Random Matrix Analysis

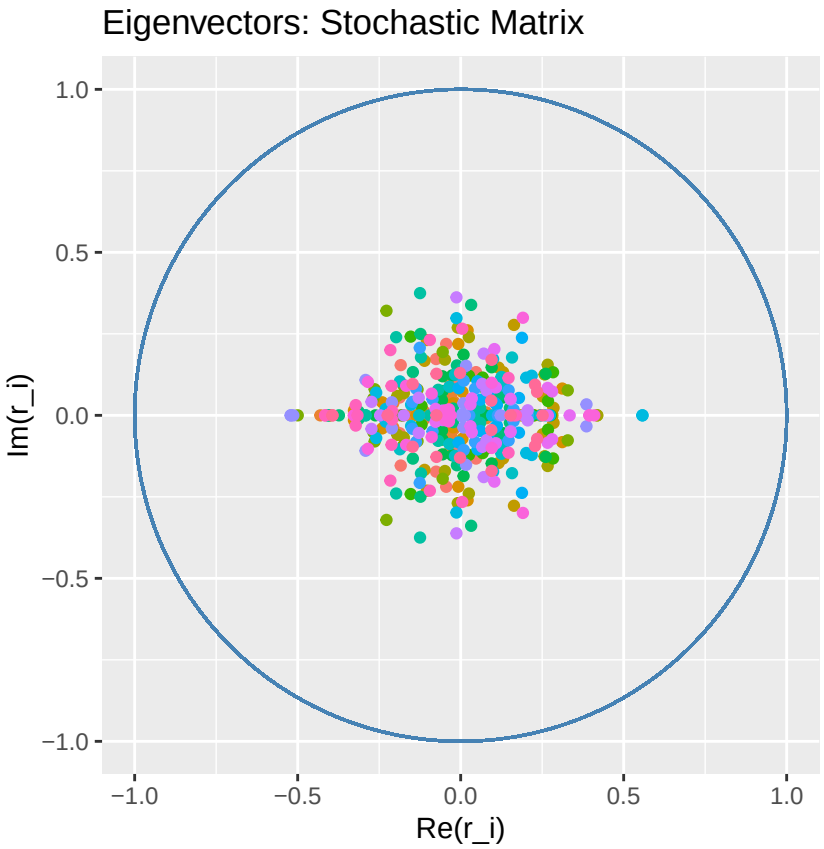
Ali Taqi

```
bool_plot <- T
bool_loud <- F
M <- 20
```

