Mani Sarkar
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blogs: https://medium.com/@neomatrix369

From backend development to machine learning

—

my journey from Software Engineering to ML/Data Science

3rd July 2020

hashtag: #abhishektalks

About me

Mani Sarkar

More about me

Freelance Software, Data, ML Engineer

Java / JVM

Cloud / Infra / DevOps

Polyglot developer

Code quality, testing, performance, DevOps, deep affinity for AI/ML/DL, NN...

LJC, Devoxx, developer communities

Strengthening teams and helping them *accelerate*

JCP member, F/OSS projects: @adoptopenjdk @graalvm @truffleruby

Java Champion, Oracle Groundbreaker Ambassador, Software Crafter, Blogger, Speaker

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I'm a big fan of...

Nikola Tesla and his fine work

Richard Feynman, his books and quotes!

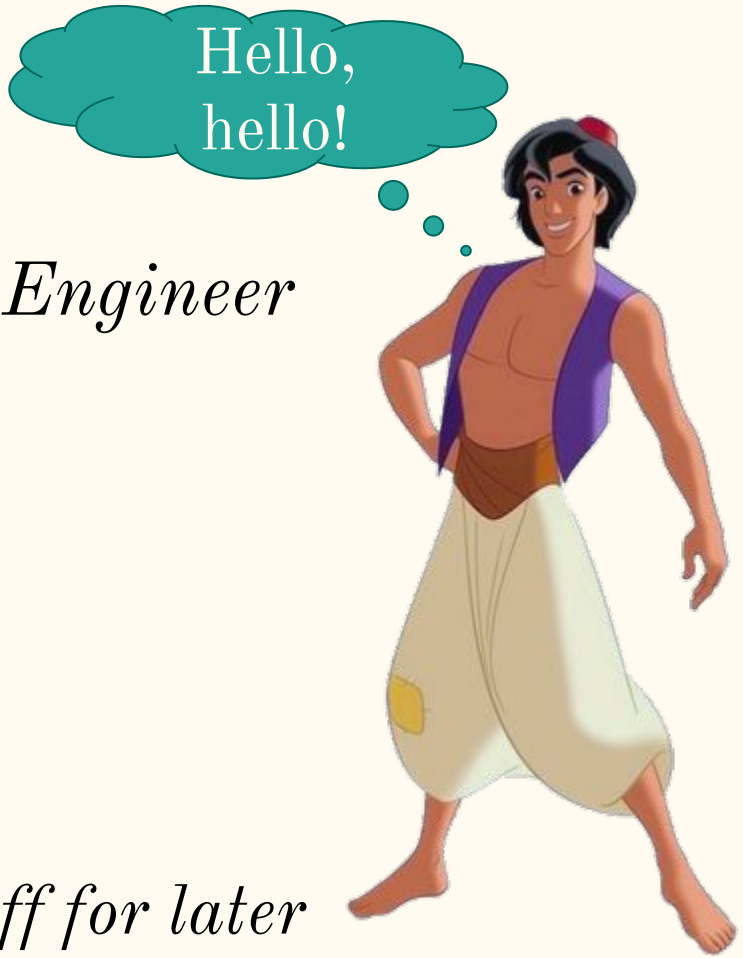
Sir Arthur Conan Doyle and his work (I have all his 65+ series on DVD)

It's important to have heros and mentors!

Agenda

About the talk

- *Timeline: Backend dev to ML Engineer*
- *Demos*
- *References to other talks*
- *Resources*
- *Summary and Closing*
- *Q&A*
- ***Appendix** section: more good stuff for later*



Presentation slides: *live*

https://bit.ly/backend-dev-to-ml-slides

Thank You!

- **Abhishek Thakur**, for organising this session, and giving me a chance to present at this forum
- And to "**you**", for sparing your valuable time and trusting me

Disclaimer

- ***YMMV***
- Might have rough edges and **inaccuracies**
- Sharing our **learnings** over the past years
- Gathered ideas from **different sources**
- **Sharing ideas** and **experiences**

Citation

The respective authors and creators are, and remain the true owners of the images and other artifacts used in this presentation.

Thank you for your creations!

Introduction

Summarising

~20 years till 2017

Dos

First PC: 8086/88

QuickBasic

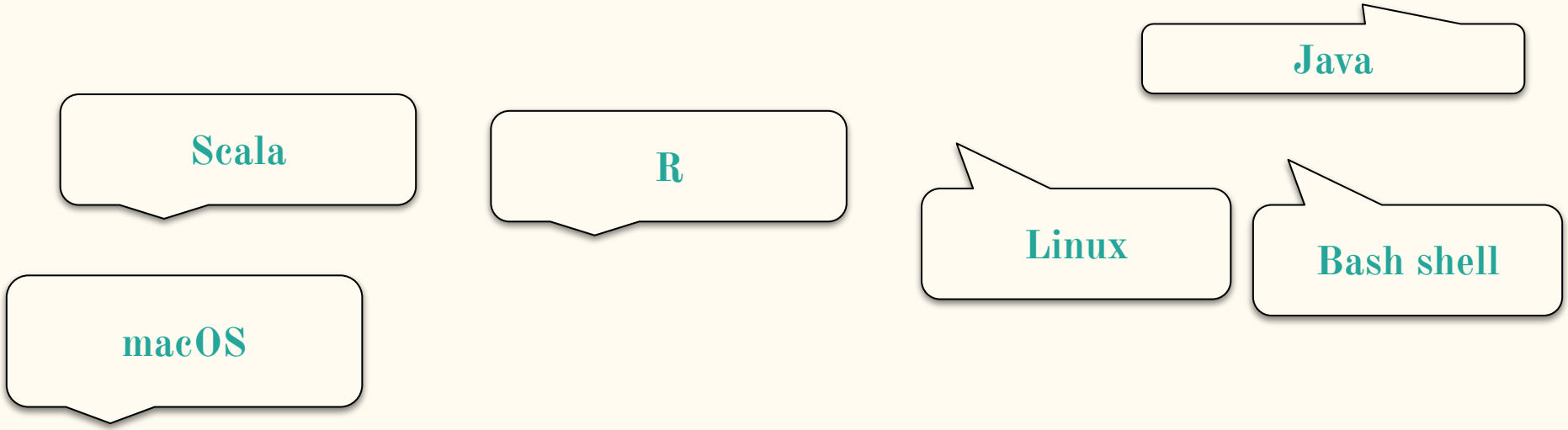
VBA macros

Games: PacMan, Digger, WITWI Carmen Sandiego, Prince of Persia, Myst, among others

Object Pascal / Delphi

SmallTalk

Windows


Java
Scala
R
Linux
Bash shell
macOS

During the first half of my career I have been writing Desktop, command-line, REST-enabled and server-side apps on the Windows platform, and later doing the same on Linux and macOS.

Skipping a lot of details,
lots to talk about those
~20 years of my career

~2009 / ~2010:

Throwing myself into the deep-end of tech!

