Opening the Black Box with R

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We have a problem.

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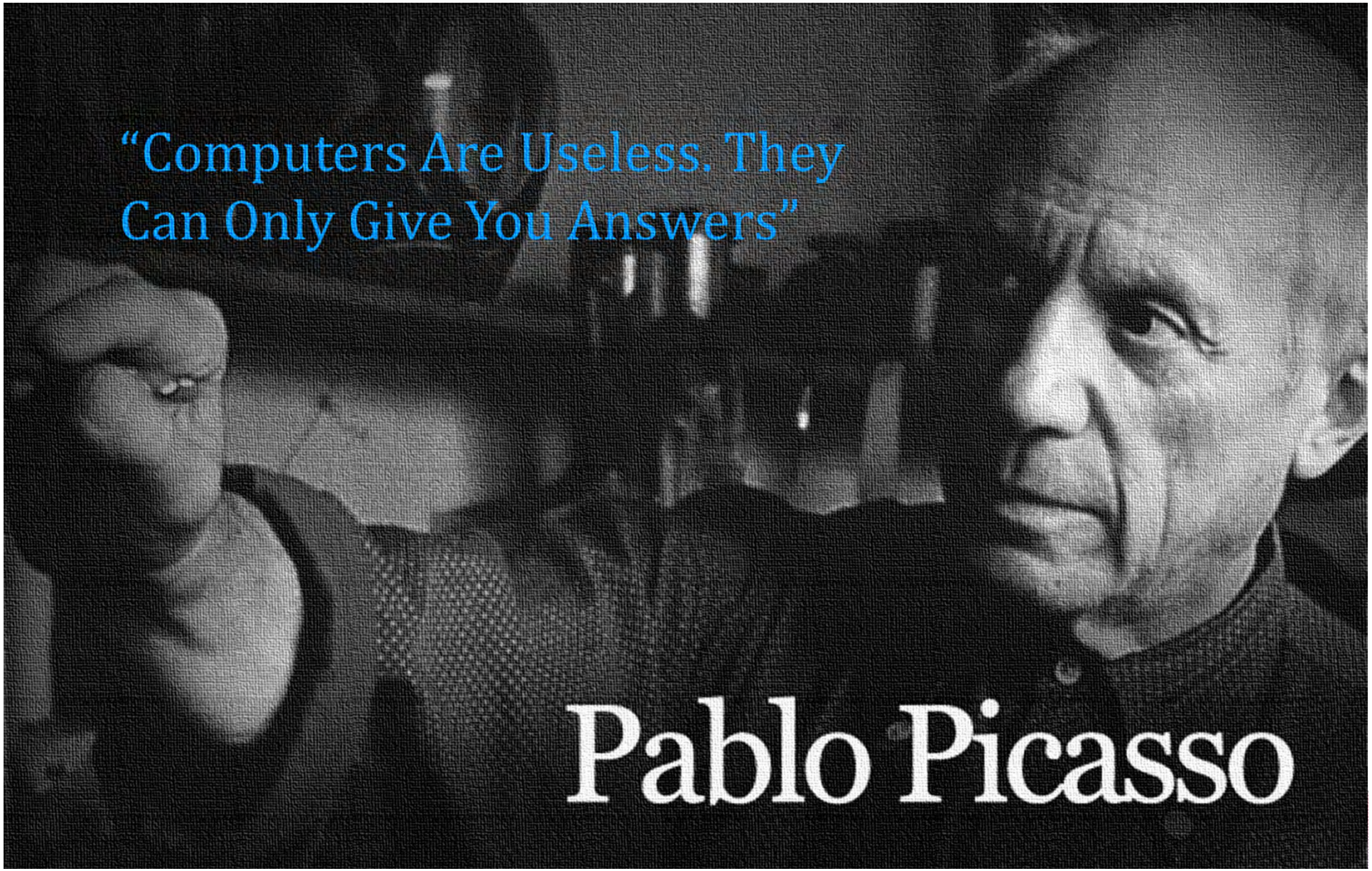
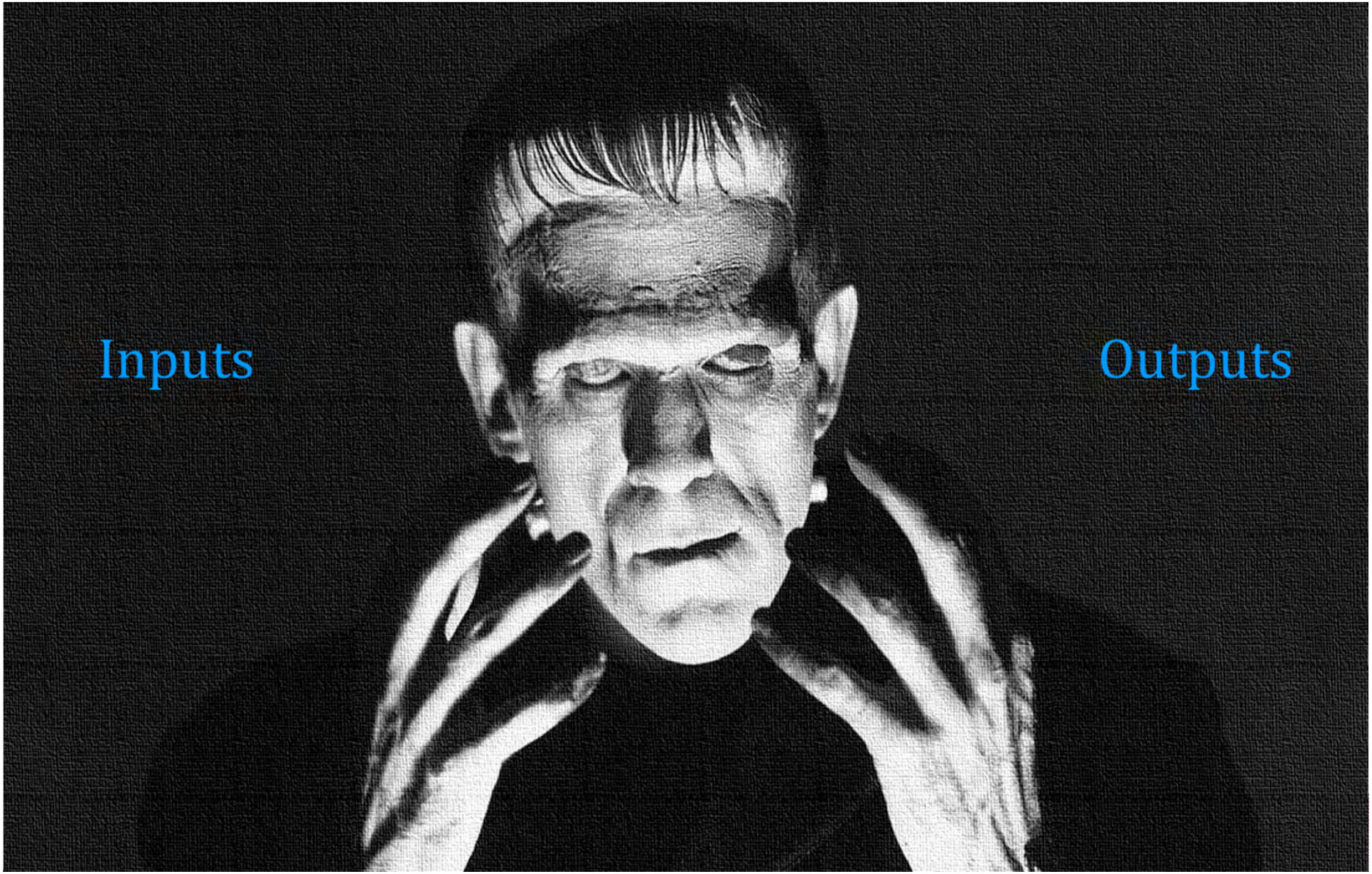


