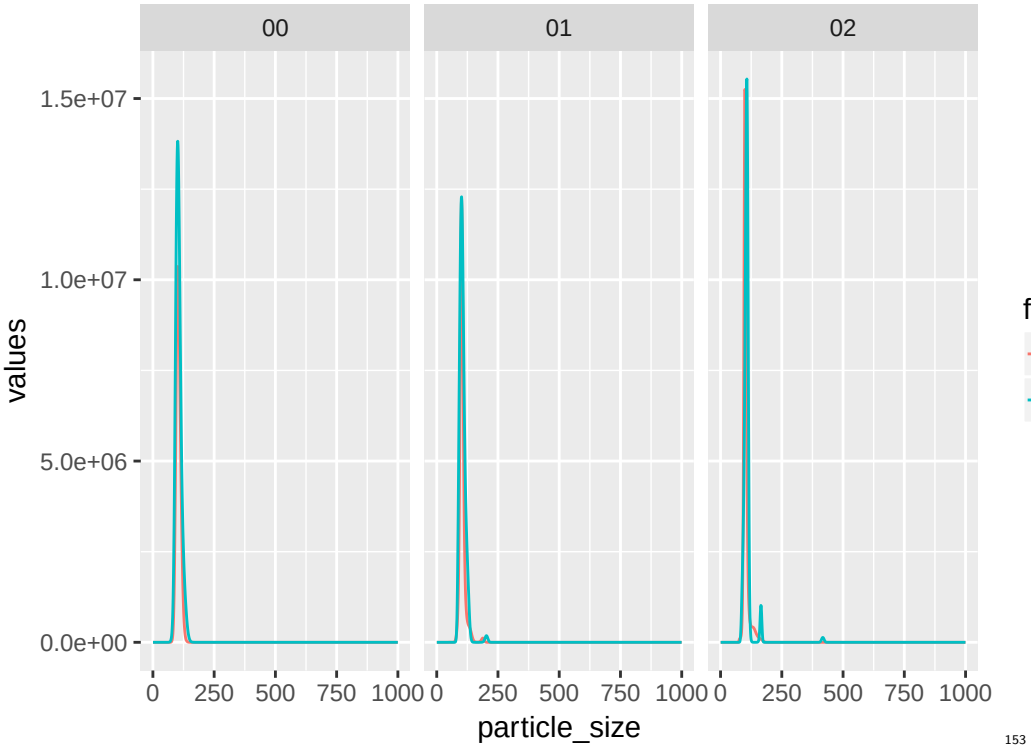
```
data %>%
  filter(sample == "fluor") %>%
  ggplot(aes( x = particle_size, y = values, color = filter))+
  geom_line() +
  facet_wrap(~tech_rep)
```



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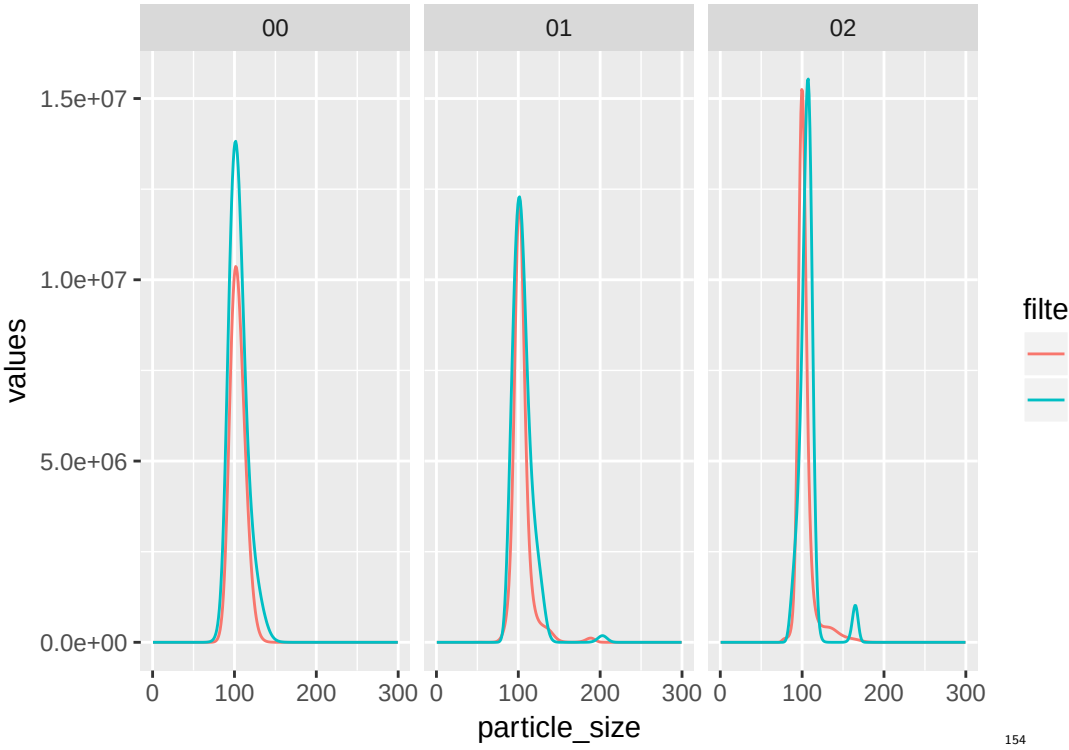
```
data %>%
  filter(sample == "fluor" &
         particle_size < 300) %>%
  ggplot(aes( x = particle_size, y = values, color = filter))+
  geom_line() +
  facet_wrap(~tech_rep)
```