Stopped using Windows (secondary OS on the partition)

Very serious meetup go-er - sometimes *4 times a week (sometimes weekends)*

Throw myself in the deep-end: Linux CLI and macOS

Reading a lot

Introduction to Git

Getting more serious about Java

Interest and learning about VMs, Interpreters, Compilers, chipsets, GPUs

Building OpenJDK (using make and bash)

Running VMs: VirtualPC, vmWare

~2013 - ~2017:

A new phase begins

OpenJDK => AdoptOpenJDK

Core Java

Scala

JVM internals

Performance Tuning / GC

Shell scripting

Helping Conference organisers

VBA Macros

Workshops and speaking at conferences

Writing blogs

Wrote R scripts for ~6 months

My first R blog post (~2013)

Developing interest in data and ML

Agile methodology

Code quality

Tests and TDD

Craftmanship (crafter)

Code coverage

Fuzzy testing

Refactoring code

Mutation testing

Property-based testing

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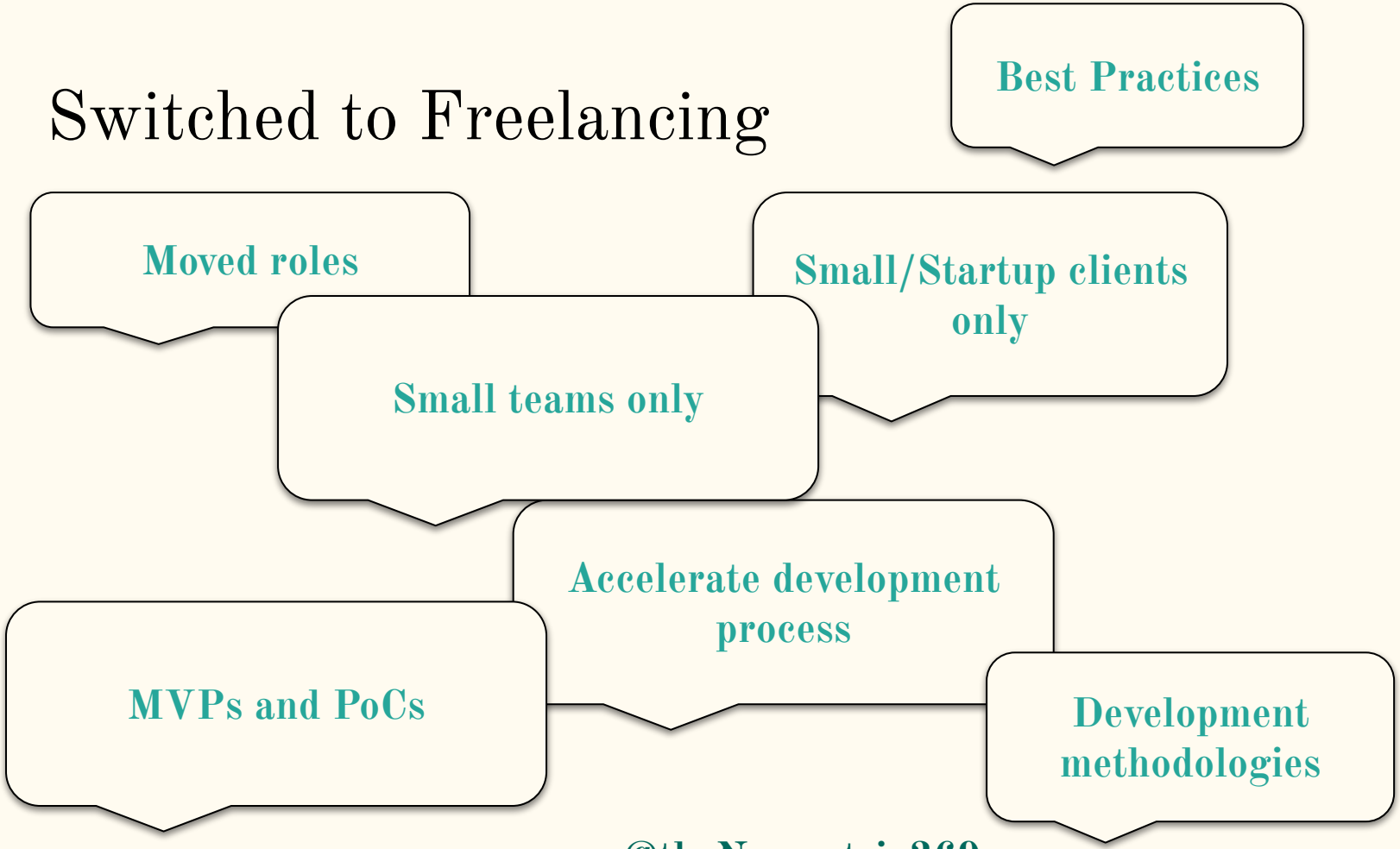
I was learning what it takes to become a *better professional!*

- Speak online or at conferences
- Write blogs or articles or papers
- Push code to git (personal or F/OSS projects)
- Review code, books, articles, etc...
- ....just help others become better at what they do
- Collaborate with other developers
- Be organised, practical and develop pragmatism
- Read and write a lot of code
- Rewrite any or all of the above (build muscle memory)
- and keep doing them iteratively, and more...

~2017 / 2018: another important phase

Switched to Freelancing



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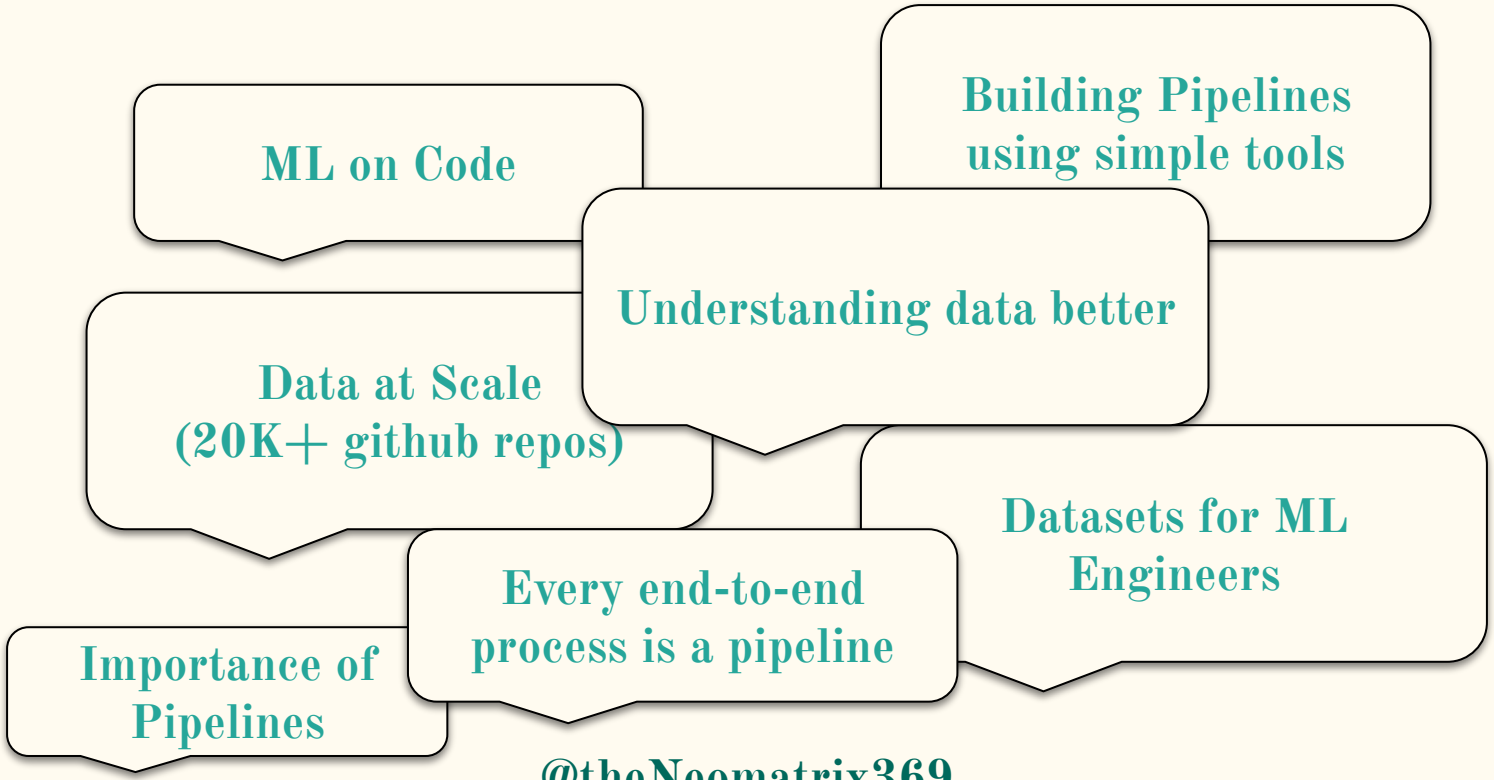
Working on a ML/Data Engineering project



