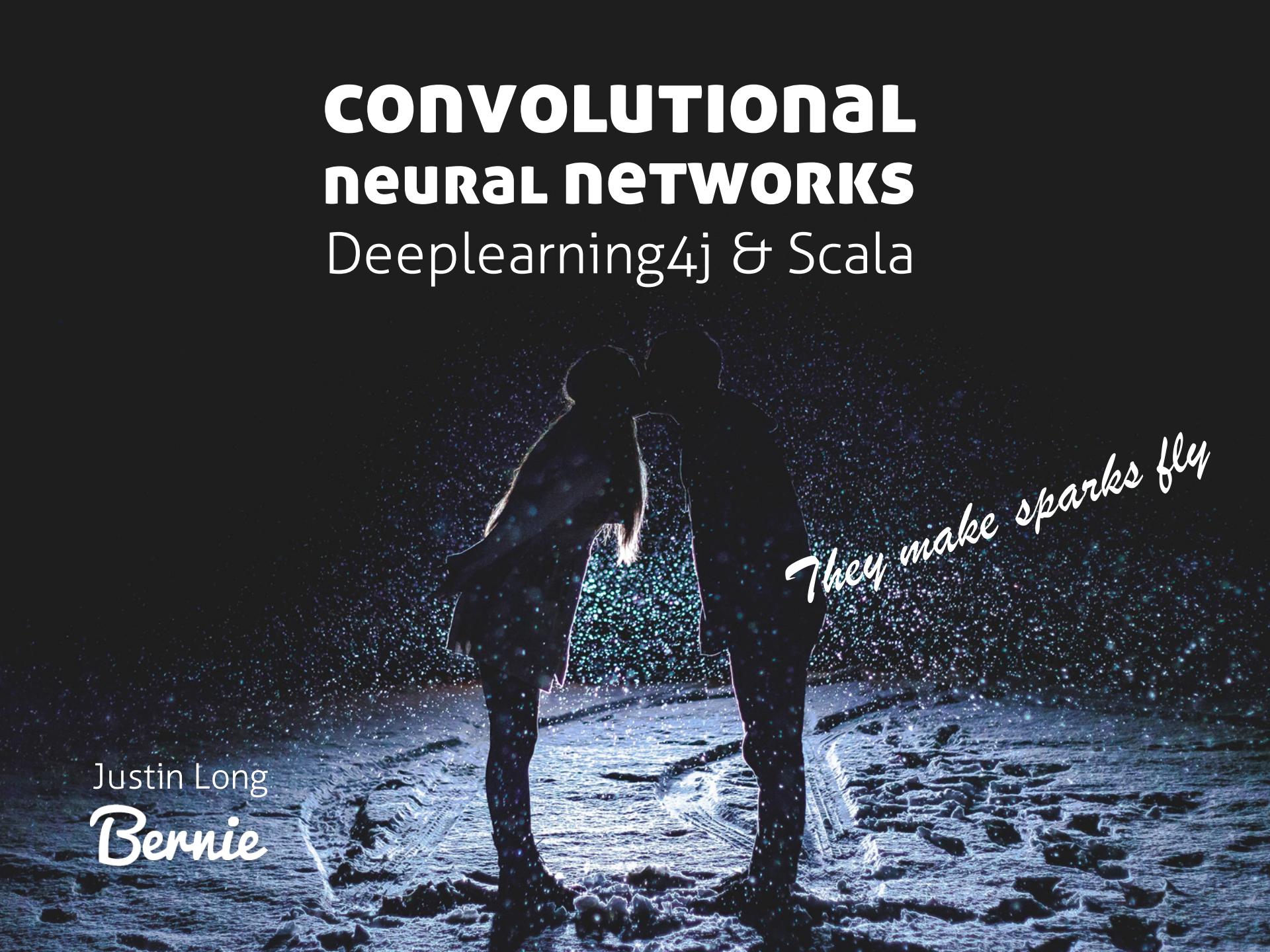


CONVOLUTIONAL neURAL NETWORKS

Deeplearning4j & Scala



They make sparks fly

Justin Long
Bernie

ABOUT BERNIE

Bernie is a personal assistant for online dating. Bernie learns the user's physical attractive preferences, and starts conversations to determine mutual interest.

