Random Matrix Analysis

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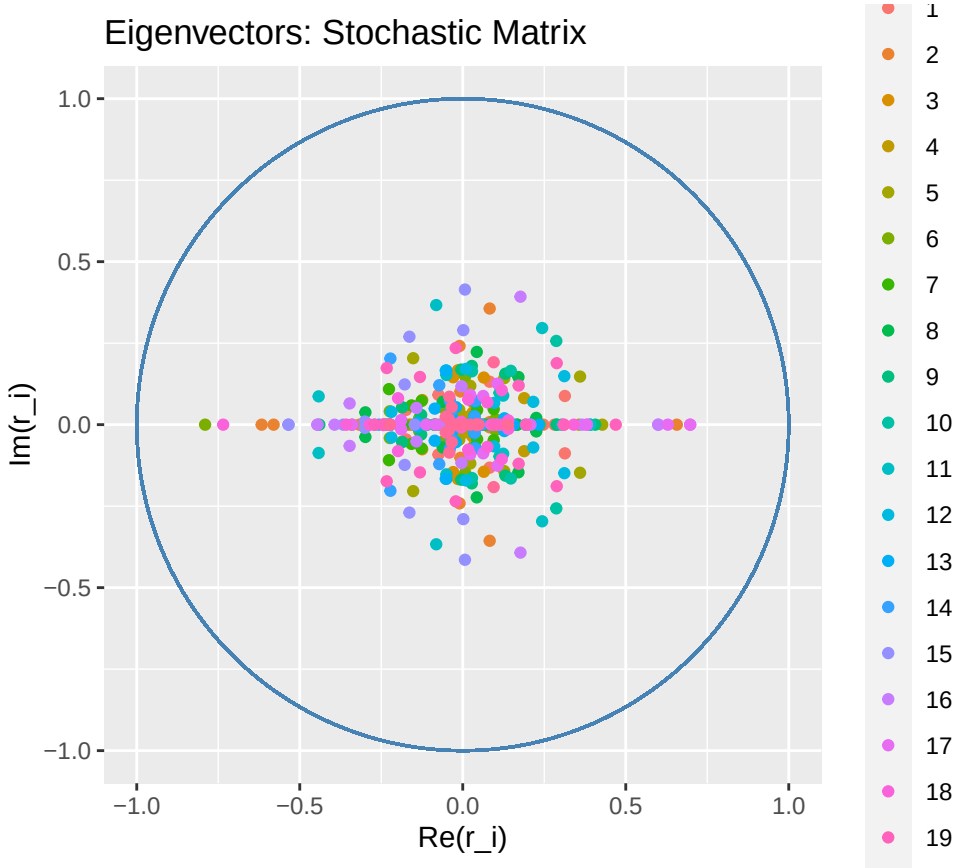
```
bool_plot <- T
M <- 20
```

Eigenmetrics of Various Random Matrices

Stochastic Matrix

```
set.seed(1)
P <- rand_M_stoch(M, row_fn = r_zeros)
if(bool_plot){eigen_plot(P, loud = T, "Stochastic")}
```




```
eigen_summary(eigen_frame(P))
```

