

R scripts for the SDSS quasar r magnitudes

```
# Read dataset of 120 SDSS quasar  $r$  magnitudes
qso=
read.table("http://astrostatistics.psu.edu/datasets/SDSS_QSO.dat",
dim(qso) ; names(qso) ; summary(qso)
rmag=qso[1:120,9]
amag=qso[1:120,17]

# Plot e.d.f. with confidence bands install.packages('sfsmisc')
; library('sfsmisc')
ecdf.ksCI(rmag)

# Plot e.d.f.'s
wilcox.test(rmag,amag,conf.int=T)
Absmag=amag+44.7 # sets equal medians
plot(ecdf(rmag),pch=20,xlab="Magnitude")
plot(ecdf(Absmag),add=T) ; text(21,0.7,lab='r mag')
```

```
# Run e.d.f. 2-sample tests
ks.test(rmag,Absmag)
install.packages('cramer') ; library(cramer)
cramer.test(rmag,Absmag)
```

```
# Plot histograms and kernel density estimators
hist(rmag,breaks='scott') ; hist(rmag,breaks=30)
plot(density(rmag, bw=bw.nrd0(rmag)))
```

```
# Plot k.d.e. with confidence bands
install.packages('sm') ; library(sm)
help('sm.density')
sm.density(rmag) ; tt=sm.density(rmag)
lines(tt$eval.points,tt$upper,col=3) ;
lines(tt$eval.points,tt$lower,col=3)
```

R script for the SDSS quasar LOESS plot

```
# Read SDSS quasar sample, N=77,429. Clean bad
photometry
qso=
read.table("http://astrostatistics.psu.edu/datasets/SDSS_QSO.dat",
q1=qso[qso[,10] < 0.3,] ; q1=q1[q1[,12]<0.3,]
dim(q1) ; names(q1) ; summary(q1)
r_i=q1[,9]-q1[,11] ; z=q1[,4]

# Plot two-dimensional smoothed distribution
install.packages('ash') ; library(ash)
nbin=c(500,500) ; ab= matrix(c(0.0,-0.5,5.5,2.),2,2)
bins=bin2(cbind(z1,r_i1),ab,nbin)
f=ash2(bins,c(5,5)) ; f$z=log10(f$z)
image(f$x,f$y,f$z,zl=c(-
2,0.5),col=gray(seq(0,1,by=0.05)),xl=c(0,5.5))
contour(f$x,f$y,f$z,zlim=c(-1,0.5),nlevels=4,add=T)
```

```
# Construct loess local regression lines
z1=q1[,4][order(z)] ; r_i1=r_i[order(z)]
locfit1=loess(r_i1 z1,span=0.1,data.frame(x=z1,y=r_i1))
lines(z1,predict(locfit1),lwd=2,col=2)

z2=z1[z1>2.5]; r_i2=r_i1[z1>2.5]
locfit2=loess(r_i2 z2,span=0.1,data.frame(x=z2,y=r_i2))
lines(z2,predict(locfit2),lwd=2,lty=2,col=3)

# Save evenly-spaced loess fit to file
x1=seq(0.0,2.5,by=0.02)
; x2=seq(2.52,5.0,by=0.02)
locfitdat1=predict(locfit1,data.frame(x=x1))
locfitdat2=predict(locfit2,data.frame(x=x2))
write(rbind(x1,locfitdat1) sep=' ',ncol=2,file='qso.txt')
write(rbind(x2,locfitdat2),sep='
',ncol=2,file='qso.txt',append=T)
```