Eigenmetrics of Various Random Matrices

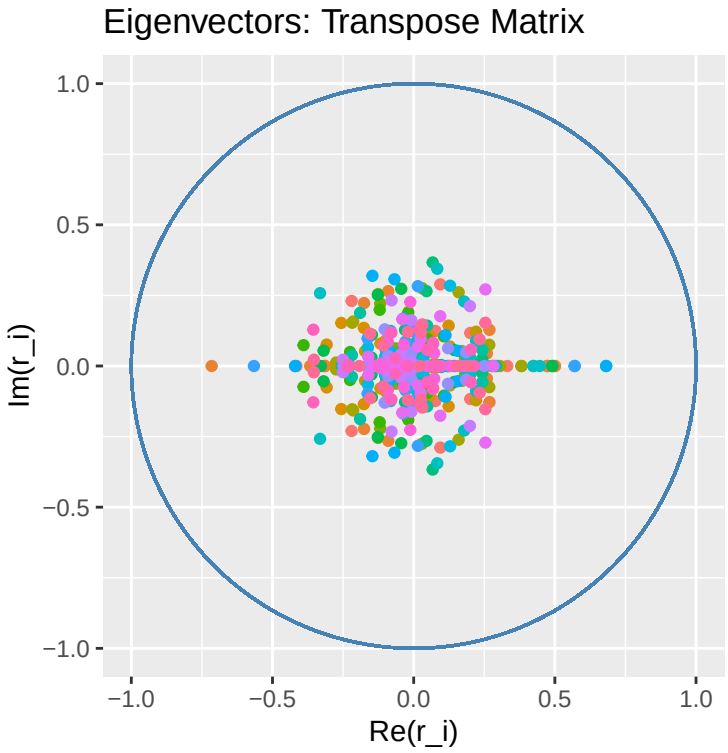
Stochastic Matrix

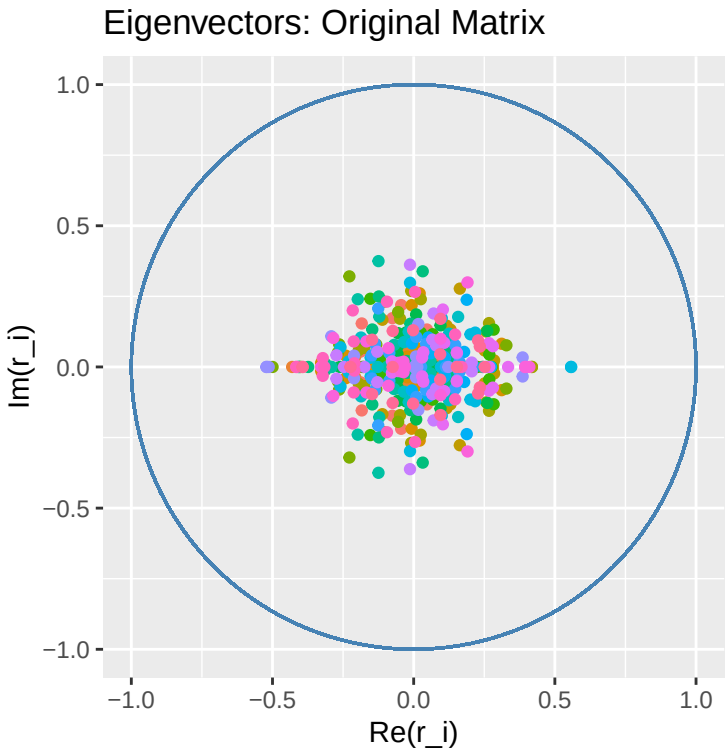
```
P <- RM_stoch(M, sparsity = T)
if(bool_plot){eigen_plot(P, loud = bool_loud, "Stochastic")}
```




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

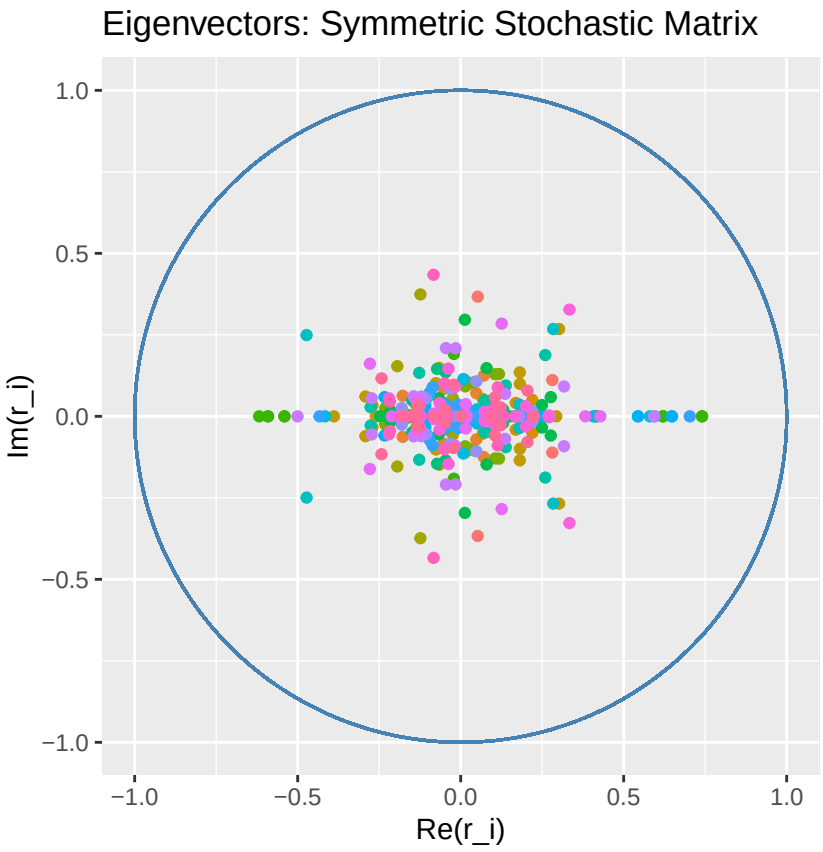
```
## [1] "Proportion of real-valued rows: 0"
```