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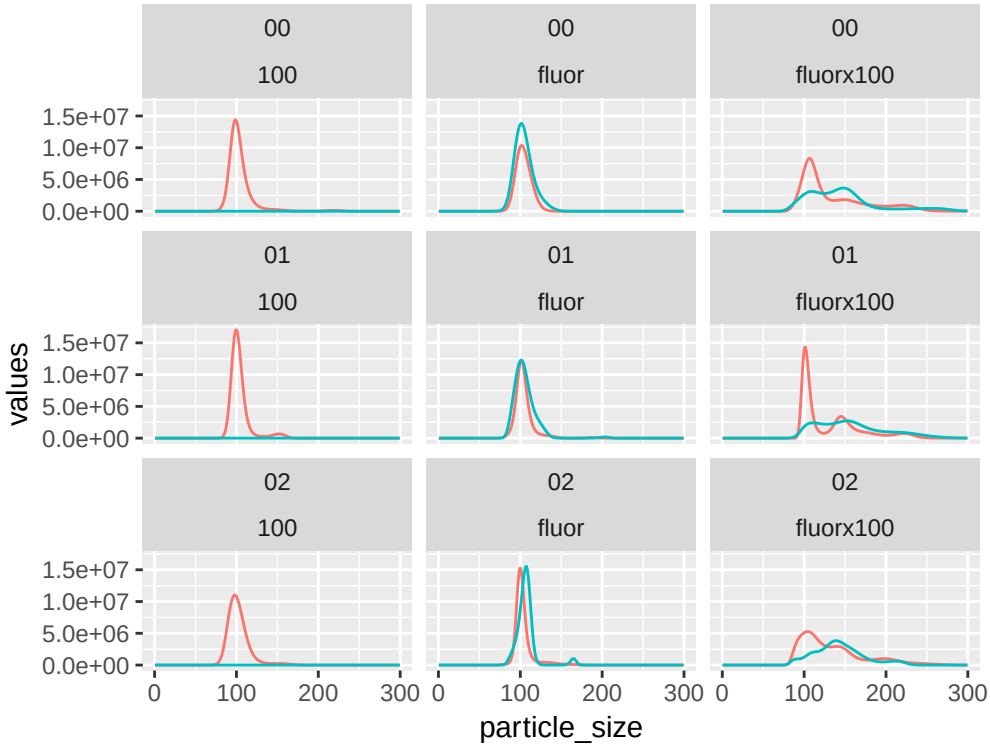
```
data %>%
  filter(sample %in% c("100","fluor","fluorx100"),
         particle_size < 300) %>%
  ggplot(aes(x = particle_size , y = values, color = filter))+
  geom_line() +
  facet_wrap(tech_rep~sample)
```



Here are two sample references: [1,2].

References

1. Feynman R, Vernon Jr. F. The theory of a general quantum system interacting with a linear dissipative system. Annals of Physics. 1963;24: 118–173. doi:10.1016/0003-4916(63)90068-X

2. Dirac P. The lorentz transformation and absolute time. Physica. 1953;19: 888–896. doi:10.1016/S0031-8914(53)80099-6