CellTrajectory

Load libraries

```
library("ggplot2") # general plotting
library("igraph") # working with graphs
library("ggpubr") # combining plots
```

Load functions

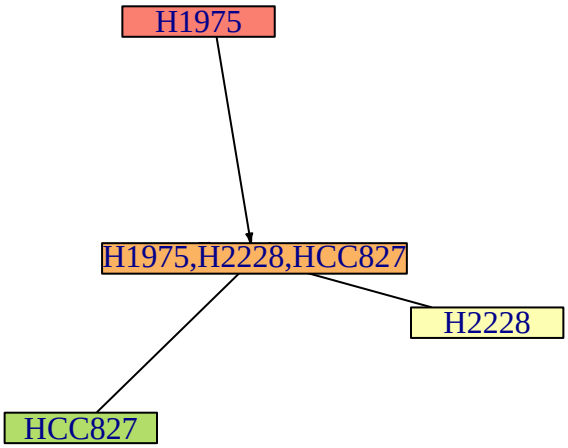
```
source("R/kNNgraph.R")
source("R/get_edges2D.R")
```

Load the data

```
cells_info <- readRDS("Data/cellbench-SC1_luyitian.rds")
```

View the ground truth model

```
G <- graph_from_data_frame(cells_info$milestone_network)
cols <- c("H1975"=rgb(250, 127, 113, maxColorValue = 255),
          "HCC827"=rgb(178, 221, 104, maxColorValue = 255),
          "H2228"=rgb(254, 254, 178, maxColorValue = 255),
          "H1975,H2228,HCC827"=rgb(252, 179, 97, maxColorValue = 255))
V(G)$color <- cols
op <- par(mar = c(0, 0, 0, 0))
plot(G, vertex.shape="rectangle", vertex.label.cex=1, vertex.size=c(75, 75, 75, 150),
     edge.arrow.size=0.25, edge.color="black"); par(op)
```



View the kNN graph of the high-dimensional data through a low-dimensional embedding

```
fit <- data.frame(prcomp(cells_info$expression, rank.=2)$x)
fit[["group"]] <- factor(cells_info$grouping)
if(mean(fit[fit[["group"]] == "HCC827", 1]) > 0){
  fit[,1] <- -fit[,1]
}
if(mean(fit[fit[["group"]] == "H2228", 2]) < 0){
  fit[,2] <- -fit[,2]
```

```
}
kNNhigh <- kNNgraph(cells_info$expression, k=5)
Ehigh <- get_edges2D(fit[,1:2], kNNhigh)

P1 <- ggplot(fit, aes(x=PC1, y=PC2)) +
  geom_segment(data=Ehigh, aes(x=x1, y=y1, xend=x2, yend=y2), color='black', alpha=0.15) +
  geom_point(size=3, col="black", aes(fill=group), pch=21) +
  scale_colour_manual(values=cols, aesthetics="fill") +
  ggtitle("high-dimensional 5NN") +
  theme_bw() +
  theme(legend.title=element_text(size=15, face="bold"), legend.text=element_text(size=12),
        text=element_text(size=10), plot.title=element_text(hjust = 0.5, size=12),
        legend.position="none")
```

View the kNN graph of the low-dimensional embedding

```
kNNlow <- kNNgraph(fit[,1:2], k=5)
Elow <- get_edges2D(fit[,1:2], kNNlow)

P2 <- ggplot(fit, aes(x=PC1, y=PC2)) +
  geom_segment(data=Elow, aes(x=x1, y=y1, xend=x2, yend=y2), color='black', alpha=0.75) +
  geom_point(size=3, col="black", aes(fill=group), pch=21) +
  scale_colour_manual(values=cols, aesthetics="fill") +
  theme_bw() +
  ggtitle("low-dimensional 5NN") +
  theme(legend.title=element_text(size=15, face="bold"), legend.text=element_text(size=12),
        text=element_text(size=10), plot.title=element_text(hjust = 0.5, size=12),
        legend.position="none")
```

Combine the plots

```
ggarrange(P1, P2, ncol=2)
```