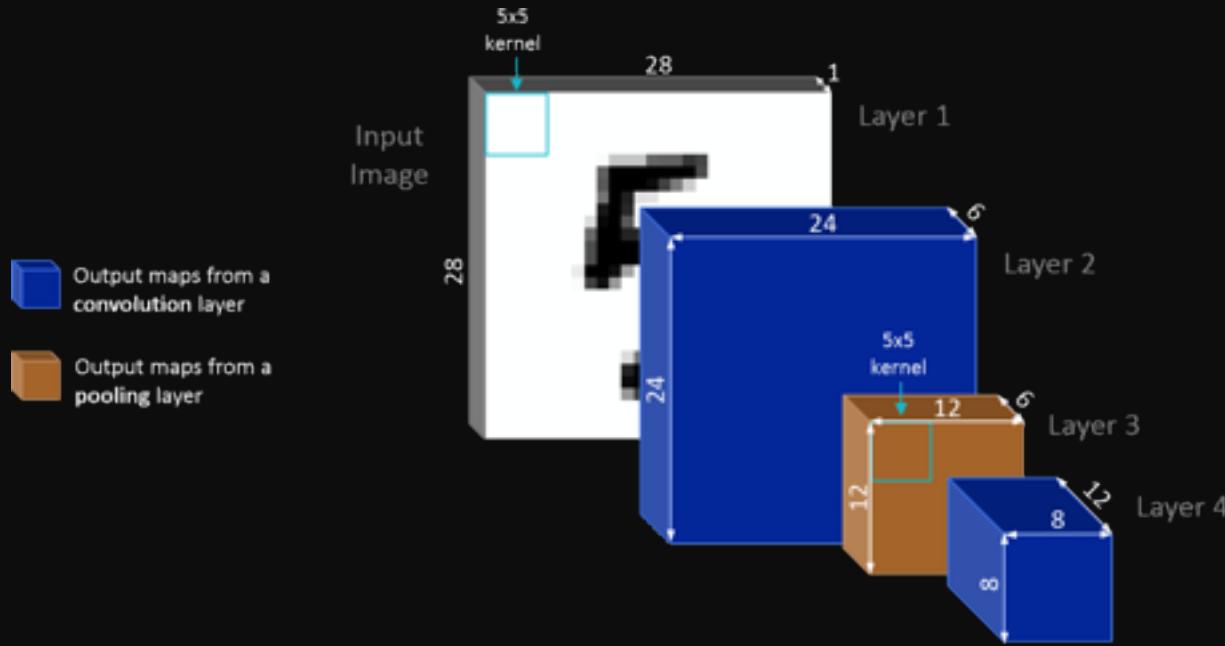
PROBLEMS WITH PCA

Principal Component Analysis (and Eigenvector-based algorithms) can't detect features and is better suited for features based on structure, and require extreme consistency in a dataset.



