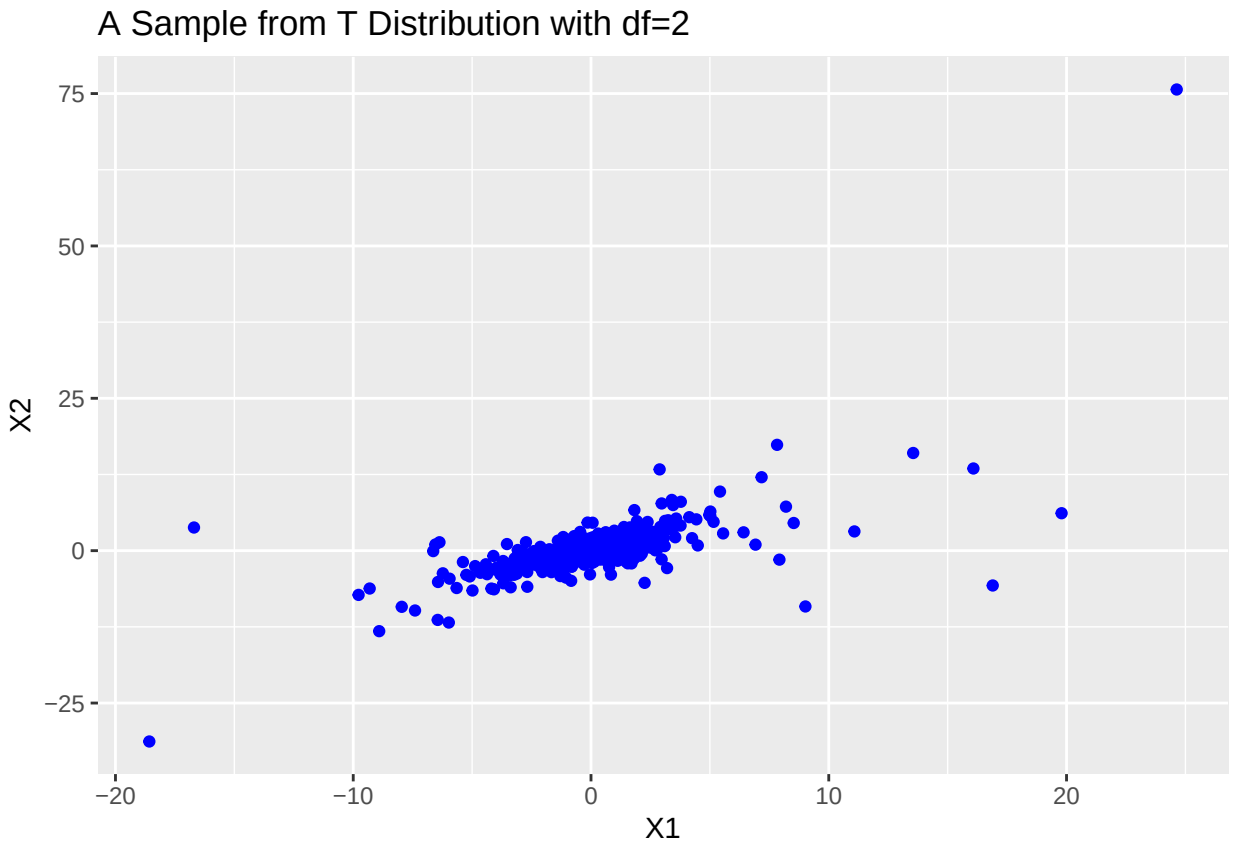
Summary of Mohamad Khaled

T-copula with df=2

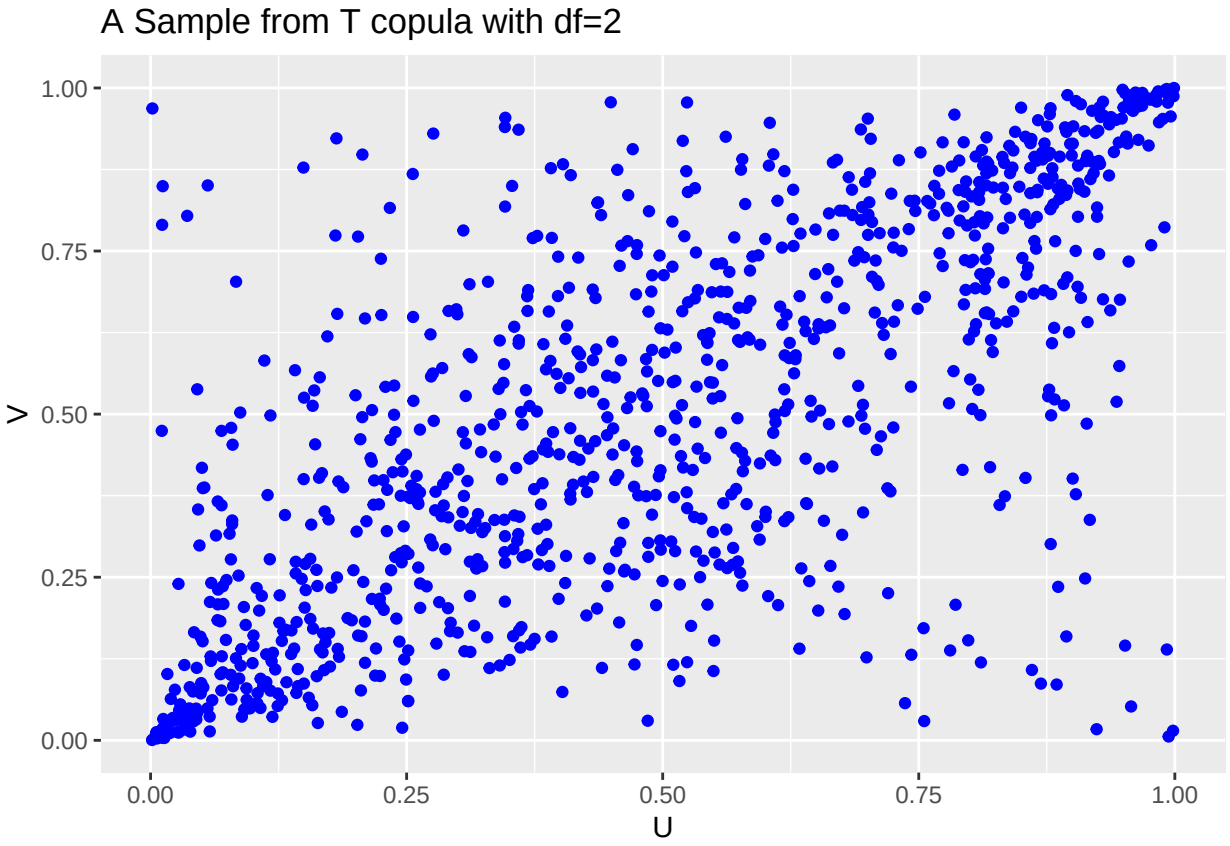
```
sigma=matrix(c(1, 0.75, 0.75, 1), ncol=2)
dataT=rmvt(1000, sigma, df=2)

copulaT=data.frame(pt(dataT, df=2))
colnames(copulaT)=c('U', 'V')

dataT=data.frame(dataT)
ggplot(dataT)+
  geom_point(aes(x=X1, y=X2),color='blue')+
  ggtitle("A Sample from T Distribution with df=2")
```




```
ggplot(copulaT)+
  geom_point(aes(x=U, y=V),color='blue')+
  ggtitle("A Sample from T copula with df=2")
```



EM algorithm to estimate a mixture of multivariate normal distributions

```
U=copulaT[,1]
V=copulaT[,2]
Z=qnorm(U);
W=qnorm(V);
dataZ=data.frame(Z, W)

est=mvnormalmixEM(dataZ, lambda = NULL, mu = NULL, sigma = NULL, k = 3,
              arbmean = TRUE, arbvar = TRUE, epsilon = 1e-08,
              maxit = 10000, verb = FALSE)
```

```
## number of iterations= 380
```

##Sampling from the posterior predictive distribution

```
x.1<-rmvnorm(round(est$lambda[1],2)*1000, est$mu[[1]], est$sigma[[1]])
x.2 <- rmvnorm(round(est$lambda[2],2)*1000, est$mu[[2]], est$sigma[[2]])
x.3 <-rmvnorm(round(est$lambda[3],2)*1000, est$mu[[3]], est$sigma[[3]])

X.pred <- rbind(x.1, x.2, x.3)
pred=data.frame(X.pred)
colnames(pred)=c("Z", "W")

copula.pred=data.frame(pnorm(pred$W), pnorm(pred$Z))
colnames(copula.pred)=c("V", "U")
```

Plots of the Copula

```
ggplot(copulaT) +
  geom_point(aes(x=V,y=U, color='blue'))+
  geom_point(data=copula.pred,aes(x=V,y=U, color = 'red')) +
  scale_color_discrete(name='', labels=c('Pred','Raw data'))
```