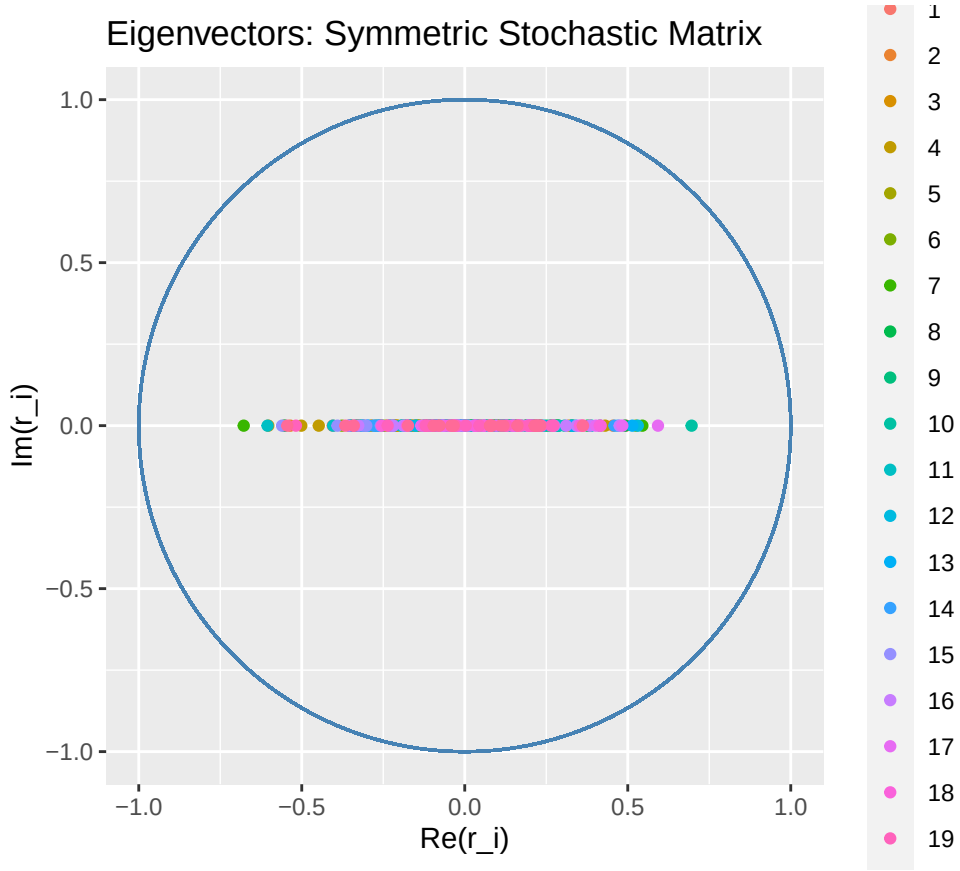
```
## # A tibble: 20 x 3
##    row_i prop_reals is_real
##    <dbl>      <dbl> <lgl>
```

```
##  1     1        0.4 FALSE
##  2     2        0.4 FALSE
##  3     3        0.4 FALSE
##  4     4        0.4 FALSE
##  5     5        0.4 FALSE
##  6     6        0.4 FALSE
##  7     7        0.4 FALSE
##  8     8        0.4 FALSE
##  9     9        0.4 FALSE
## 10    10        0.4 FALSE
## 11    11        0.5 FALSE
## 12    12        0.4 FALSE
## 13    13        0.4 FALSE
## 14    14        0.4 FALSE
## 15    15        0.5 FALSE
## 16    16        0.6 FALSE
## 17    17        0.6 FALSE
## 18    18        0.4 FALSE
## 19    19        0.4 FALSE
## 20    20        0.4 FALSE
```

```
## [1] "Proportion of real-valued rows: 0"
```

Symmetric Stochastic Matrix

```
set.seed(23)
P <- rand_M_symm_stoch(M, row_fn = r_zeros)
if(bool_plot){eigen_plot(P, loud = T, "Symmetric Stochastic")}
```




```
eigen_summary(eigen_frame(P))
```

