The following R-code corresponds to the neural network described in preprint arXiv:1701.04897. Please feel free to contact the authors if you have any additional questions.

```r
# load libraries
library(ggplot2)
library(grid)
library(gridExtra)
library("neuralnet")

# NEURAL NETWORK
# Read Atomistic Results
t raining <− read.csv(file = "trainingRv7.csv")
# Train
t raining$\bar{R}$ <- log(t raining$r$
tr aining$\angle 1$ <- cos(t raining$\angle 1 \times \pi / 180$
tr aining$\angle 2$ <- cos(t raining$\angle 2 \times \pi / 180$
tr aining$\angle 3$ <- cos(t raining$\angle 3 \times \pi / 180$
```

```
dim(t raining)
# Test
testing <− read.csv(file = "testingRv7.csv")
testing$\bar{R}$ <- log(testing$r$

testing$\angle 1$ <- cos(testing$\angle 1 \times \pi / 180$

testing$\angle 2$ <- cos(testing$\angle 2 \times \pi / 180$

testing$\angle 3$ <- cos(testing$\angle 3 \times \pi / 180$

set.seed(555)

net.sqrt <- neuralnet($\bar{R}$~angle1+angle2+angle3, training, hidden = c(10,6,3), thresh...

#net.sqrt <- neuralnet($\bar{R}$~angle1+angle2+angle3, training, hidden = c(10,6,3), thresh...

save(net.sqrt, file = "NNResistivity.R")
```
head(net$\sqrt{[13]}$)
print(net$\sqrt{ }$)

#Plot the neural network
plot(net$\sqrt{ }$)
dev.copy(jpeg, filename="plot.jpg");
dev.off();

#Test the neural network on some training data
#Generate some squared numbers
testingIN <- testing[,2:4]
testingOUT <- testing[,6]
et.results <- compute(net$\sqrt{ }, testingIN) #Run them through the neural network

#NN results
print(net$results$net.result)

#Calculating the MSE
cleanoutput$diff.sqrt <- (cleanoutput$SR.Neural - cleanoutput$SR.Expected)^2
MSE.MLN <- sum(cleanoutput$diff.sqrt)/length(cleanoutput$diff.sqrt)

Figure 1: Multi-Layer Neural Network for specific resistance on copper interconnect as described in preprint arXiv:1701.04897 obtained by the code described before.