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AI/ML/DL: Learn and collaborate

Joining Meetups

Attending Conferences

Participating in Study groups / AI Labs

Focus moved to more AI/ML/DL topics

WhatsApp, Telegram, Slack channels, Mailing list, etc...

Gave talks at UCL's CREST Open Workshops

See awesome-graal work

My talks at the CREST workshops: [1] [2]

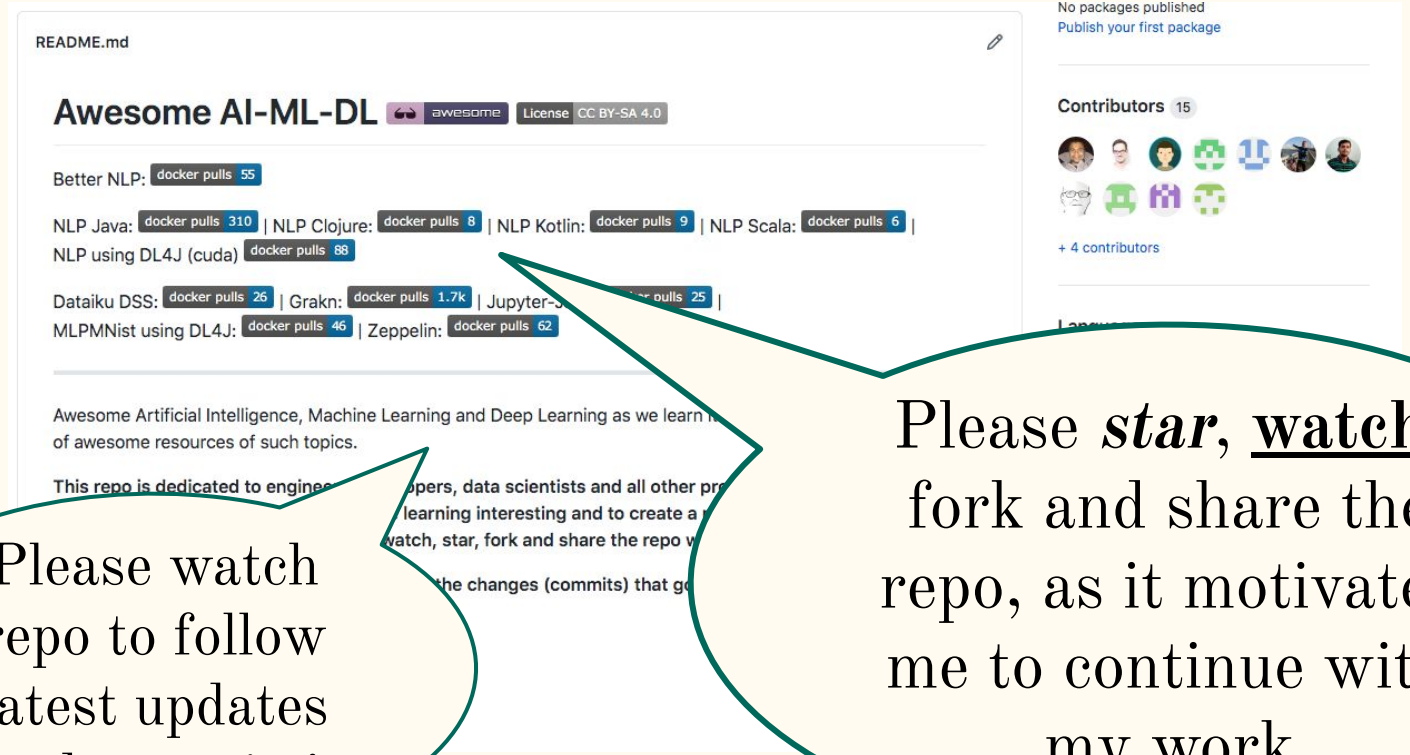
Discussing and developing ML on Code ideas

~2018 till date:
AI/ML/DL fun begins

Thanks to Yolande Poirier for posting all those AI/ML/DL links on @java between 2016 and 2018

AI/ML/DL git repo

https://github/neomatrix369/awesome-ai-ml-dl



Please watch repo to follow latest updates and commits!

Please ***star***, **watch,** fork and share the repo, as it motivates me to continue with my work