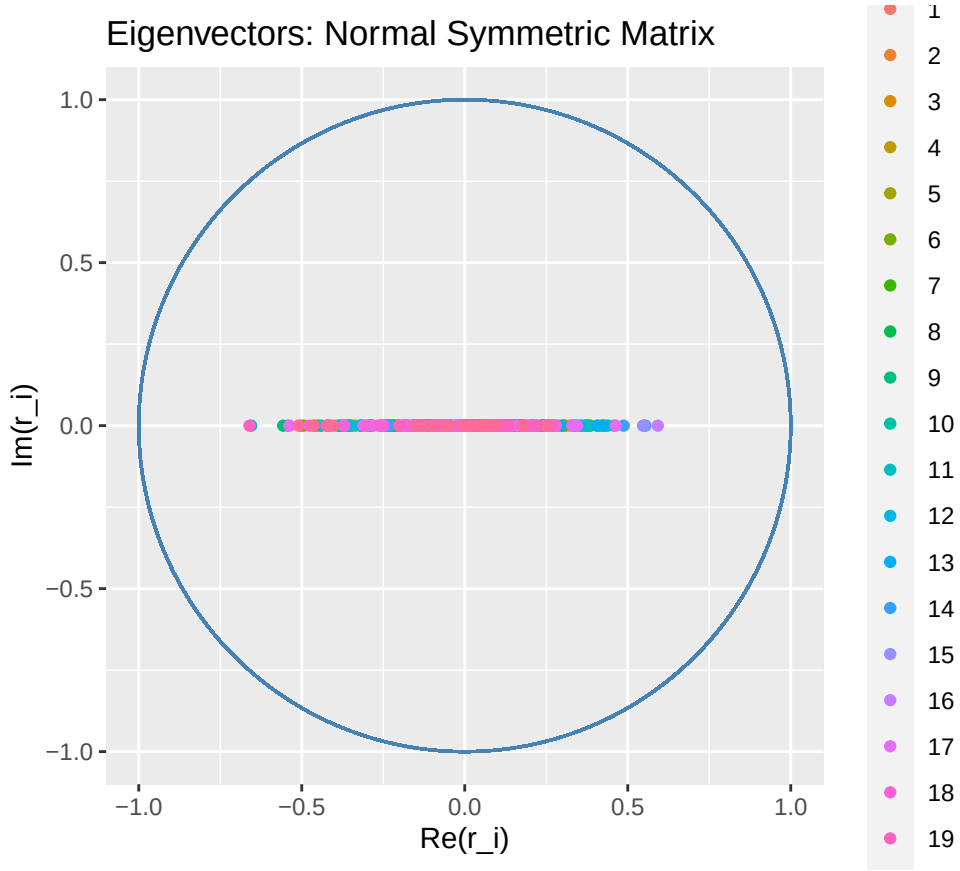
```
## # A tibble: 20 x 3
##    row_i prop_reals is_real
##    <dbl>      <dbl> <lgl>
##  1     1          1 TRUE
##  2     2          1 TRUE
##  3     3          1 TRUE
##  4     4          1 TRUE
##  5     5          1 TRUE
##  6     6          1 TRUE
##  7     7          1 TRUE
##  8     8          1 TRUE
##  9     9          1 TRUE
## 10    10          1 TRUE
## 11    11          1 TRUE
## 12    12          1 TRUE
## 13    13          1 TRUE
## 14    14          1 TRUE
## 15    15          1 TRUE
## 16    16          1 TRUE
```

```
## 17    17          1 TRUE
## 18    18          1 TRUE
## 19    19          1 TRUE
## 20    20          1 TRUE
```

```
## [1] "Proportion of real-valued rows: 1"
```

Normal Symmetric Matrix

```
set.seed(23)
P <- rand_M_symm_norm(M, mu = 0, sd = 1)
if(bool_plot){eigen_plot(P, loud = F, "Normal Symmetric")}
```




```
eigen_summary(eigen_frame(P))
```