Eigenvectors: Transpose Matrix
1.0
0.5
0.0
−0.5
−1.0
Im(r_i)
−1.0
−0.5
0.0
0.5
1.0
Re(r_i)


Eigenvectors: Original Matrix
1.0
0.5
0.0
−0.5
−1.0
Im(r_i)
−1.0
−0.5
0.0
0.5
1.0
Re(r_i)

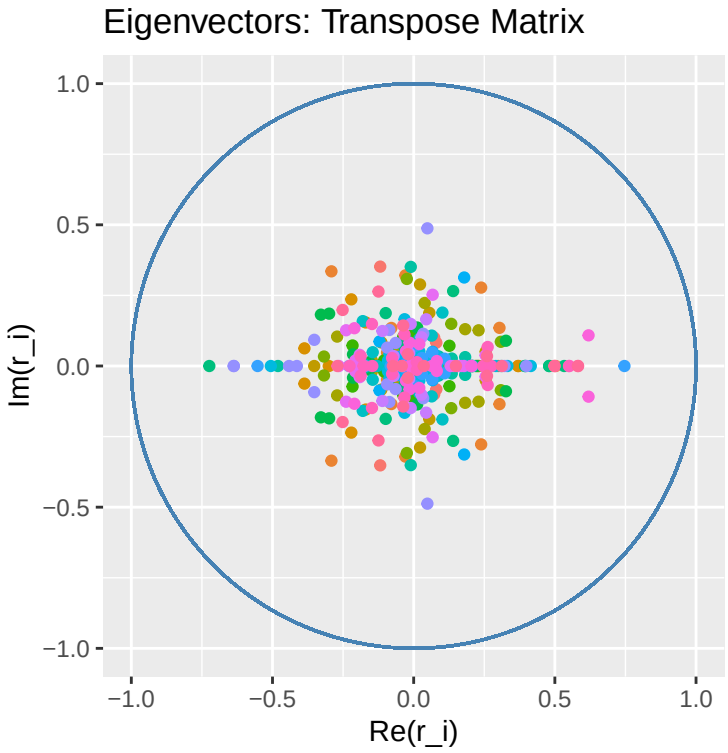
Symmetric Stochastic Matrix

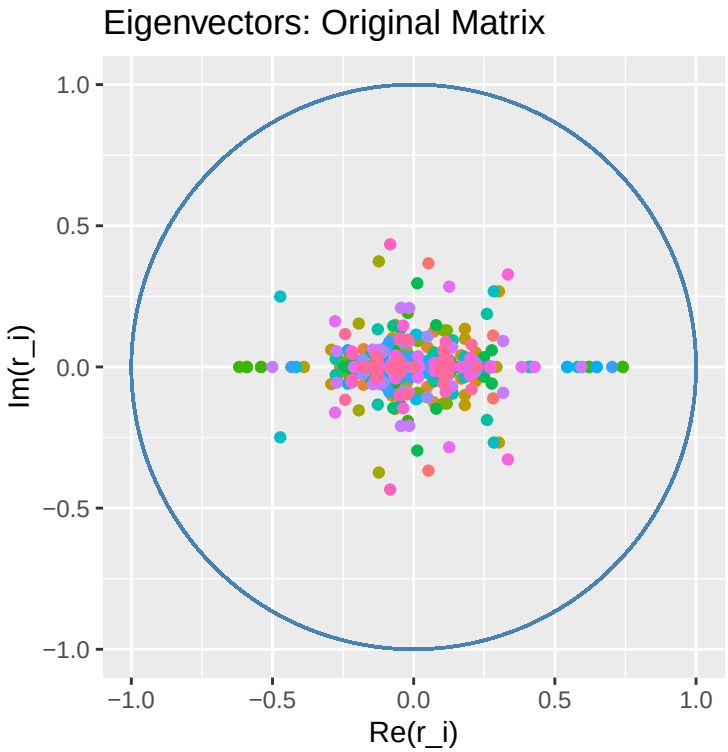
```
set.seed(23)
P <- RM_stoch(M, symm = T, sparsity = T)
if(bool_plot){eigen_plot(P, loud = bool_loud, "Symmetric Stochastic")}
```