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AI/ML/DL artefacts

Cheatsheets

Notebooks

Presentations

Examples

Virgilio

Guides

Docker containers

Study Notes

Things to know list

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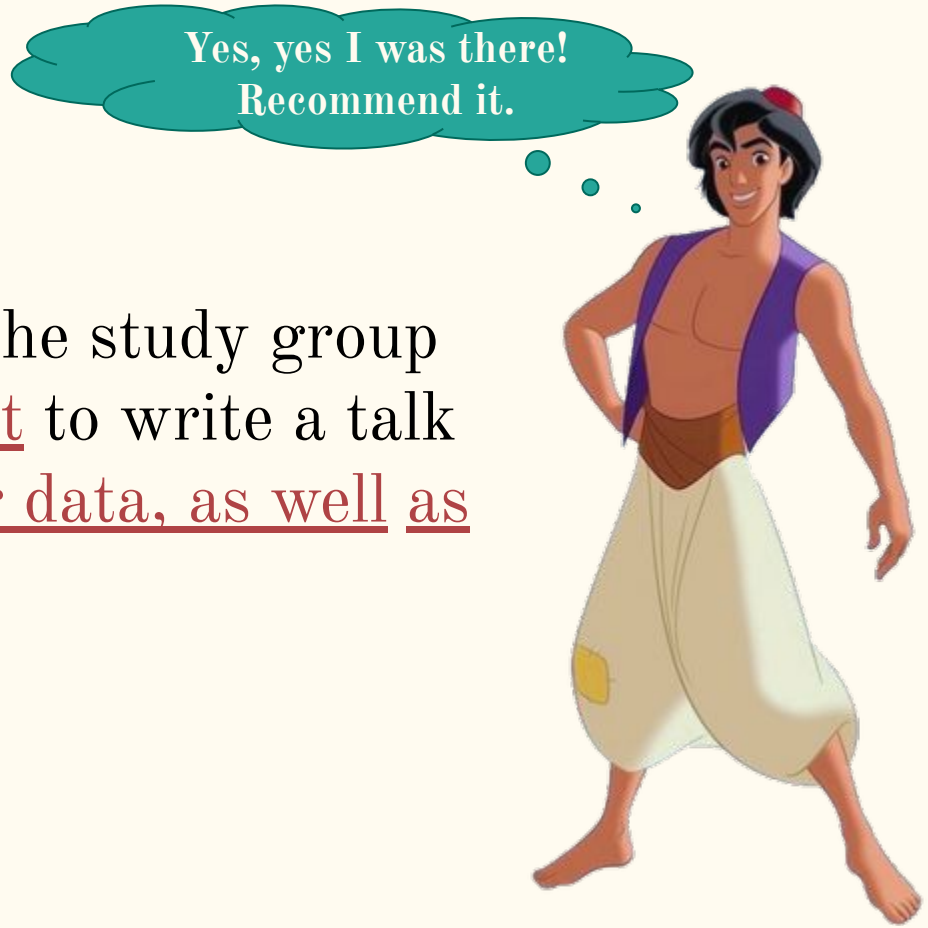
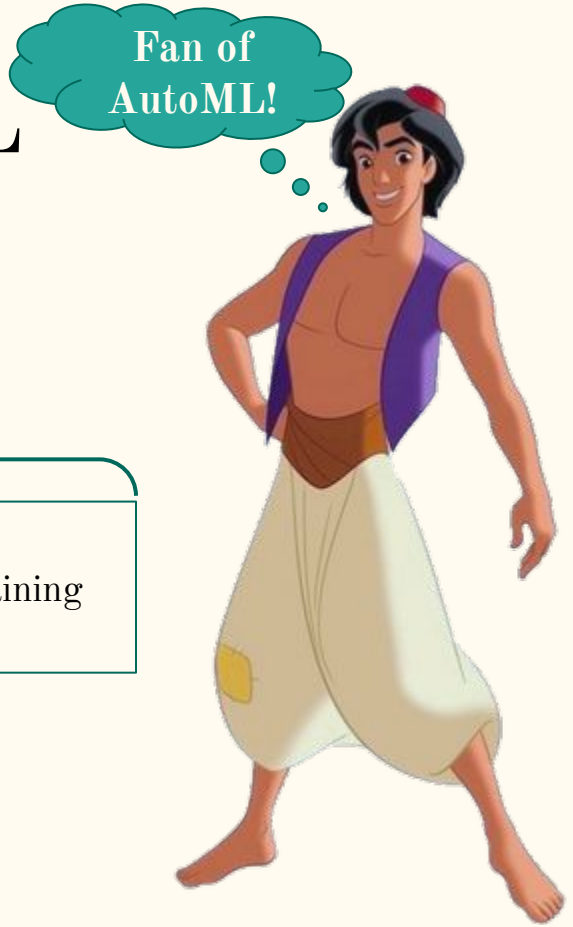
Thanks to the Meet-a-Mentor initiative by LJC during 2018-19, for holding the ML Study Group!

Talk on data

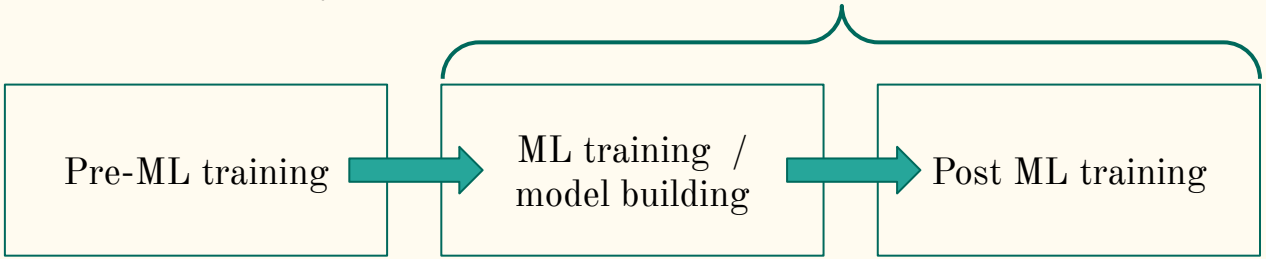


During this time I attended the study group I paired with Jeremie Charlet to write a talk on data, see Do we know our data, as well as we know our tools? talk!

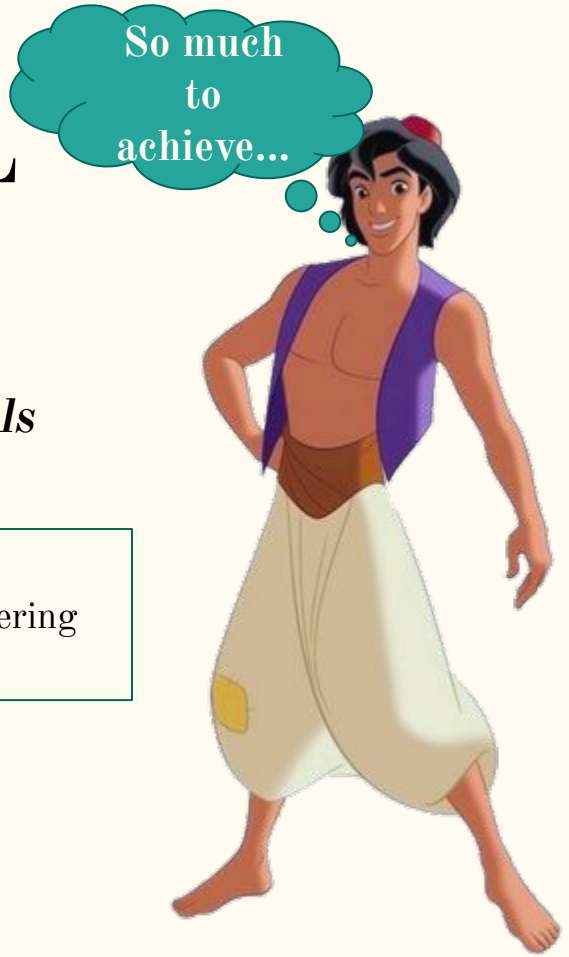
Developing ideas about data and ML



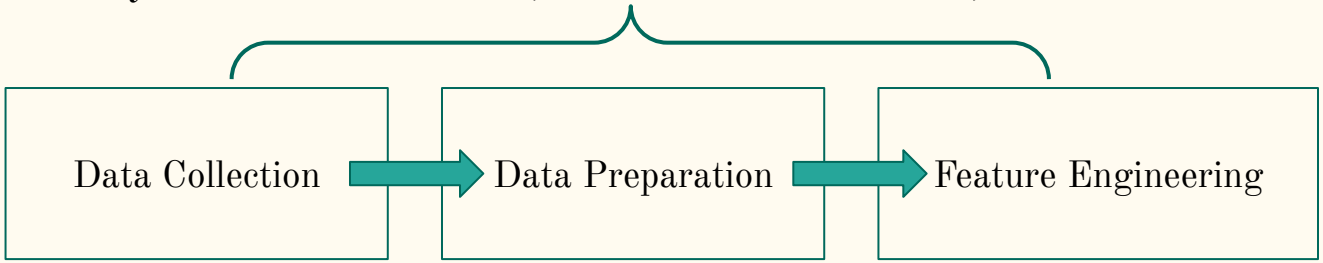
Mostly <u>solved</u>: AutoML, pipelines, etc...



