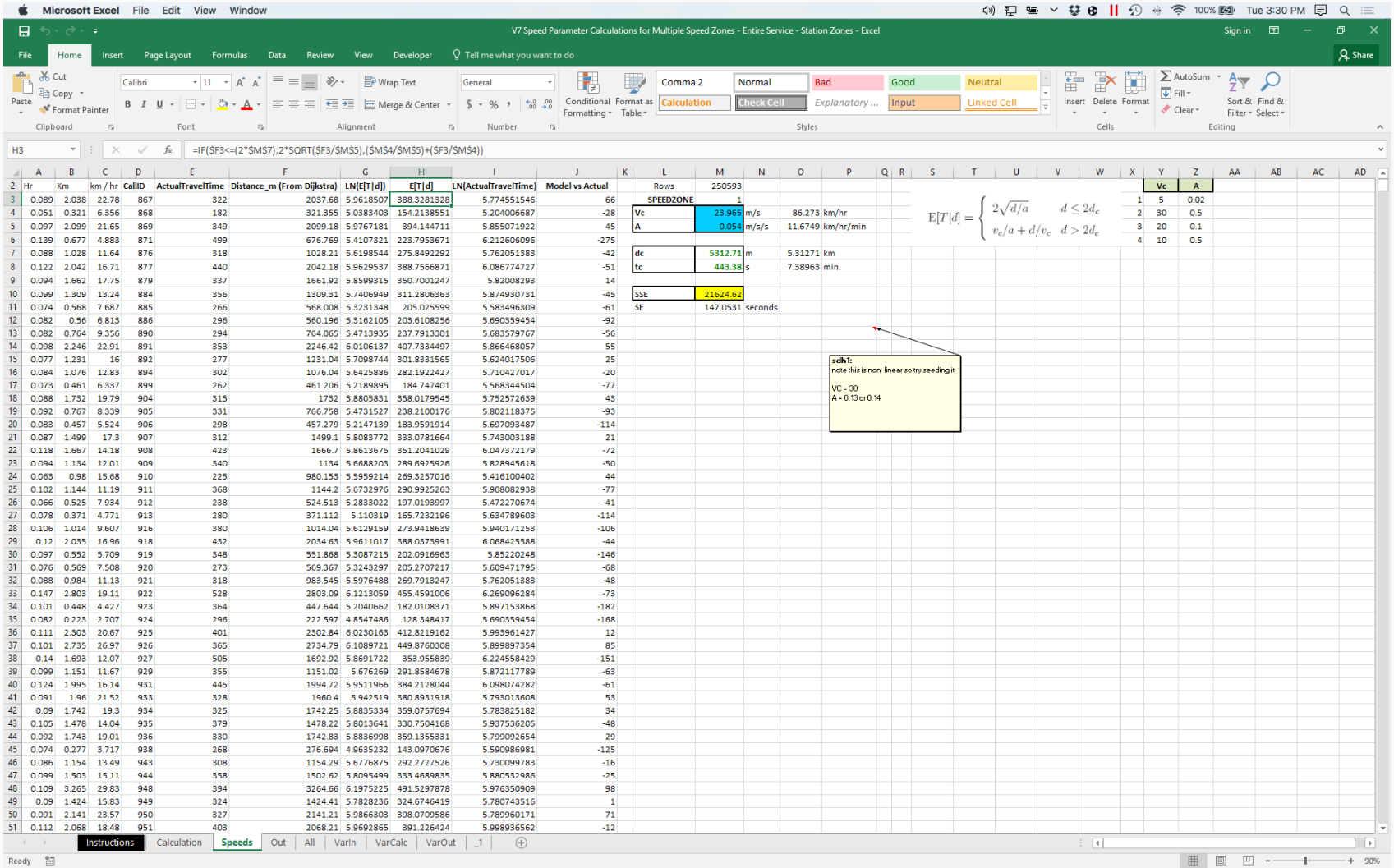
A talker on Docker:

How containers can make your work more reproducible, accessible, and ready for production.

Finbarr Timbers, Analyst, Darkhorse Analytics

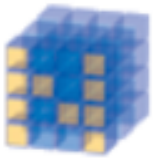
Three stories.

One: Moving a nonlinear regression from Excel to Python.



One: Moving a nonlinear regression from Excel to Python.

The solution:



NumPy

Base N-dimensional array package

SciPy library

Fundamental library for scientific computing

But…

“Hey Finbarr, can you help? The code doesn’t seem to run.”