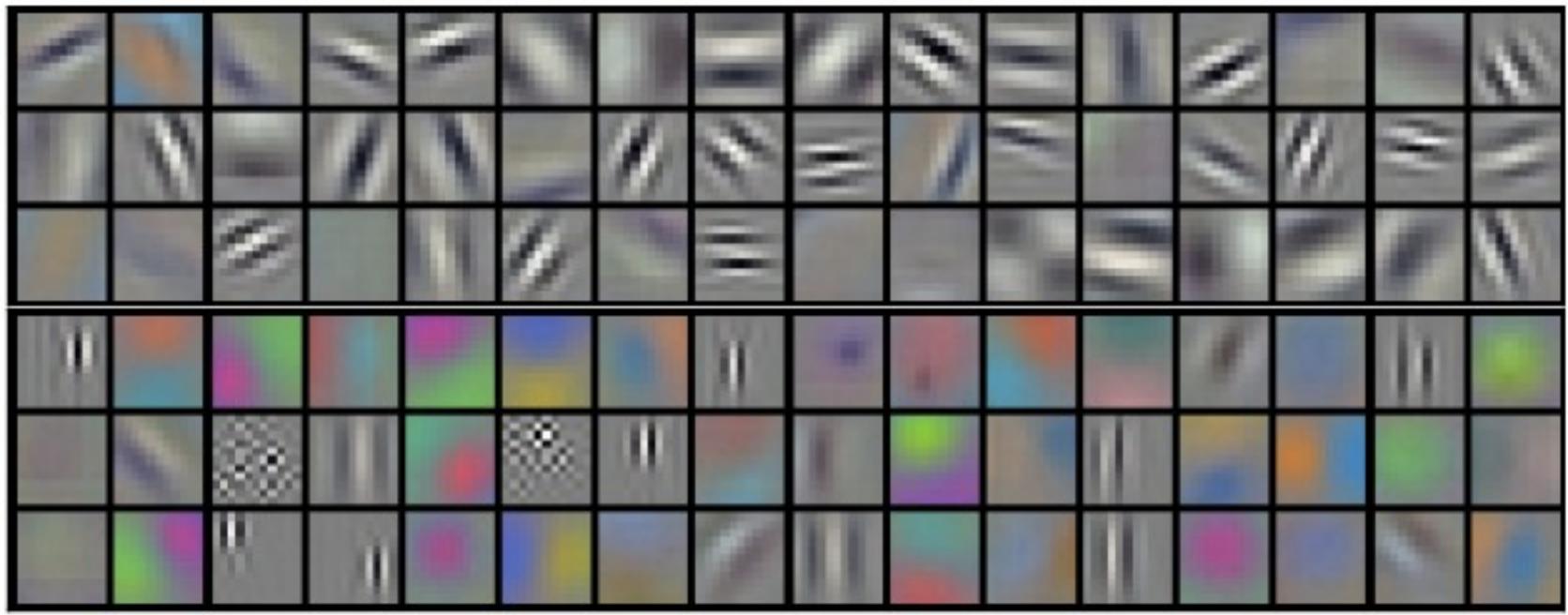
NO

YES



CONVOLUTION

Neural networks are “okay”, and engineers designed convolutional nets to specifically be trained on images.



FILTER MAPS

When the network is well-trained, the lowest level filters will represent localized, commonly occurring visual patterns.

DEEPMLEARNING4J

Open-source, commercial-grade, distributed deep-learning library for Java, Scala, and Clojure (and Kotlin if you're really cool). Integrates with Hadoop and Spark, and supported by SkyMind.

```
val labels = new java.util.ArrayList[String]()
val recordReader = new ImageRecordReader(
    imageWidth, imageHeight, nChannels, true, labels)
```

DL4J AND SCALA

The authors of DeepLearning4J have designed the library to be Scala-friendly. There are some gotchas...

PREPPING DATA

If you try the latest release candidate, strongly recommend you trial with black and white JPGs or non-compressed sRGB images.

HELPFUL COMMANDS

ImageMagick is worth its weight in gold
if you need to clean your dataset.

```
find ./ -name "*.jpg" -exec mogrify -grayscale rec709luma {} \;
```