Developing ideas about data and ML

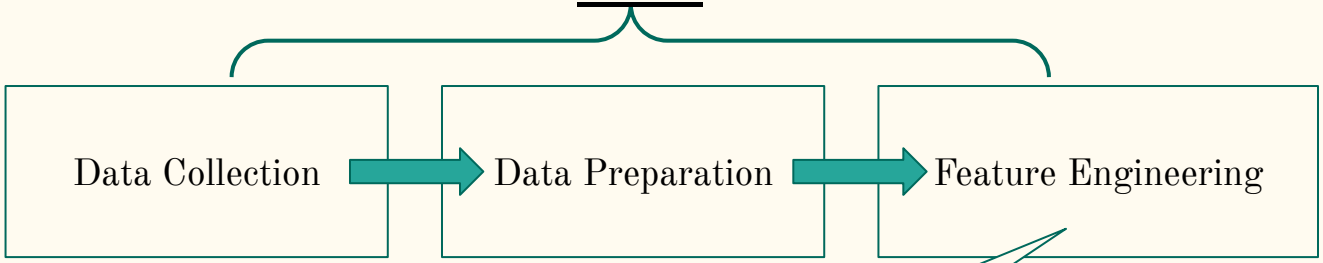


Mostly <u>unsolved</u>: manual, human intervention, some tools



Developing ideas about data and ML

Very important steps, more important than <u>just building model</u>



When done well gives reliable and robust models

Thanks to Yaz for the Tensorflow meetups in London, UK during 2018 and 2019

My Study notes from Tensorflow and other topics

Rewrote a Keras post: BoW, Classification

Please have a look at all the TPU notebooks on each of the links!

Followed on by a post on TPUs

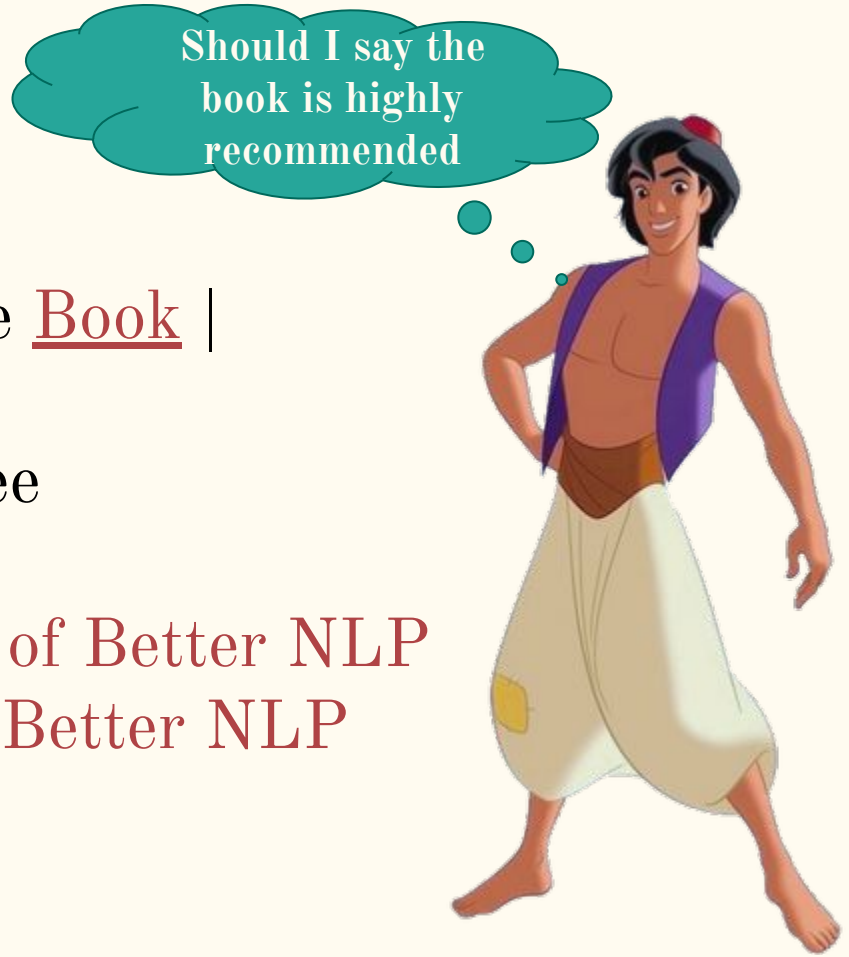
Enjoyed CPU vs GPU vs TPU comparisons

How to harness the Powers of the Cloud TPU

Thanks to Professor Ajit Jaokar for his meetups and the AI Labs in London, UK during 2018 and 2019

Meetups and AI Labs

- Machine Learning is Fun! See Book | Tutorial / Blogs
- Better NLP library launch, see presentations:
  - First presentation: launch of Better NLP
  - Follow-up presentation of Better NLP



And many others in my journey...

Awesome AI/ML/DL repo

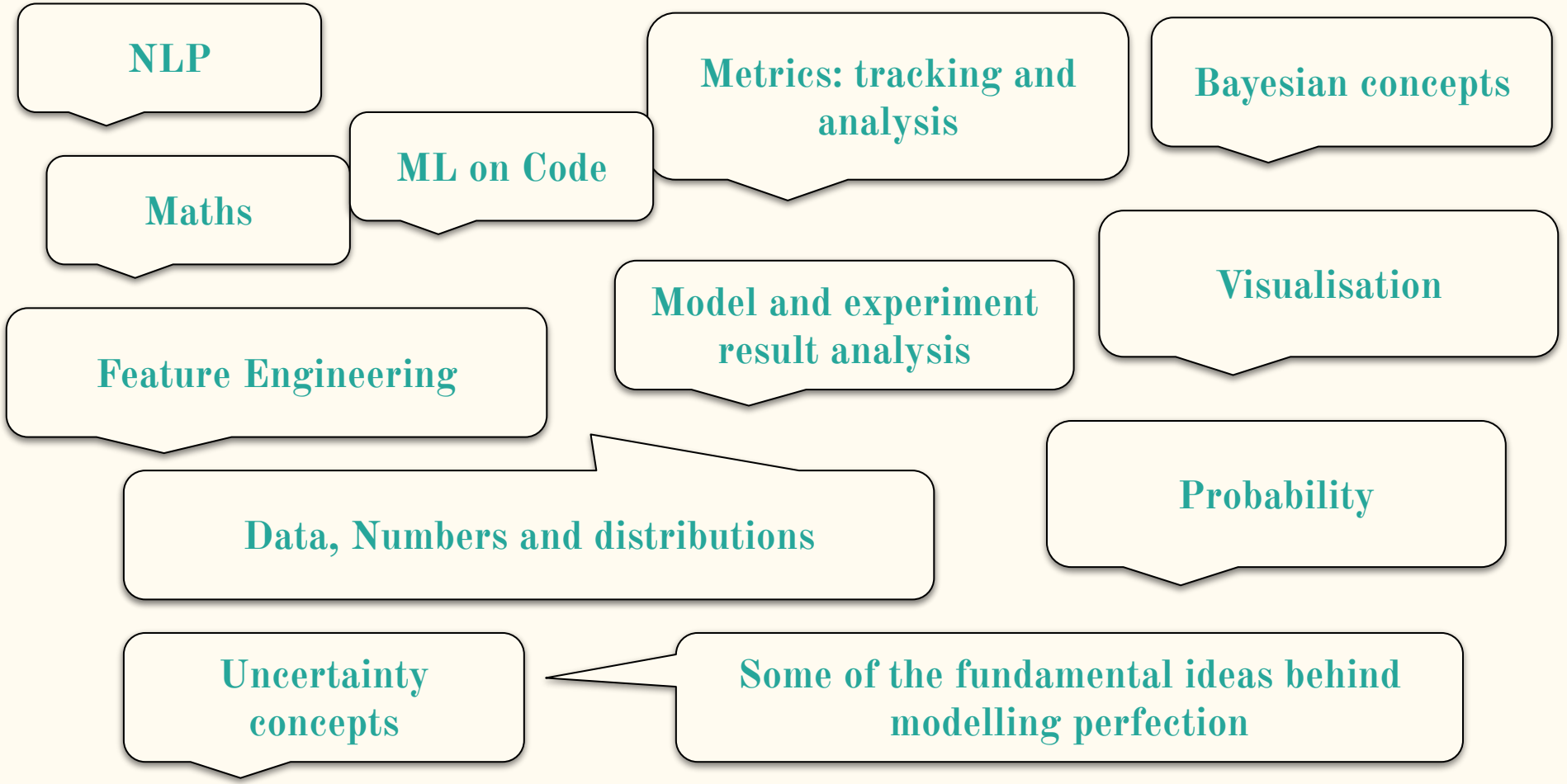
We are cross-linking resources with MWML & Virgilio

