Visualization

Nick Wawee

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This document will visualize results obtained from the sliding window statistics. The code below visualizes the AR(1) lag coefficient as a function of sliding window position for the regular and interpolated expression data. The loess method is used to produce the smooth plots.

```
##Loading
#Hepatocyte Values
hepvals<-read.table('hepatocytedynamicvals.txt')

#Cholangiocyte Values
cholvals<-read.table('cholangiocytedynamicvals.txt')
```

```
##Tidying

#naming hepatocyte branch
hepvals$Branch<-rep('Hepatocyte',length(hepvals$Pseudotime))

#naming cholangiocyte branch
cholvals$Branch<-rep('Cholangiocyte', length(cholvals$Pseudotime))

#joining the two branches
#ACF Values
allvals<-rbind(hepvals,cholvals)
allvals$Branch<-factor(allvals$Branch)

df.m<-melt(allvals, id.vars=c('Gene_Name','Pseudotime','Branch'))
names(df.m)<-c('Gene_Name','Pseudotime','Branch','Data_Type','Value')


bifurcationpoint=51.90215#from Monocle and AR fitting
genenames<-levels(df.m$Gene_Name)
```

Line and smooth plots are generated by using ggplot2 and the use of a for-loop and plot list. Each gene is plotted with custom limits that make it so the plot has the same limits on both branches of pseudotime. The LOESS method is used to generate the smooth version of the expression and lag-coefficent data. The for-loop creates a plot of the expression values and lag coefficient for each specified gene and adds these 4 plots as one plot corresponding to the gene to the plot list at every iteration. The plot is then saved to view outside of R.

Genes are plotted based on their activity throughout each branch.

```
#Chol Plot
critgenesC<-c("Onecut2","Hnf1b","Krt7","Sox4","Sox9")
plotind.C<-match(critgenesC,genenames)

finalplot<-ggarrange(plotlist=plotlist[plotind.C], nrow=length(critgenesC))
finalplot<-annotate_figure(finalplot, fig.lab  = "Cholangiocyte Branch", fig.lab.pos = "top.left",fig.lab.size=20
, fig.lab.face="bold")
finalplot<-annotate_figure(finalplot, fig.lab ="Hepatocyte Branch", fig.lab.pos = "top.right",fig.lab.size=20, fi
g.lab.face="bold")
finalplot<-annotate_figure(finalplot, fig.lab = "Pseudotime",fig.lab.pos = "bottom")
ggsave("autocorrandexp_lineandsmooth_Chol.png", finalplot, height=4*length(critgenesC), width=12, units="in", lim
itsize = FALSE, dpi=300)

#Hep Plot
critgenesH<-c("Arg1","Apoh","Tbx3", "Lin28b","Ppara")
plotind.H<-match(critgenesH,genenames)

finalplot<-ggarrange(plotlist=plotlist[plotind.H], nrow=length(critgenesH))
finalplot<-annotate_figure(finalplot, fig.lab = "Pseudotime",fig.lab.pos = "bottom")
finalplot<-annotate_figure(finalplot, fig.lab  = "Cholangiocyte Branch", fig.lab.pos = "top.left",fig.lab.size=20
, fig.lab.face="bold")
finalplot<-annotate_figure(finalplot, fig.lab ="Hepatocyte Branch", fig.lab.pos = "top.right",fig.lab.size=20, fi
g.lab.face="bold")
finalplot<-annotate_figure(finalplot, fig.lab = "Pseudotime",fig.lab.pos = "bottom")

ggsave("autocorrandexp_lineandsmooth_Hep.png", finalplot, height=4*length(critgenesH), width=12, units="in", limi
tsize = FALSE, dpi=300)
```