The solution?

Fiddle with the computer for 20 minutes.

Two: Sharing exploratory models

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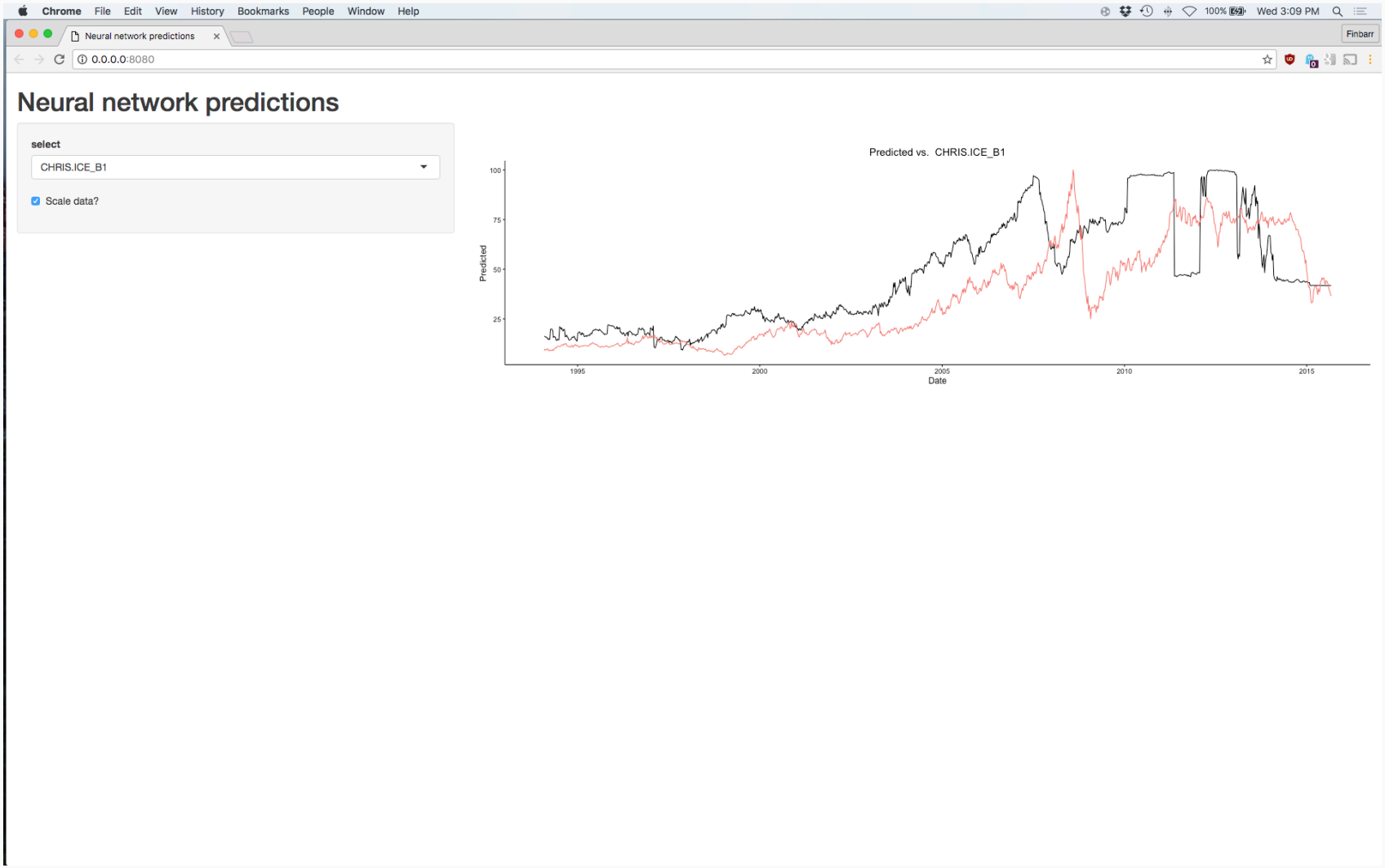

Three: Running statistical model on client's system

(If you’re a consultant, this happens a lot).

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All we knew was:

1. We had access to a database.

Three: Running statistical model on client's system

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1. We had access to a database.
2. We had to create an application that would talk to that database.

The solution?

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1. Attend a series of meeting with the client's IT team discussing their systems and our needs.

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2. Write a comprehensive test suite that ensured every possible point of failure was covered.
3. Pray.