Thanks to the contributors for your pull requests

Collaboration with MWML

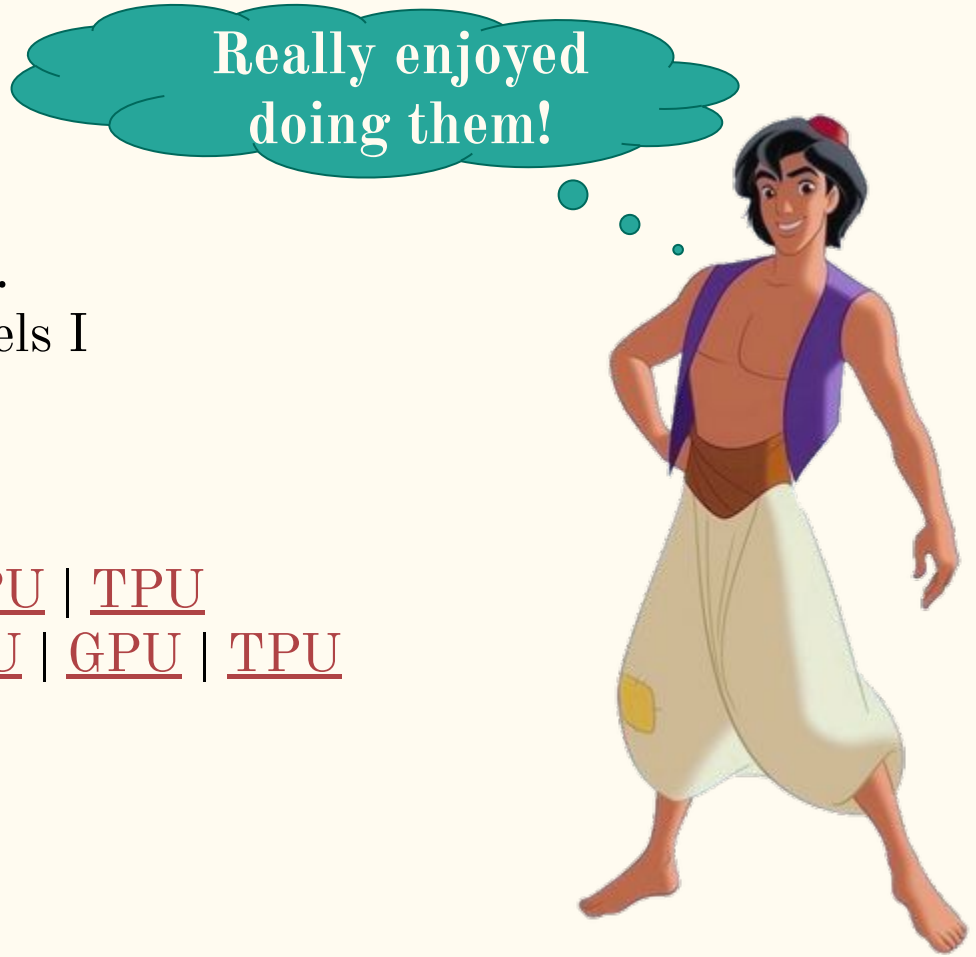
Working with Virgilio to make better guides

All things AI/ML/DL I’m excited about...


NLP
Metrics: tracking and analysis
Bayesian concepts
ML on Code
Maths
Visualisation
Model and experiment result analysis
Feature Engineering
Probability
Data, Numbers and distributions
Uncertainty concepts
Some of the fundamental ideas behind modelling perfection

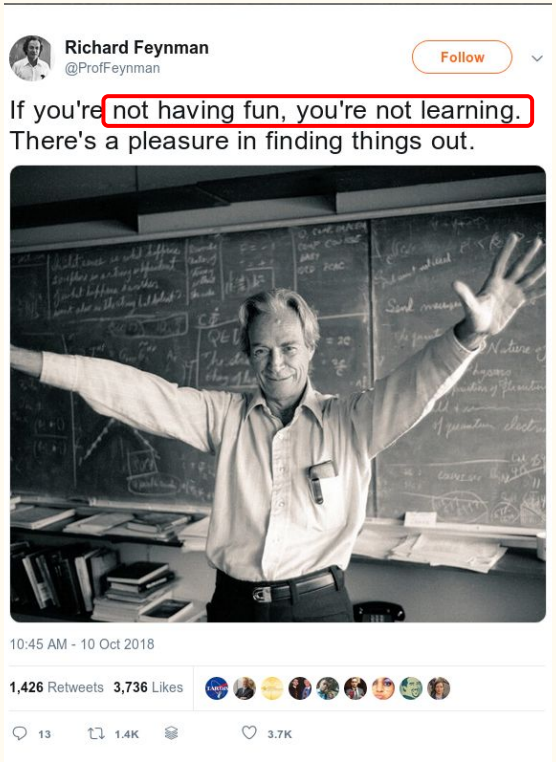
Notebooks/kernels...

- A good way to learn anything...
- Here's a list of notebooks/kernels I rewrote/refactored/improved:
  - Kaggle kernels
  - Google Colab notebooks
    - Tensorflow GPU & TPU | TPU
    - Generative Image: CPU | GPU | TPU
  - Resources on AI/ML/DL



Have fun!

See more Feynman quotes here



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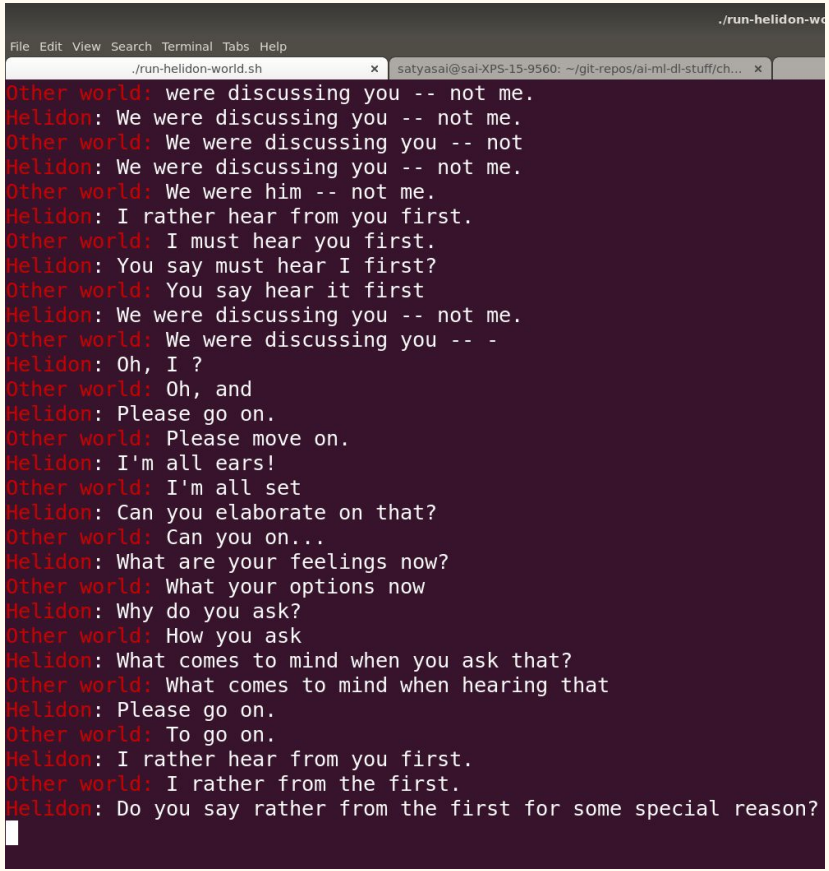
Participating in Competitions