We created a man-made monster.



How we did it (1).

How we did it (2).

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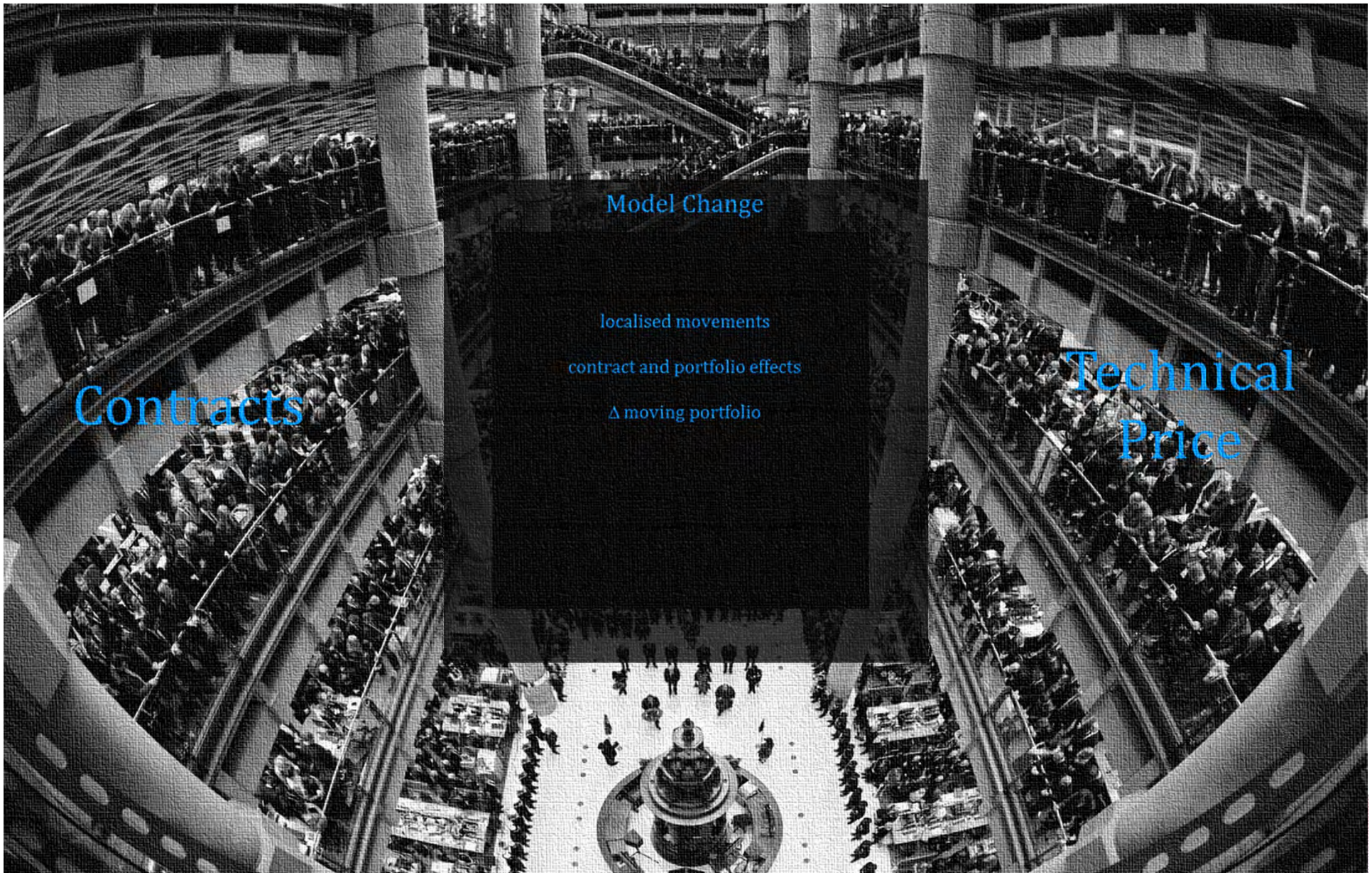
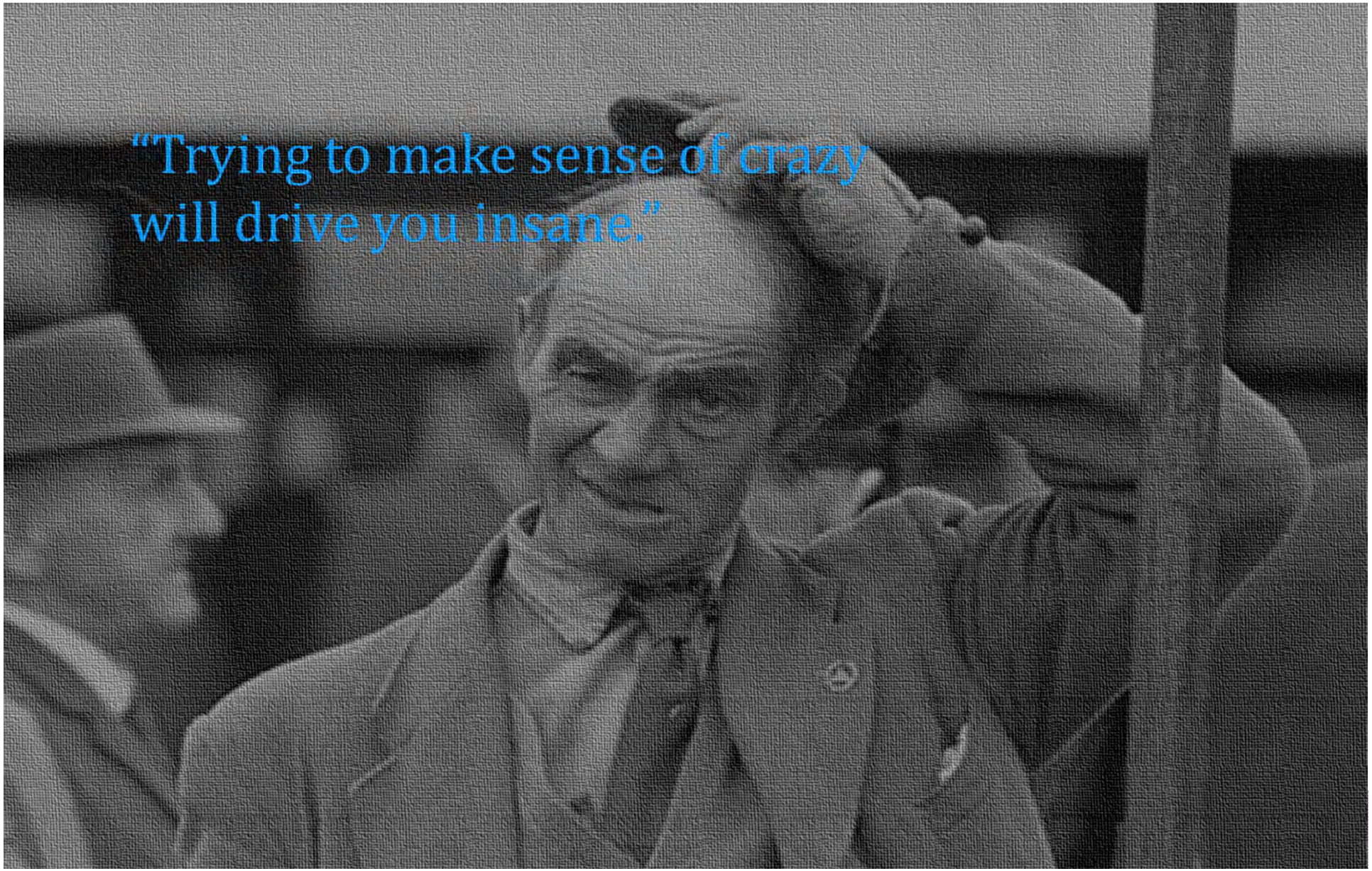
How we did it (3).

How we did it (4).



Where we got to.



R to the Rescue.