Environment

System environment is shown below

```
## ALLUSERSPROFILE       C:\ProgramData
## APPDATA               C:\Users\Nicholas\AppData\Roaming
## asl.log               Destination=file
## CLICOLOR_FORCE        1
## CommonProgramFiles    C:\Program Files\Common Files
## CommonProgramFiles(x86)
##                       C:\Program Files (x86)\Common Files
## CommonProgramW6432    C:\Program Files\Common Files
## COMPUTERNAME          DESKTOP-KUE1HG3
## ComSpec               C:\WINDOWS\system32\cmd.exe
## configsetroot         C:\WINDOWS\ConfigSetRoot
## DISPLAY               :0
## DriverData            C:\Windows\System32\Drivers\DriverData
## FPS_BROWSER_APP_PROFILE_STRING
##                       Internet Explorer
## FPS_BROWSER_USER_PROFILE_STRING
##                       Default
## GFORTRAN_STDERR_UNIT
##                       -1
## GFORTRAN_STDOUT_UNIT
##                       -1
## GIT_ASKPASS           rpostback-askpass
## HOME                  C:/Users/Nicholas/Documents
## HOMEDRIVE             C:
## HOMEPATH              \Users\Nicholas
## LOCALAPPDATA          C:\Users\Nicholas\AppData\Local
## LOGONSERVER           \\DESKTOP-KUE1HG3
## MSYS2_ENV_CONV_EXCL   R_ARCH
## NOT_CRAN              true
## NUMBER_OF_PROCESSORS
##                       4
## OneDrive              C:\Users\Nicholas\OneDrive
## OneDriveConsumer      C:\Users\Nicholas\OneDrive
## OS                    Windows_NT
## PATH                  C:\Program
##                       Files\R\R-3.5.1\bin\x64;C:\Program Files
##                       (x86)\Common
##                       Files\Oracle\Java\javapath;C:\Windows\system32;C:\Windows;C:\Windows\System32\Wbem;C:\Wi
ndows\System32\WindowsPowerShell\v1.0\;C:\Program
##                       Files (x86)\NVIDIA
##                       Corporation\PhysX\Common;C:\Program
##                       Files\MATLAB\R2018a\runtime\win64;C:\Program
##                       Files\MATLAB\R2018a\bin;C:\Program
##                       Files\MATLAB\R2017a\runtime\win64;C:\Program
##                       Files\MATLAB\R2017a\bin;C:\WINDOWS\system32;C:\WINDOWS;C:\WINDOWS\System32\Wbem;C:\WINDO
WS\System32\WindowsPowerShell\v1.0\;C:\WINDOWS\System32\OpenSSH\;C:\Users\Nicholas\AppData\Local\Microsoft\Window
sApps;
## PATHEXT               .COM;.EXE;.BAT;.CMD;.VBS;.VBE;.JS;.JSE;.WSF;.WSH;.MSC
## PROCESSOR_ARCHITECTURE
##                       AMD64
## PROCESSOR_IDENTIFIER
##                       Intel64 Family 6 Model 142 Stepping 9,
##                       GenuineIntel
## PROCESSOR_LEVEL       6
## PROCESSOR_REVISION    8e09
## ProgramData           C:\ProgramData
## ProgramFiles          C:\Program Files
## ProgramFiles(x86)     C:\Program Files (x86)
## ProgramW6432          C:\Program Files
## PSModulePath          C:\Program
##                       Files\WindowsPowerShell\Modules;C:\WINDOWS\system32\WindowsPowerShell\v1.0\Modules
## PUBLIC                C:\Users\Public
## R_ARCH                /x64
## R_COMPILED_BY         gcc 4.9.3
## R_DOC_DIR             C:/PROGRA~1/R/R-35~1.1/doc
## R_HOME                C:/PROGRA~1/R/R-35~1.1
## R_LIBS                C:/Users/Nicholas/Documents/R/win-library/3.5;C:/Program
##                       Files/R/R-3.5.1/library
## R_LIBS_USER           C:/Users/Nicholas/Documents/R/win-library/3.5
## R_USER                C:/Users/Nicholas/Documents
## RMARKDOWN_MATHJAX_PATH
##                       C:/Program
##                       Files/RStudio/resources/mathjax-26
## RMARKDOWN_PREVIEW_DIR
##                       C:\Users\Nicholas\AppData\Local\Temp\Rtmp2JF6RQ
## RS_LOCAL_PEER         \\.\pipe\33814-rsession
## RS_RPOSTBACK_PATH     C:/Program Files/RStudio/bin/rpostback
## RS_SHARED_SECRET      63341846741
## RSTUDIO               1
## RSTUDIO_CONSOLE_COLOR
##                       256
## RSTUDIO_CONSOLE_WIDTH
##                       92
## RSTUDIO_MSYS_SSH      C:/Program
##                       Files/RStudio/bin/msys-ssh-1000-18
## RSTUDIO_PANDOC        C:/Program Files/RStudio/bin/pandoc
## RSTUDIO_SESSION_PORT
##                       33814
## RSTUDIO_USER_IDENTITY
##                       Nicholas
## RSTUDIO_WINUTILS      C:/Program Files/RStudio/bin/winutils
## SESSIONNAME           Console
## SSH_ASKPASS           rpostback-askpass
## SystemDrive           C:
## SystemRoot            C:\WINDOWS
## TEMP                  C:\Users\Nicholas\AppData\Local\Temp
## TERM                  xterm-256color
## TMP                   C:\Users\Nicholas\AppData\Local\Temp
## USERDOMAIN            DESKTOP-KUE1HG3
## USERDOMAIN_ROAMINGPROFILE
##                       DESKTOP-KUE1HG3
## USERNAME              Nicholas
## USERPROFILE           C:\Users\Nicholas
## windir                C:\WINDOWS
```