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

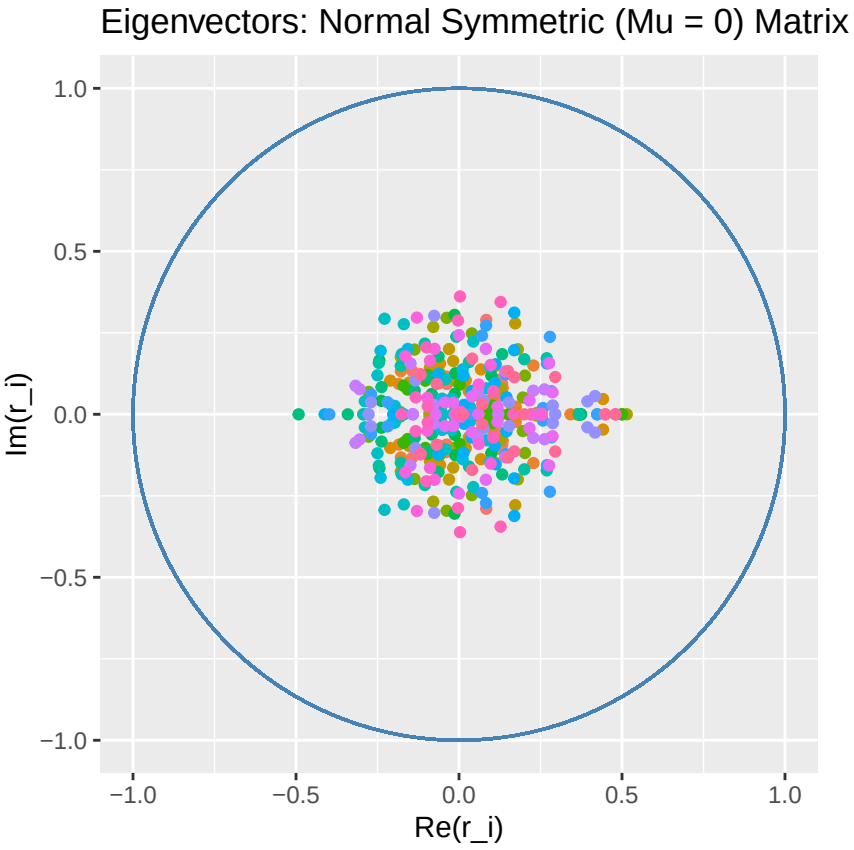
```
## [1] "Proportion of real-valued rows: 0"
```


Eigenvectors: Transpose Matrix
1.0
0.5
0.0
−0.5
−1.0
Im(r_i)
−1.0
−0.5
0.0
0.5
1.0
Re(r_i)


Eigenvectors: Original Matrix
1.0
0.5
0.0
−0.5
−1.0
Im(r_i)
−1.0
−0.5
0.0
0.5
1.0
Re(r_i)