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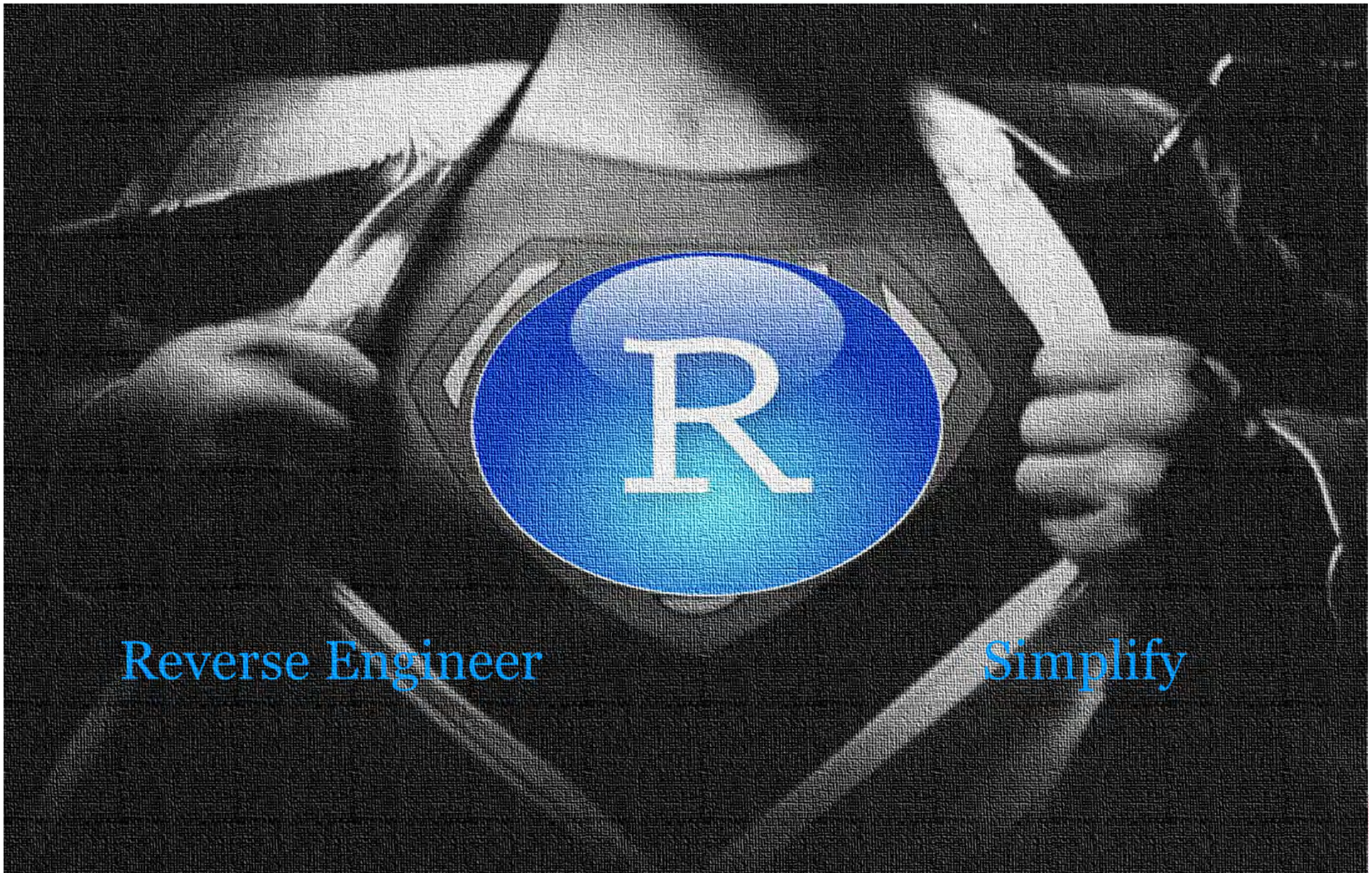

The Kitchen Sink of Machine Learning? (1)

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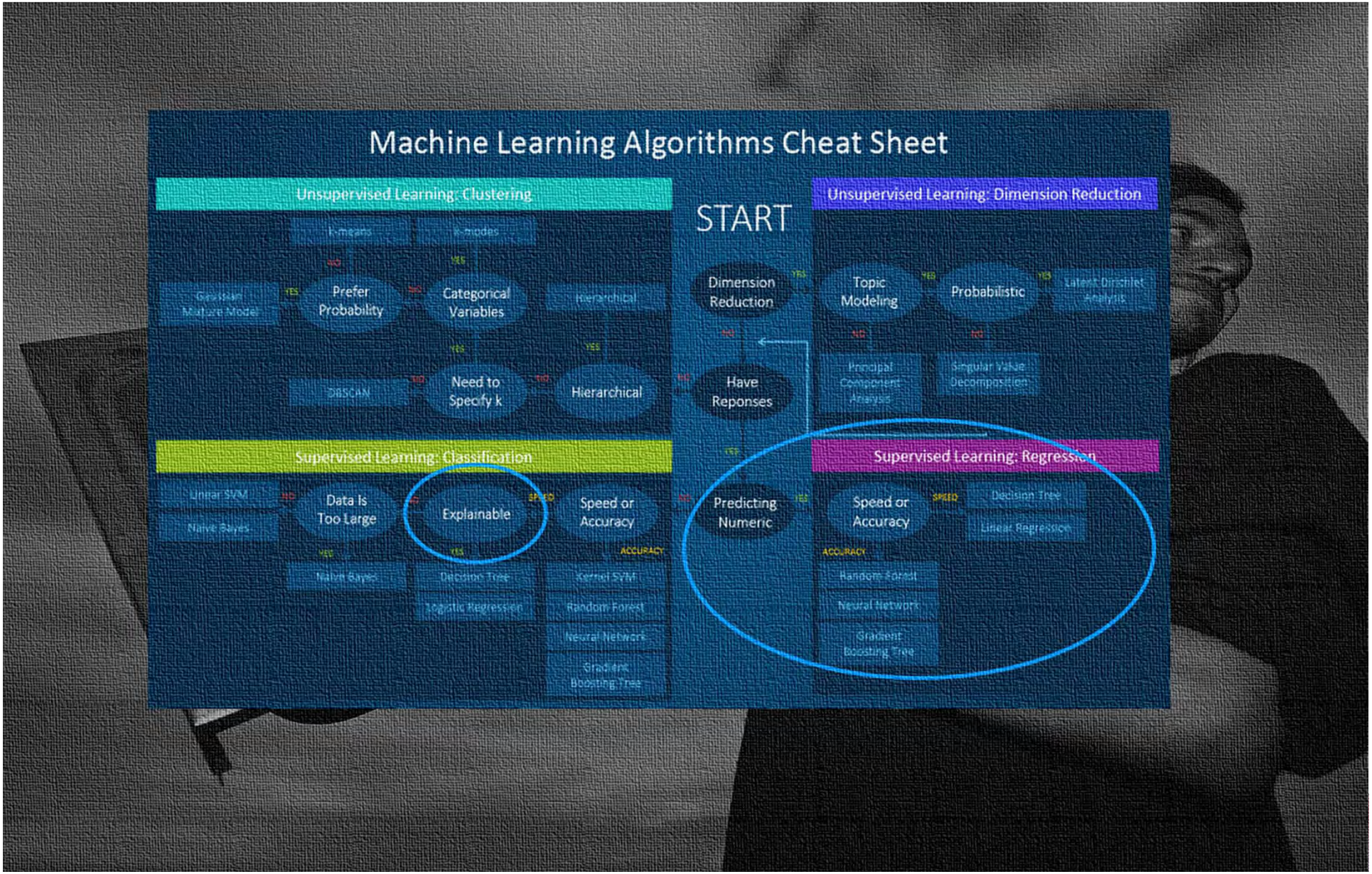
The Kitchen Sink of Machine Learning? (2)