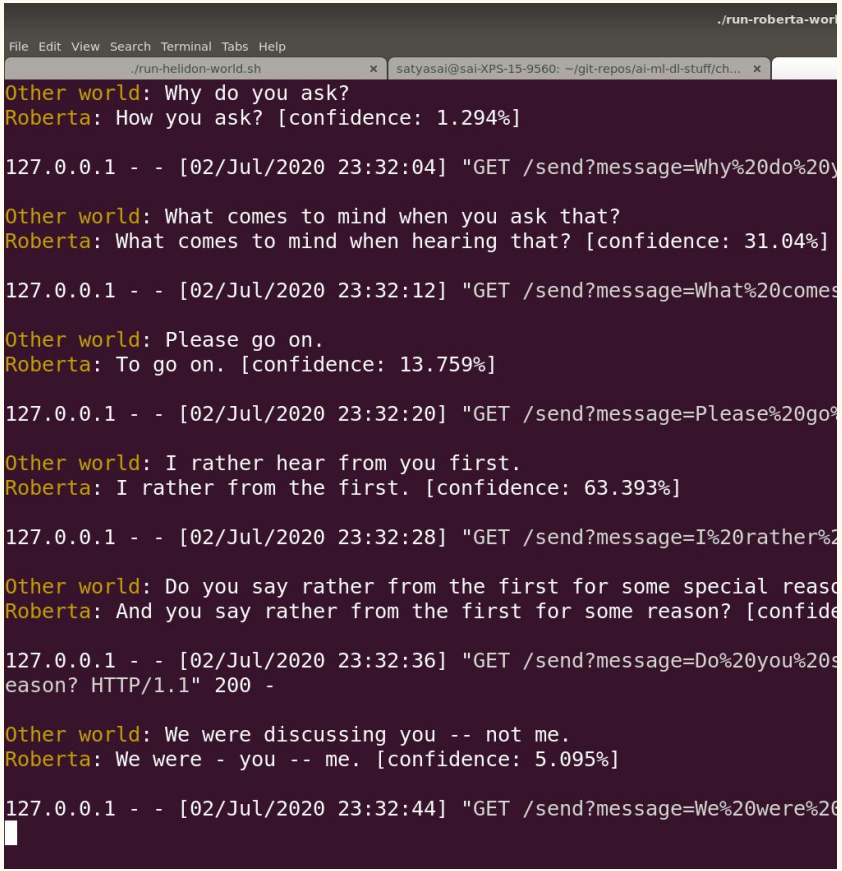
- Late 2019: participating in competitions
- Become an Kaggle Discussion Expert two weeks ago
- Won my first Bronze medal at the recent Kaggle competition earlier this week
- See other results from online participations
- **Thanks:** Carlo, Marco, Abhishek and many others for your collaborations and inspirations

Demo: RoBERTa

About the demo: RoBERTa

- **Code on GitHub:**
  https://github.com/neomatrix369/chatbot-conversations
- Simple chatbot like app written in Python
- Runs as a Flask app (REST endpoint server)
- Demonstrates some NLP capabilities
- Download Roberta models
- Uses RoBERTa Base (others can be used as well)
- We wrote a similar one in Java using Eliza


./run-helidon-wo
File Edit View Search Terminal Tabs Help
./run-helidon-world.sh
satyasai@sai-XPS-15-9560: ~/git-repos/ai-ml-dl-stuff/ch...
Other world: were discussing you -- not me.
Helidon: We were discussing you -- not me.
Other world: We were discussing you -- not
Helidon: We were discussing you -- not me.
Other world: We were him -- not me.
Helidon: I rather hear from you first.
Other world: I must hear you first.
Helidon: You say must hear I first?
Other world: You say hear it first
Helidon: We were discussing you -- not me.
Other world: We were discussing you -- -
Helidon: Oh, I ?
Other world: Oh, and
Helidon: Please go on.
Other world: Please move on.
Helidon: I'm all ears!
Other world: I'm all set
Helidon: Can you elaborate on that?
Other world: Can you on...
Helidon: What are your feelings now?
Other world: What your options now
Helidon: Why do you ask?
Other world: How you ask
Helidon: What comes to mind when you ask that?
Other world: What comes to mind when hearing that
Helidon: Please go on.
Other world: To go on.
Helidon: I rather hear from you first.
Other world: I rather from the first.
Helidon: Do you say rather from the first for some special reason?


./run-roberta-worl
File Edit View Search Terminal Tabs Help
./run-helidon-world.sh
satyasai@sai-XPS-15-9560: ~/git-repos/ai-ml-dl-stuff/ch...
Other world: Why do you ask?
Roberta: How you ask? [confidence: 1.294%]
127.0.0.1 - - [02/Jul/2020 23:32:04] "GET /send?message=Why%20do%20y
Other world: What comes to mind when you ask that?
Roberta: What comes to mind when hearing that? [confidence: 31.04%]
127.0.0.1 - - [02/Jul/2020 23:32:12] "GET /send?message=What%20comes
Other world: Please go on.
Roberta: To go on. [confidence: 13.759%]
127.0.0.1 - - [02/Jul/2020 23:32:20] "GET /send?message=Please%20go%
Other world: I rather hear from you first.
Roberta: I rather from the first. [confidence: 63.393%]
127.0.0.1 - - [02/Jul/2020 23:32:28] "GET /send?message=I%20rather%2
Other world: Do you say rather from the first for some special reasc
Roberta: And you say rather from the first for some reason? [confide
127.0.0.1 - - [02/Jul/2020 23:32:36] "GET /send?message=Do%20you%20s
eason? HTTP/1.1" 200 -
Other world: We were discussing you -- not me.
Roberta: We were - you -- me. [confidence: 5.095%]
127.0.0.1 - - [02/Jul/2020 23:32:44] "GET /send?message=We%20were%20