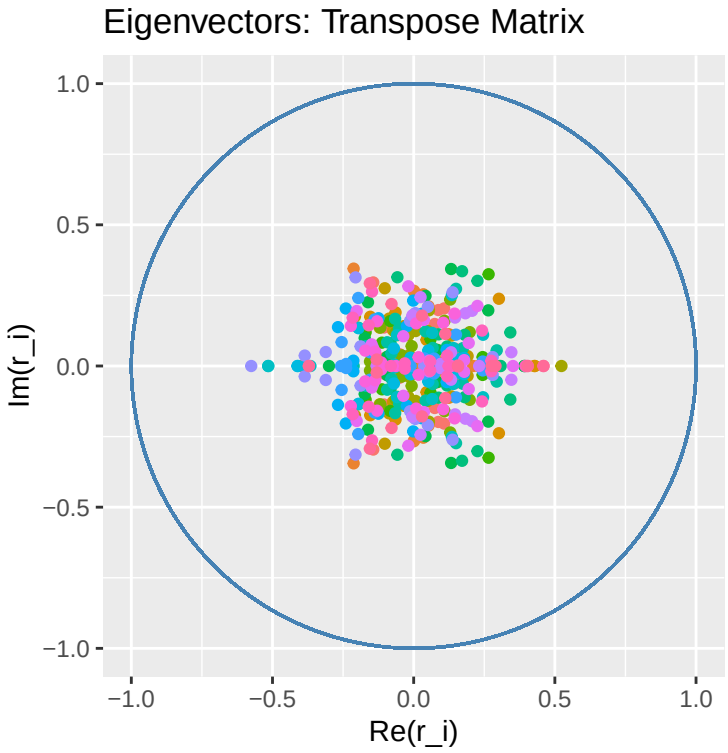
Normal Symmetric Matrix

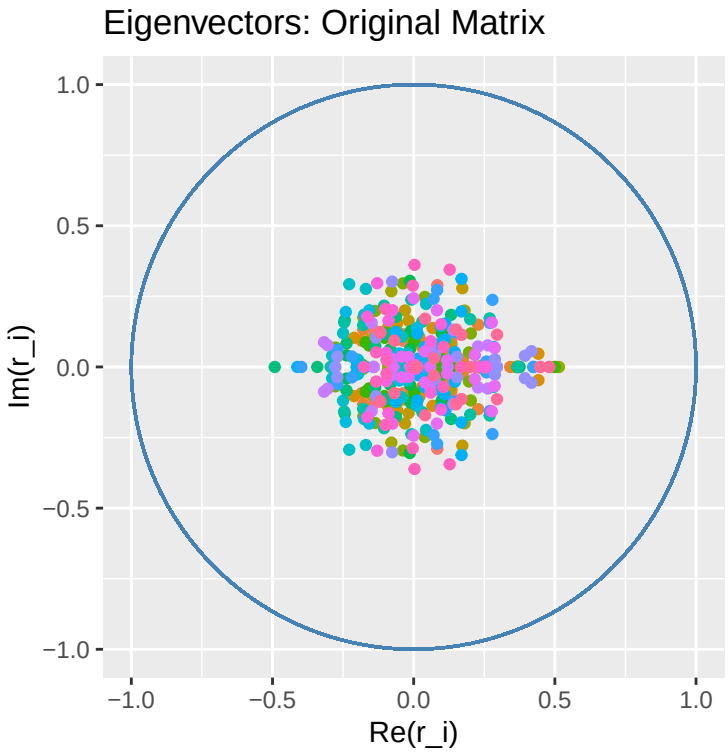
```
set.seed(23)
P <- RM_normal(M, symm = T)
if(bool_plot){eigen_plot(P, loud = bool_loud, "Normal Symmetric (Mu = 0)")}
```