Telling Stories with Pruned Trees (1).

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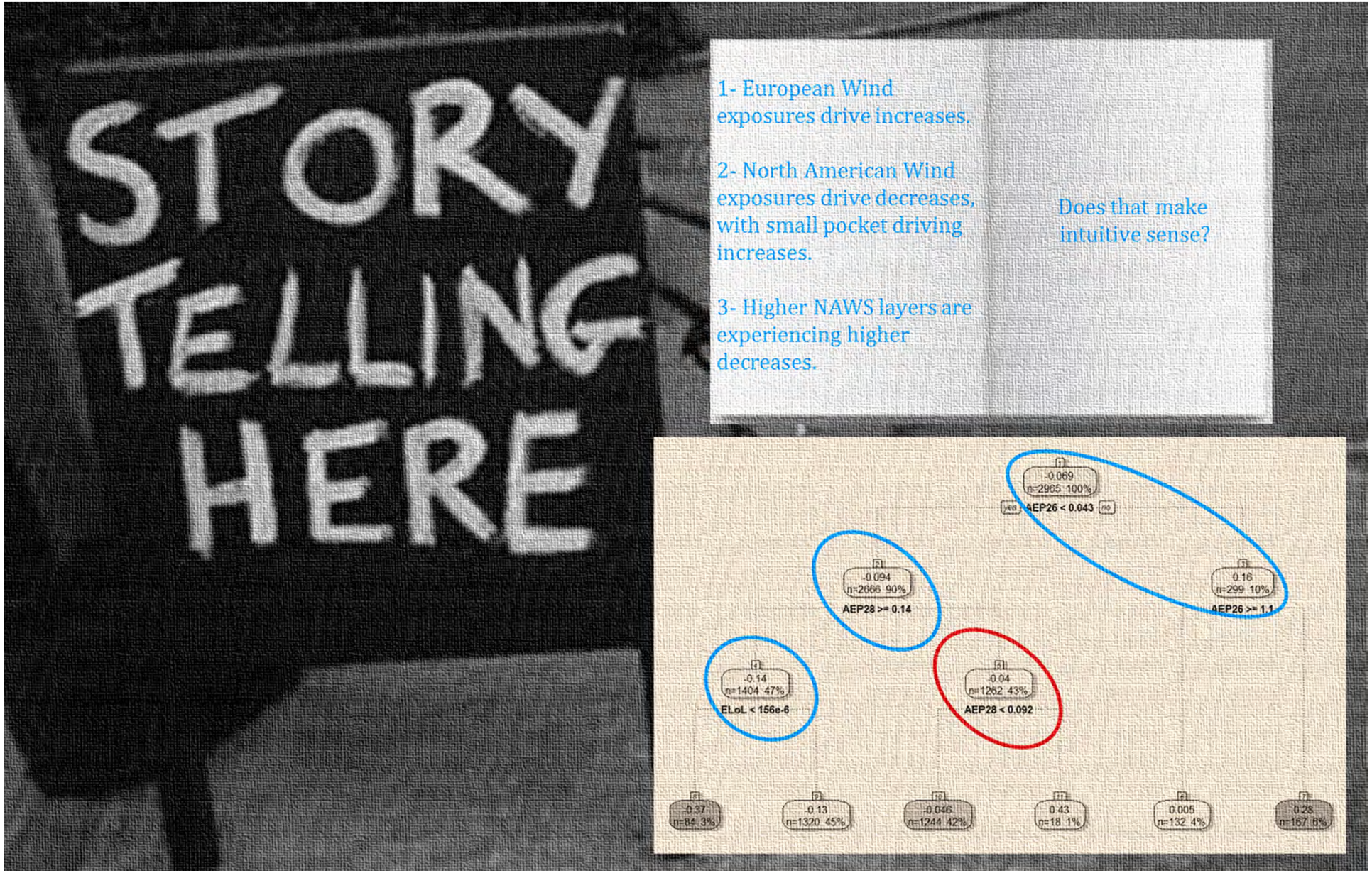
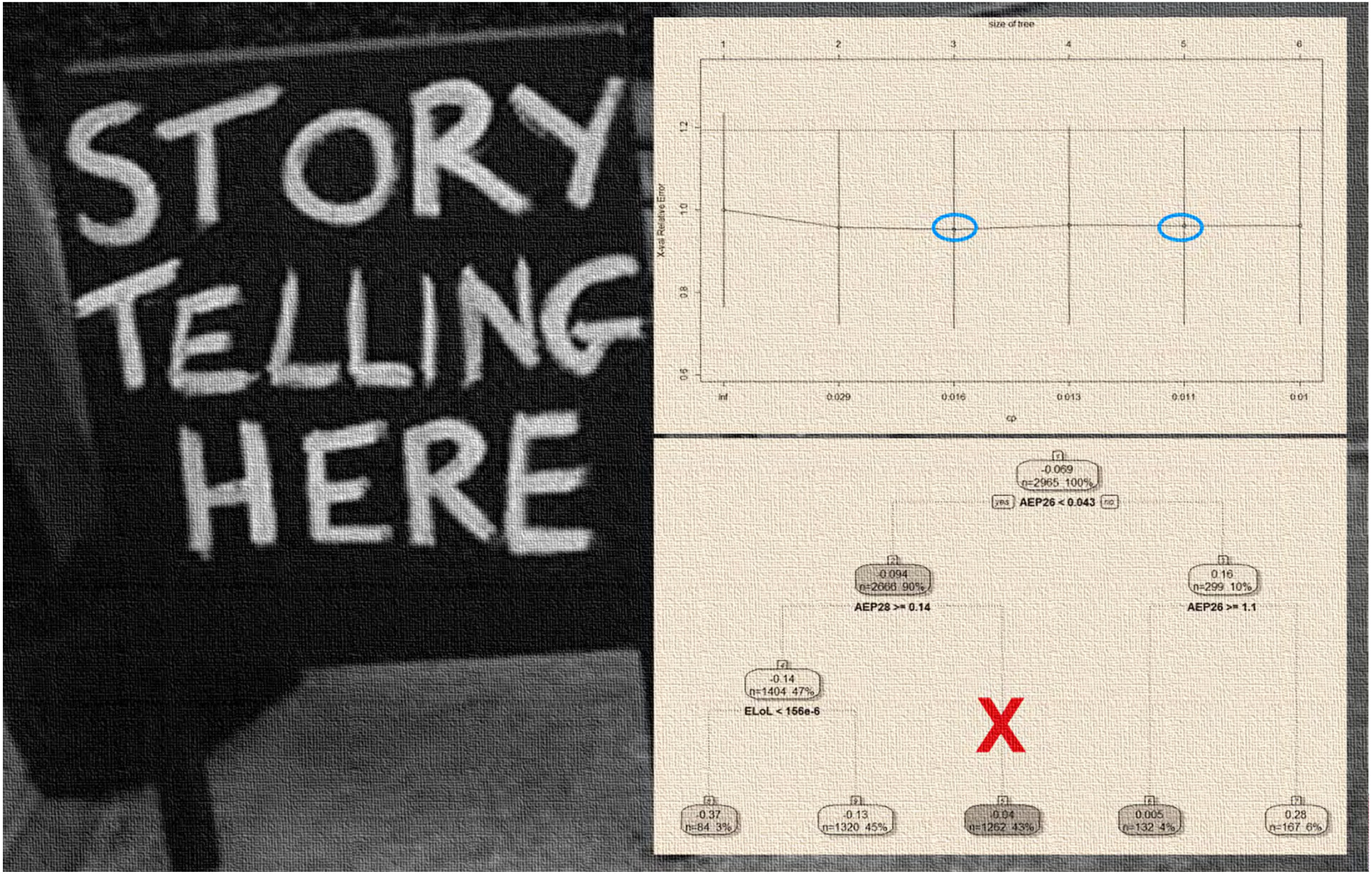
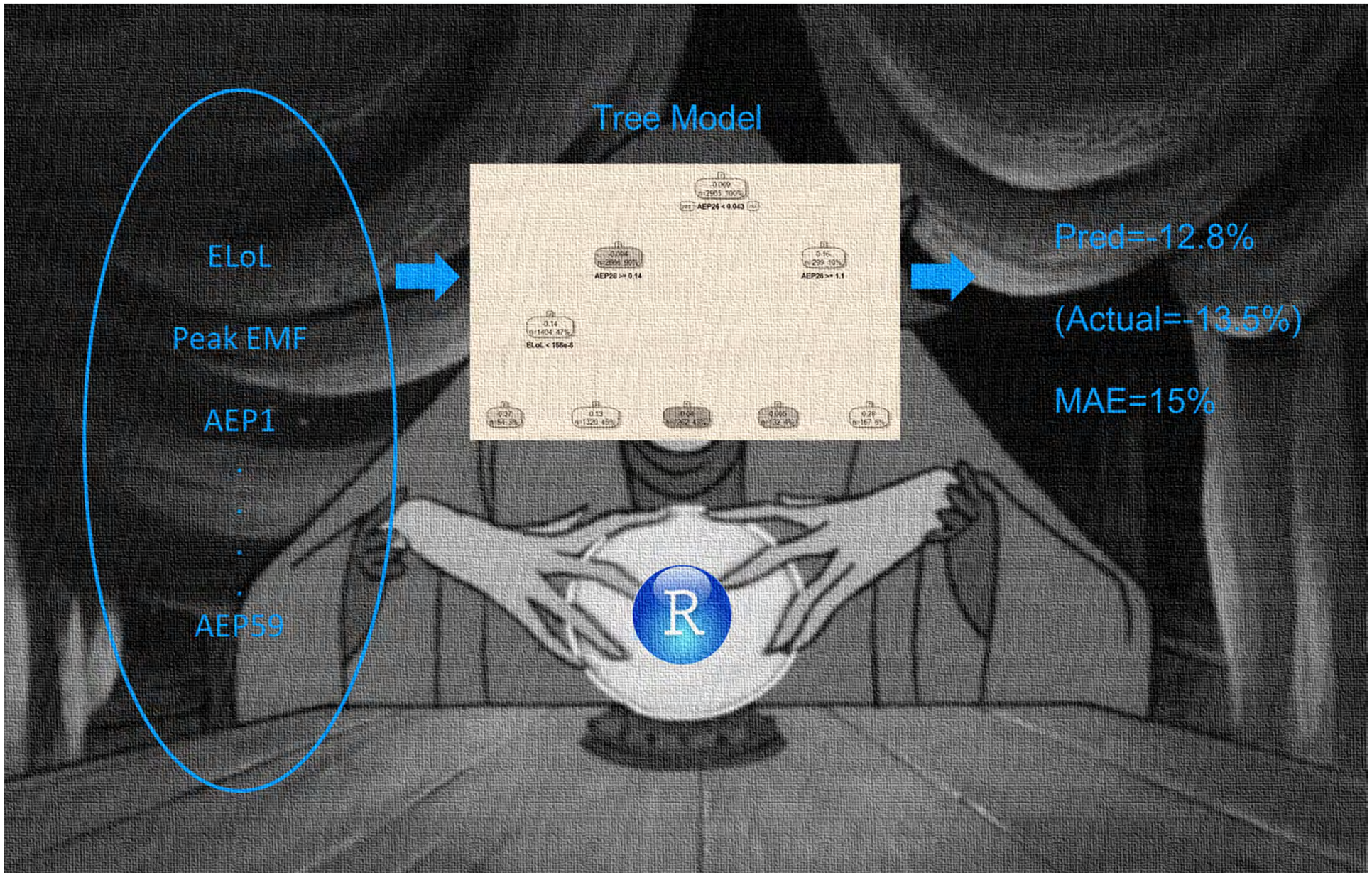