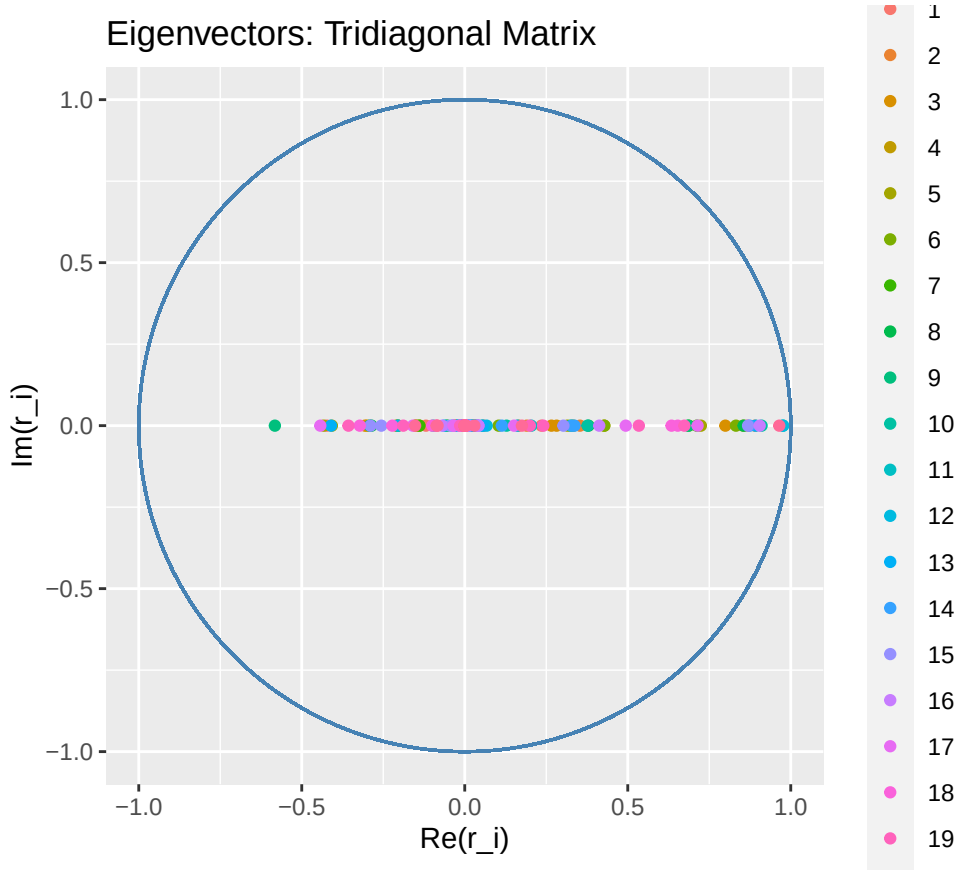
```
## # A tibble: 20 x 3
##    row_i prop_reals is_real
##    <dbl>      <dbl> <lgl>
##  1     1          1 TRUE
##  2     2          1 TRUE
##  3     3          1 TRUE
##  4     4          1 TRUE
##  5     5          1 TRUE
##  6     6          1 TRUE
##  7     7          1 TRUE
##  8     8          1 TRUE
##  9     9          1 TRUE
## 10    10          1 TRUE
## 11    11          1 TRUE
## 12    12          1 TRUE
## 13    13          1 TRUE
## 14    14          1 TRUE
## 15    15          1 TRUE
## 16    16          1 TRUE
```

```
## 17    17          1 TRUE
## 18    18          1 TRUE
## 19    19          1 TRUE
## 20    20          1 TRUE
```

```
## [1] "Proportion of real-valued rows: 1"
```

Tridiagonal Matrix

```
set.seed(23)
P <- rand_M_trid(M)
if(bool_plot){eigen_plot(P, loud = F, "Tridiagonal")}
```




```
eigen_summary(eigen_frame(P))
```

```
## # A tibble: 20 x 3
##    row_i prop_reals is_real
##    <dbl>      <dbl> <lgl>
##  1     1          1 TRUE
##  2     2          1 TRUE
##  3     3          1 TRUE
##  4     4          1 TRUE
##  5     5          1 TRUE
##  6     6          1 TRUE
##  7     7          1 TRUE
##  8     8          1 TRUE
##  9     9          1 TRUE
## 10    10          1 TRUE
## 11    11          1 TRUE
## 12    12          1 TRUE
## 13    13          1 TRUE
## 14    14          1 TRUE
## 15    15          1 TRUE
## 16    16          1 TRUE
```

```
## 17    17          1 TRUE
## 18    18          1 TRUE
## 19    19          1 TRUE
## 20    20          1 TRUE
```

```
## [1] "Proportion of real-valued rows: 1"
```

Analysis of p-Sparse Stochastic Matrices (Erdos-Renyi Graphs)