Is there a common thread?

Problems

1. Unmet dependencies.

Problems

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2. Undefined production environments.

Problems

1. Unmet dependencies.
2. Undefined production environments.
3. Lengthy setup/install processes.

If only there was something that could help us...

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2. Easy to set up.
3. Easy to deploy.
4. Fast— as close to running the code natively as possible.


docker

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- Containers are lightweight VMs that wrap up code with everything needed to run it
- “Write once run everywhere”
- Easy to write and use

Let’s revisit our three stories…

One: Moving a nonlinear regression from Excel to Python.

- After we have the Python script (`nonlinear-regression.py`), add a Dockerfile:

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FROM python:3.5.2-slim
RUN pip install numpy pandas pymssql
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- Time to build from scratch: 1:58.47
- Time to update Python code and rebuild: 0.629s
- Size: 648 MB (461.3 MB of that are the packages)

Two: Sharing exploratory models

- Dockerfile:

```
FROM tensorflow/tensorflow

RUN pip install numpy sklearn pandas
ADD world_oil_forecast_data.csv /home
ADD model.py /home
WORKDIR /home
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```

- Time to build from scratch: 2.55.19
- Size: 863.2 MB (mostly packages, but some upstream bloat).

Three: Running statistical model on client's system

- Dockerfile:

```
FROM python:3.5.2-slim

# Install build-essential, git and other dependencies
RUN pip install numpy pandas sklearn \
    scipy pymssql hypothesis
ADD weighting_algorithm.py /home
ADD test_wa.py /home
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```

- Time to build from scratch: 2:00.50
- Size: 681.3 MB (packages are 483.5 MB of that).

Docker basics

Dockerfiles:

```
FROM python:3.5.2-slim

RUN pip install numpy pandas sklearn scipy \
    pymssql hypothesis
ADD weighting_algorithm.py /home
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CMD python test_wa.py
```

Dockerfiles

1. Base Image:

```
FROM python:3.5.2-slim
```

2. Directives:

```
RUN pip install numpy pandas sklearn scipy pymssql \
    hypothesis
ADD weighting_algorithm.py /home
ADD test_wa.py /home
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```

3. The command:

```
CMD python test_wa.py
```

CLI Basics

- Once you have a Dockerfile, build a container with `docker build -t weighting-algorithm .`

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- This builds a container called `weighting-algorithm` from the file named `Dockerfile` sitting in your current folder (works similar to `Make`)

CLI Basics

- Once you have a Dockerfile, build a container with `docker build -t weighting-algorithm .`
- This builds a container called `weighting-algorithm` from the file named `Dockerfile` sitting in your current folder (works similar to `Make`)
- Once built, run anywhere on your path with `docker run weighting-algorithm`

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Example

- We have a Shiny app (R code that displays images in HTML)
- Code is in two files: `server.R` and `ui.R`, with three data files (`data.csv`, `preds_actuals.csv`, `output.csv`).
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- We have a Shiny app (R code that displays images in HTML)
- Code is in two files: `server.R` and `ui.R`, with three data files (`data.csv`, `preds_actuals.csv`, `output.csv`).
- We run the app with the command `R -e 'shiny::runApp(".", host="0.0.0.0", port=8080)'`
- How can we turn this into a Docker container?

Example

- Dockerfile:

```
FROM rocker/shiny

RUN R -e "install.packages(c('ggplot2'))"
ADD preds_actuals.csv /home
ADD data.csv /home
ADD output.csv /home
ADD server.R /home
ADD ui.R /home
WORKDIR /home
EXPOSE 8080
CMD R -e \
    'shiny::runApp(".", host="0.0.0.0", port=8080)'
```

Example

- `docker build -t tf-shinyapp`

Example

- `docker build -t tf-shinyapp`
- `docker run -p 8080:8080 tf-shinyapp`

One more thing...

We can instantly deploy this to Google's Cloud (assuming we have a cluster running on Google Container Engine):

```
gcloud docker push \
    gcr.io/applied-ridge-137723/tf-shinyapp
kubectl run tf-shinyapp \
    --image=gcr.io/applied-ridge-137723/tf-shinyapp \
    --port=8080
kubectl expose deployment \
    tf-shinyapp --type="LoadBalancer"
kubectl get service tf-shinyapp
```

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1. Docker makes it easier to distribute complex software.
2. Docker allows you to determine exactly what environment your code will run in.
3. Docker is fast and easy to use.