Telling Stories with Pruned Trees (2).

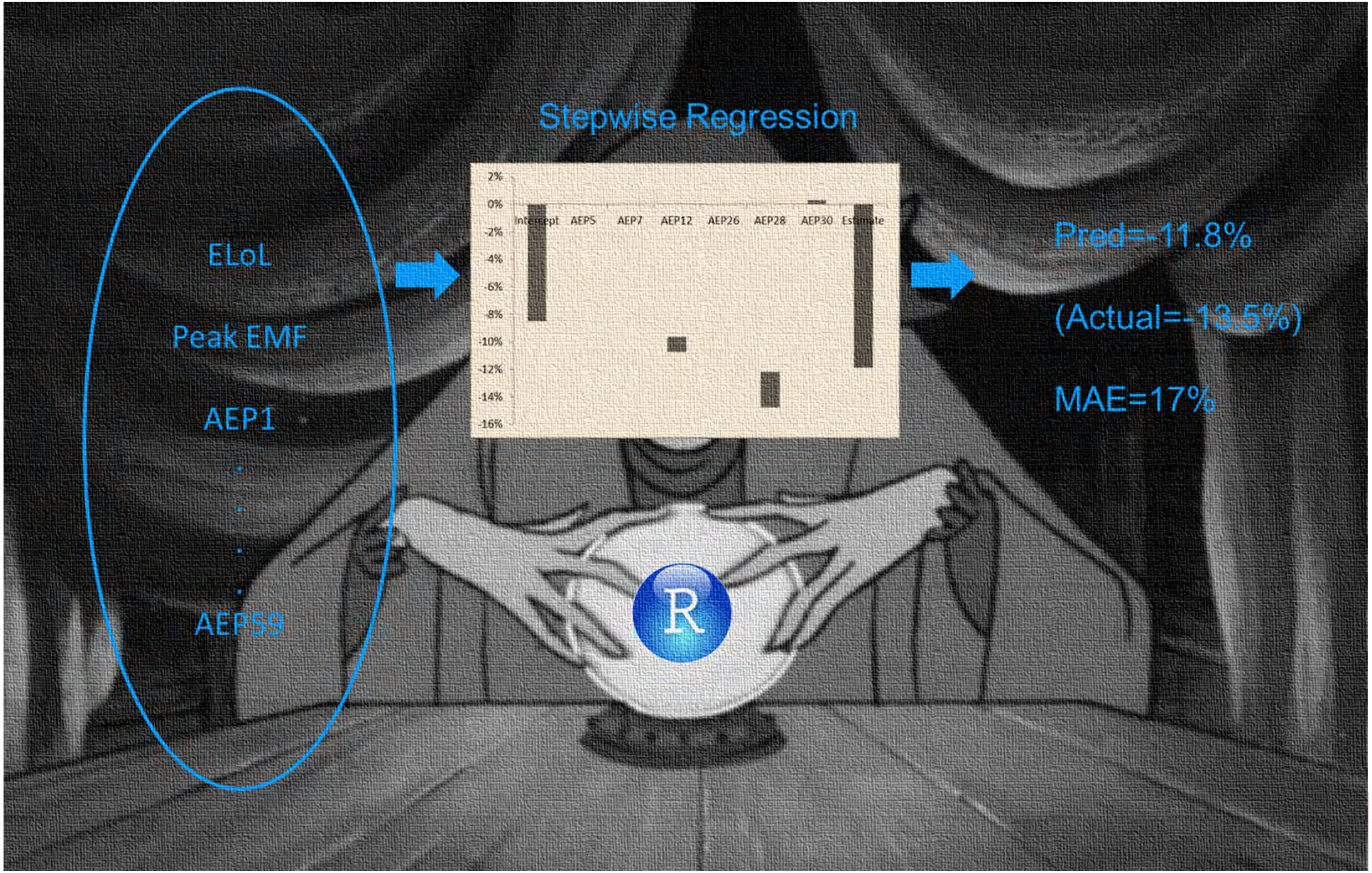
MS amlin



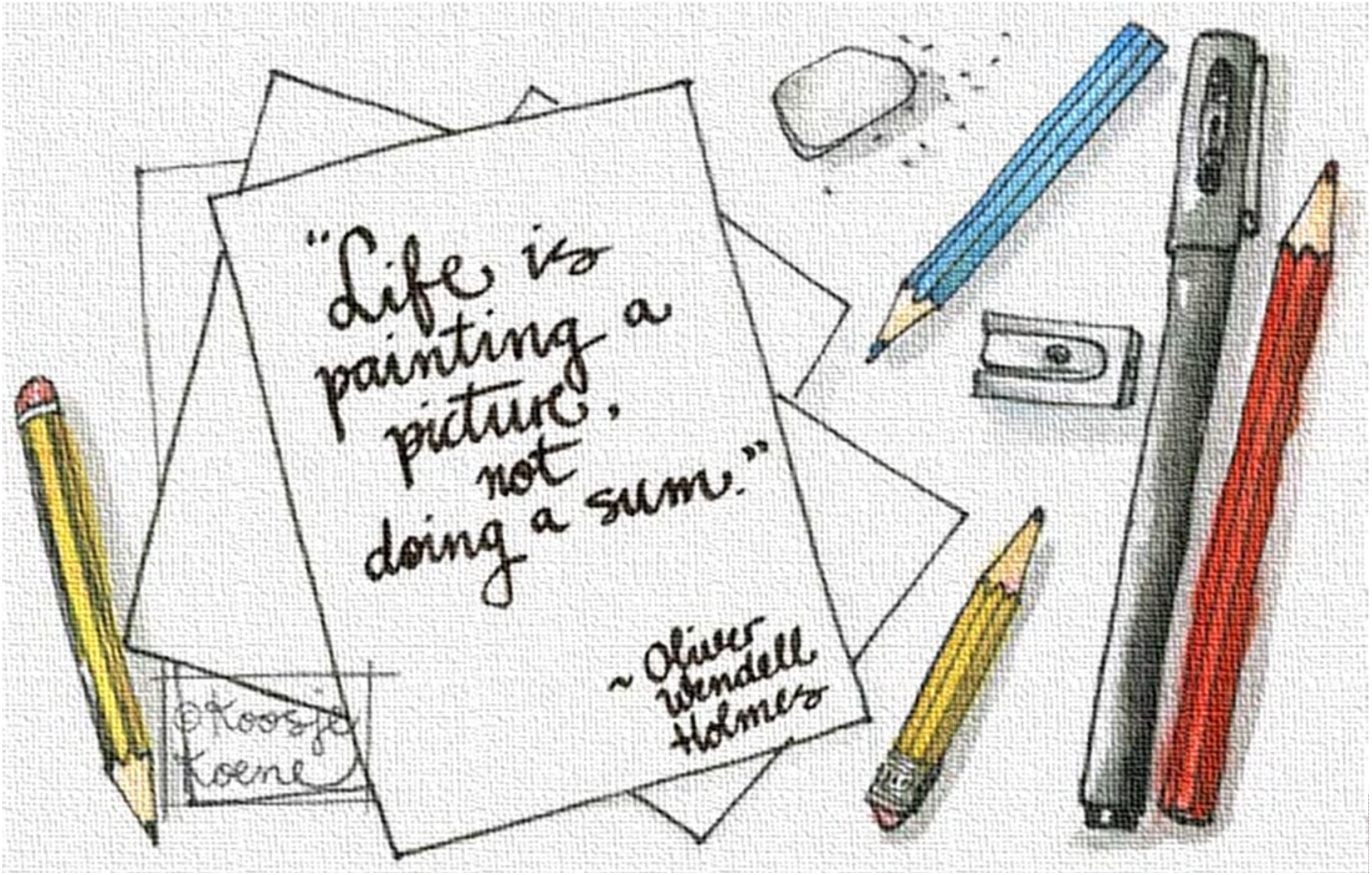
Making Predictions (1).



Making Predictions (2).



Do we have a solution?



Appendix

R Code

```
# Fit regression tree
library(rpart)
fit <- rpart(TPMov ~ ELoL + PeakEMF + AEP4 + AEP5 + AEP6 + AEP7 + AEP8 + AEP10 + AEP12 + AEP13 + AEP14 + AEP15 + AEP18 + AEP25 + AEP26 + AEP28 + AEP30 + AEP56, data=Data,
method="anova")
library(rattle)
library(rpart.plot)
library(RColorBrewer)
fancyRpartPlot(fit)
# Optimising pruning by cross-validation
plotcp(fit)
printcp(fit)
ptree <- prune(fit, cp=fit$cptable[which.min(fit$cptable[,'xerror']),'CP'])
fancyRpartPlot(ptree, uniform=TRUE, main='Pruned Classification Tree')
```

```
library(MASS)
RegressionData <- Data
# Remove outliers
RegressionData <- RegressionData[-c(1199, 1403, 1404),]
# Perform multiple regression
regressionFit <- lm(TPMov ~ ELoL + AEP4 + AEP5 + AEP6 + AEP7 + AEP8 + AEP10 + AEP12 + AEP13 + AEP14 + AEP15 + AEP18 + AEP25 + AEP26 + AEP28 + AEP30 + AEP56, data = RegressionData)
print(regressionFit)
summary(regressionFit)
plot(regressionFit)
# Stepwise regression
step <- stepAIC(regressionFit, direction="both")
step$anova # display results
summary(step)
plot(step)
```

```
MAE <- function(actual, predicted) { mean(abs(actual - predicted)) }
# Regression tree
p.rpart <- predict(fit, Data)
MAE(p.rpart, Data$TPMov)
# Stepwise regression
p.step <- predict(step, RegressionData)
MAE(predict(step, RegressionData), RegressionData$TPMov)
# Uniform allocation
MAE(0, Data$TPMov)
MAE(mean(Data$TPMov), Data$TPMov)
```