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

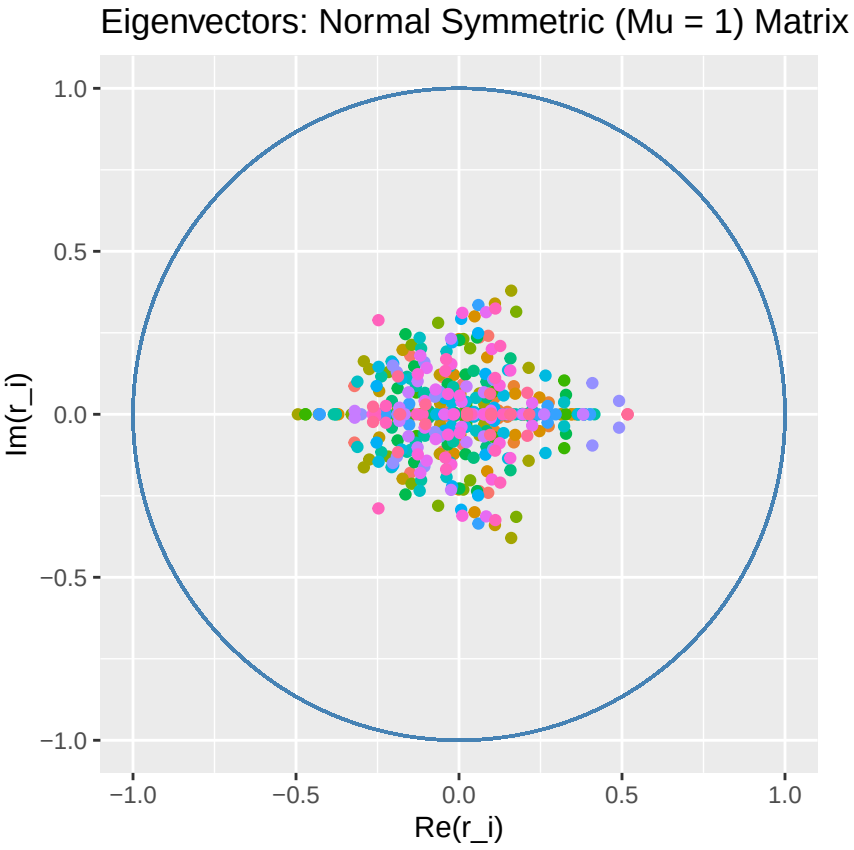
```
## [1] "Proportion of real-valued rows: 0"
```


Eigenvectors: Transpose Matrix
1.0
0.5
0.0
−0.5
−1.0
Im(r_i)
−1.0
−0.5
0.0
0.5
1.0
Re(r_i)


Eigenvectors: Original Matrix
1.0
0.5
0.0
−0.5
−1.0
Im(r_i)
−1.0
−0.5
0.0
0.5
1.0
Re(r_i)