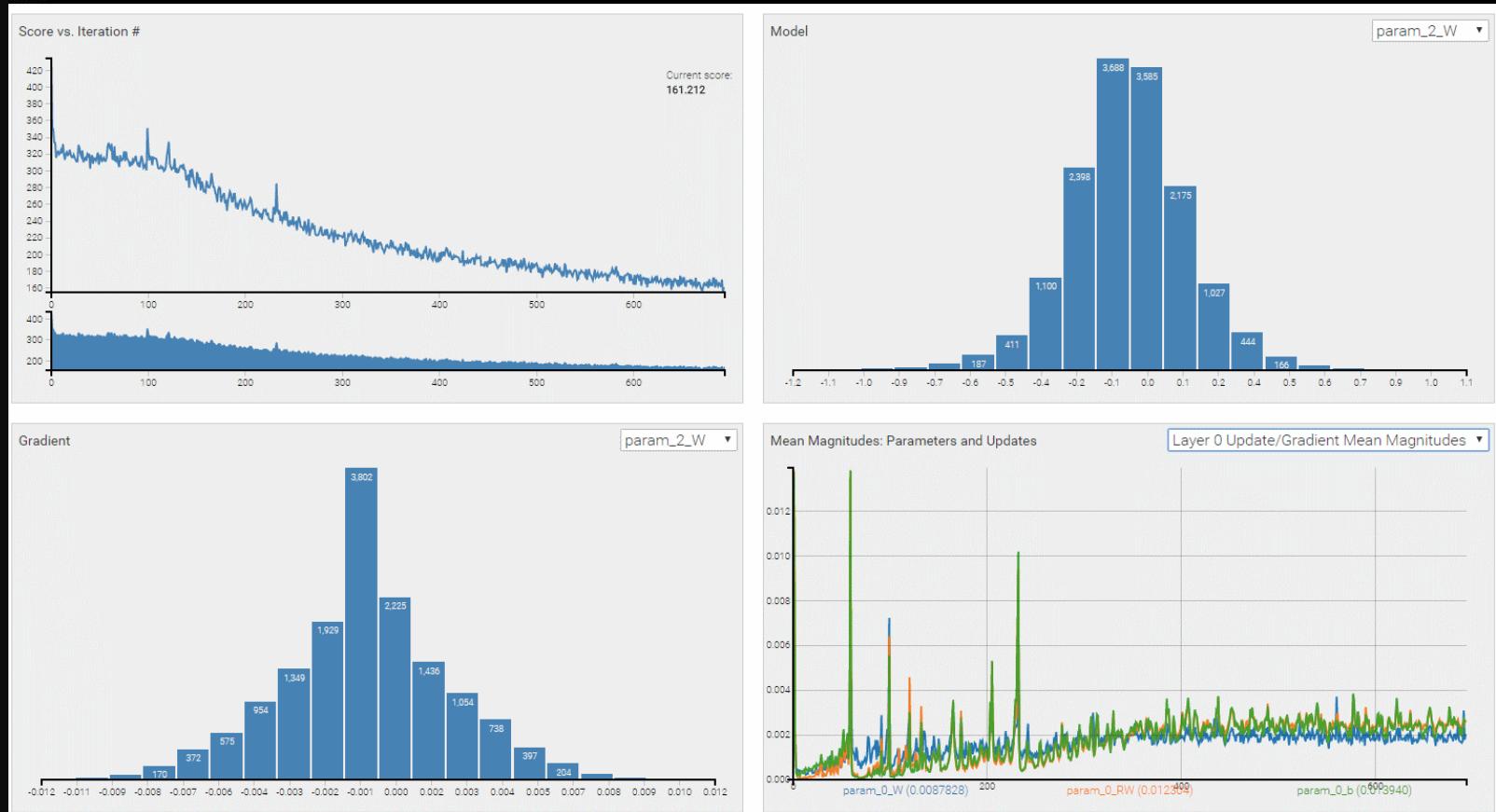
```
find . -iname "*.png" -exec identify -format "%d/%f %r\n" {} \; |  
grep "Gray" | awk '{print $1}'
```

```
find ./ -name "*.gif" -exec mogrify -depth 8 -type TrueColor -format  
png {} \;
```

SPARK STANDALONE

DL4J is Spark-compatible and will train across many machines. Worker-to-worker communication is nominal, and scaling efficiency is linear, not logarithmic.

<https://hub.docker.com/r/bernieai/docker-spark/>



DL4J VISUALS

Deeplearning4j comes with
visualization for training monitoring.

```
EarlyStoppingConfiguration esConf = new  
EarlyStoppingConfiguration.Builder()  
.epochTerminationConditions(new MaxEpochsTerminationCondition(30))  
.iterationTerminationConditions(new  
MaxTimeIterationTerminationCondition(20, TimeUnit.MINUTES))  
.scoreCalculator(new DataSetLossCalculator(myTestData, true))  
.evaluateEveryNEPOCHS(1) .modelSaver(new  
LocalFileModelSaver(directory)) .build();  
  
EarlyStoppingTrainer trainer = new  
EarlyStoppingTrainer(esConf, myNetworkConfiguration, myTrainData);  
  
//Conduct early stopping training:  
EarlyStoppingResult result = trainer.fit();
```

EARLY STOPPING

DL4J includes early stopping strategies to prevent overfitting.



IN-HOUSE

At Bernie, economics favour an in-house solution for training.

LET'S GET DIRTY

Sample repository available at

<http://github.com/crockpotveggies/dl4j-convolutional-net-scala>

QUESTIONS?

@crockpotveggies

Learn more about Bernie A.I.

<http://www.bernie.ai/>

Bernie