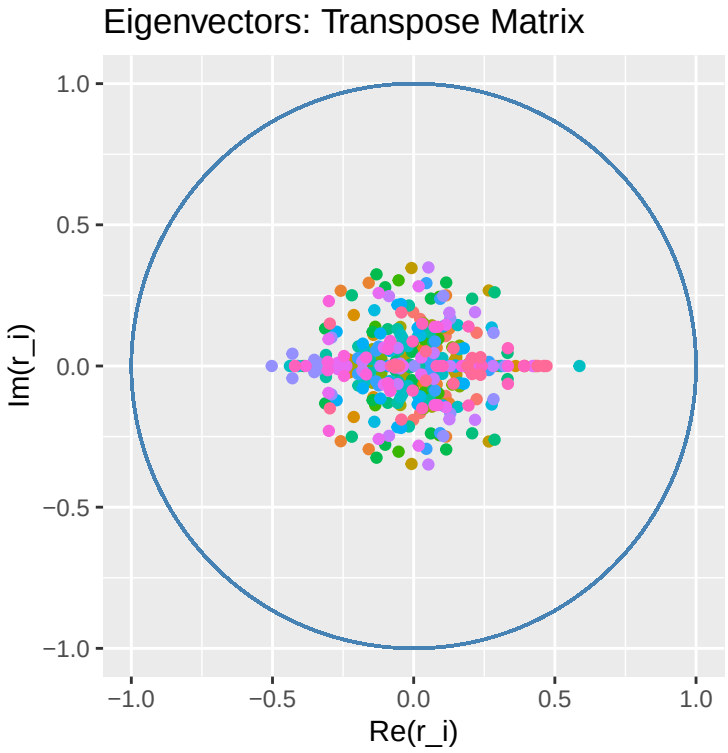
Normal Symmetric Matrix

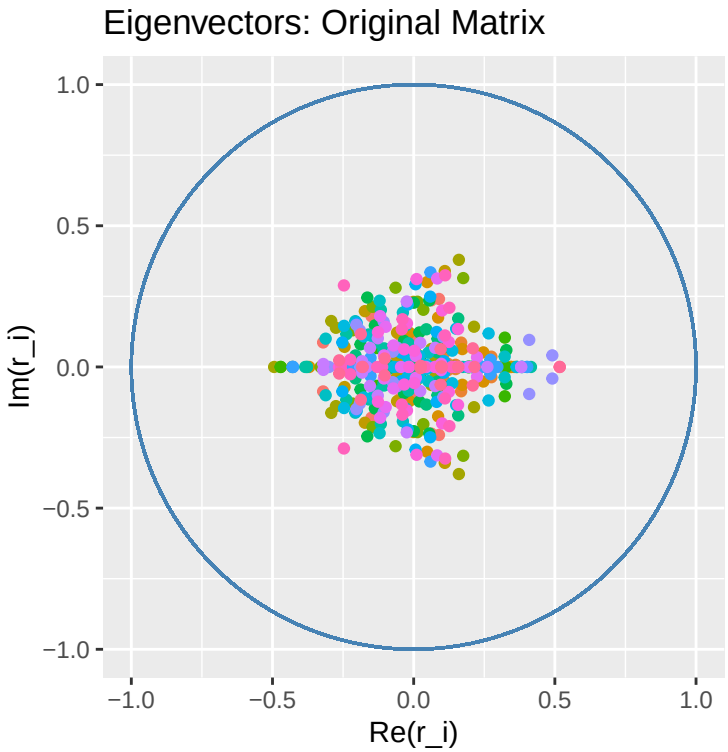
```
set.seed(23)
P <- RM_normal(M, normal_args = c(1,2), symm = T)
if(bool_plot){eigen_plot(P, loud = bool_loud, "Normal Symmetric (Mu = 1)")}
```




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

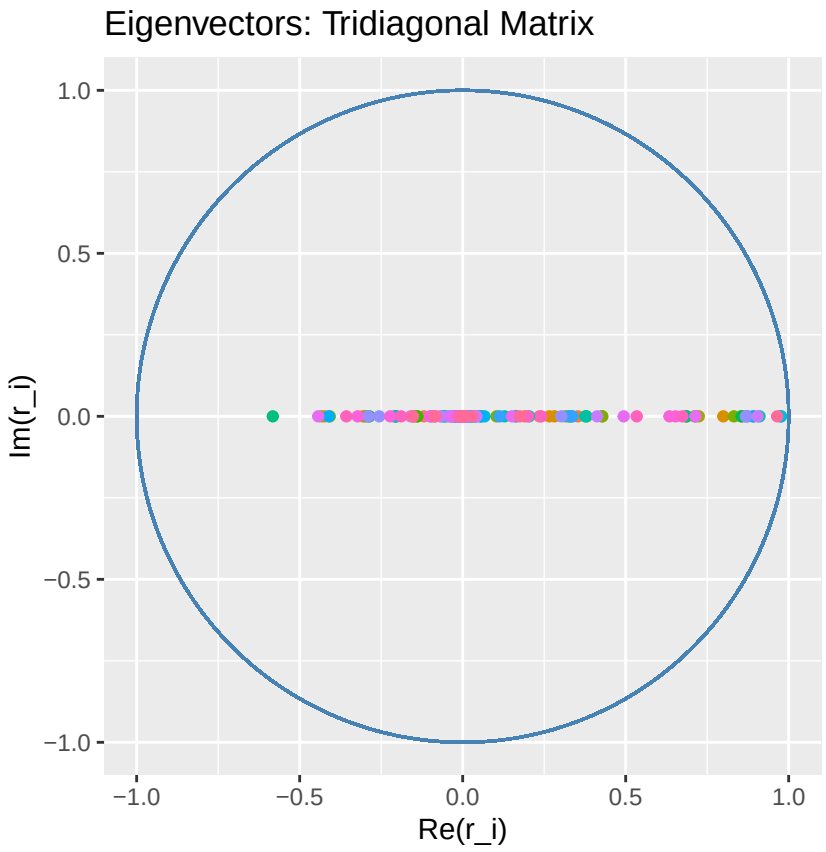
```
## [1] "Proportion of real-valued rows: 0"
```


Eigenvectors: Transpose Matrix
1.0
0.5
0.0
−0.5
−1.0
Im(r_i)
−1.0
−0.5
0.0
0.5
1.0
Re(r_i)


Eigenvectors: Original Matrix
1.0
0.5
0.0
−0.5
−1.0
Im(r_i)
−1.0
−0.5
0.0
0.5
1.0
Re(r_i)

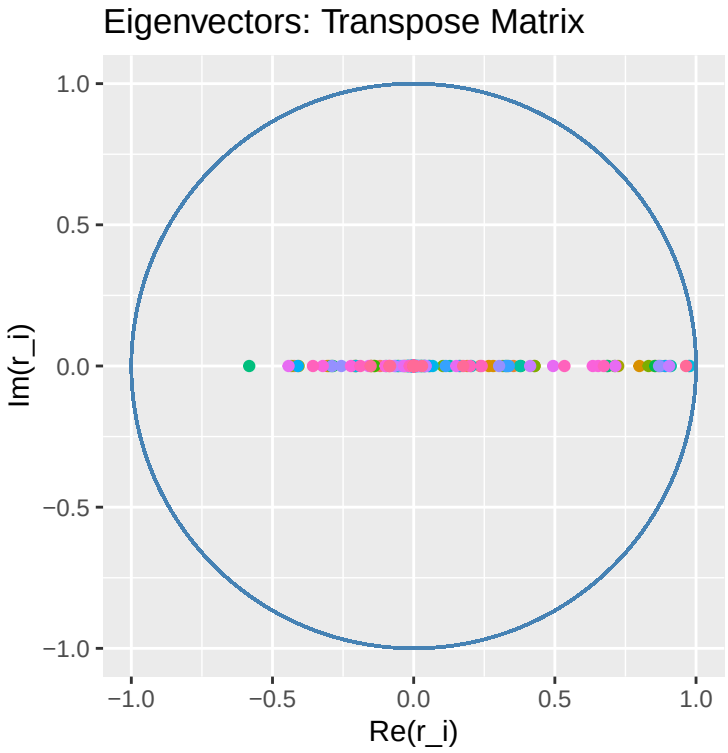
Tridiagonal Matrix

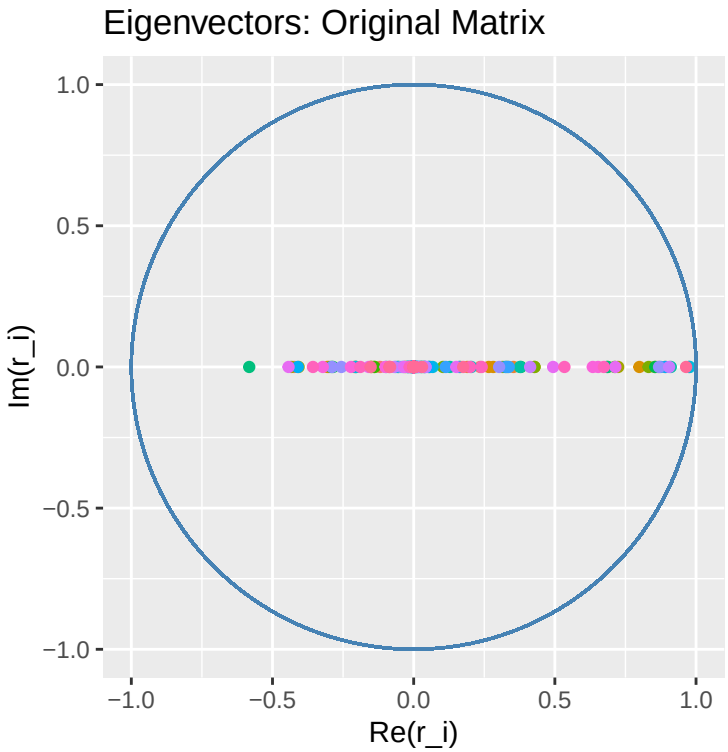
```
set.seed(23)
P <- RM_trid(M)
if(bool_plot){eigen_plot(P, loud = bool_loud, "Tridiagonal")}
```




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

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


Eigenvectors: Transpose Matrix
1.0
0.5
0.0
−0.5
−1.0
Im(r_i)
−1.0
−0.5
0.0
0.5
1.0
Re(r_i)


Eigenvectors: Original Matrix
1.0
0.5
0.0
−0.5
−1.0
Im(r_i)
−1.0
−0.5
0.0
0.5
1.0
Re(r_i)