./run-connecting-wor

ile Edit View Search Terminal Tabs Help

./run-helidon-world.sh × satyasai@sai-XPS-15-9560: ~/git-repos/ai-ml-dl-stuff/ch... ×

```
elidon => Roberta: You say must hear I first?
oberta => Helidon: You say hear it first?
elidon => Roberta: We were discussing you -- not me.
oberta => Helidon: We were discussing you -- -
elidon => Roberta: Oh, I ?
oberta => Helidon: Oh, and ?
elidon => Roberta: Please go on.
oberta => Helidon: Please move on.
elidon => Roberta: I'm all ears!
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oberta => Helidon: Can you on...
elidon => Roberta: What are your feelings now?
oberta => Helidon: What your options now?
elidon => Roberta: Why do you ask?
```
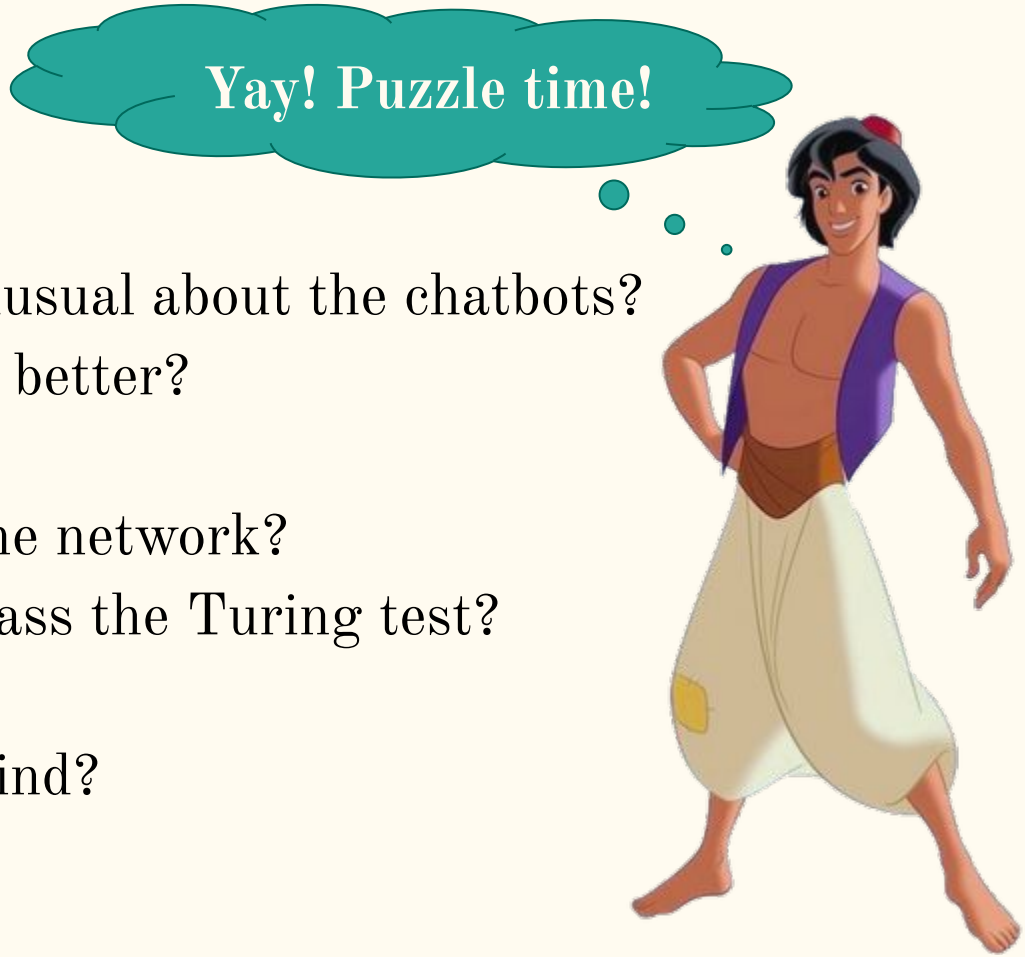

I'm not calling these sensible conversations. LOL!

Puzzles: RoBERTa

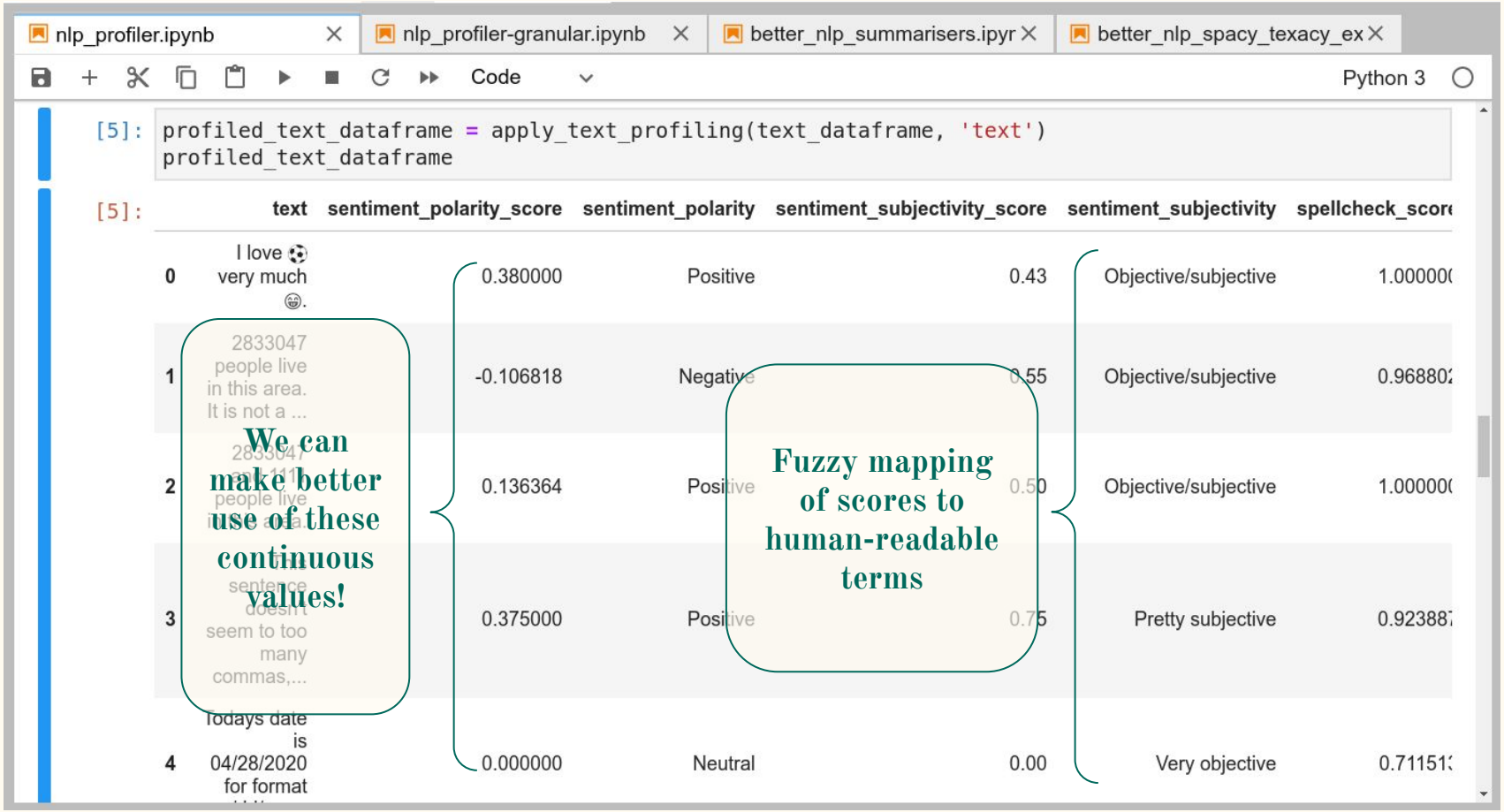


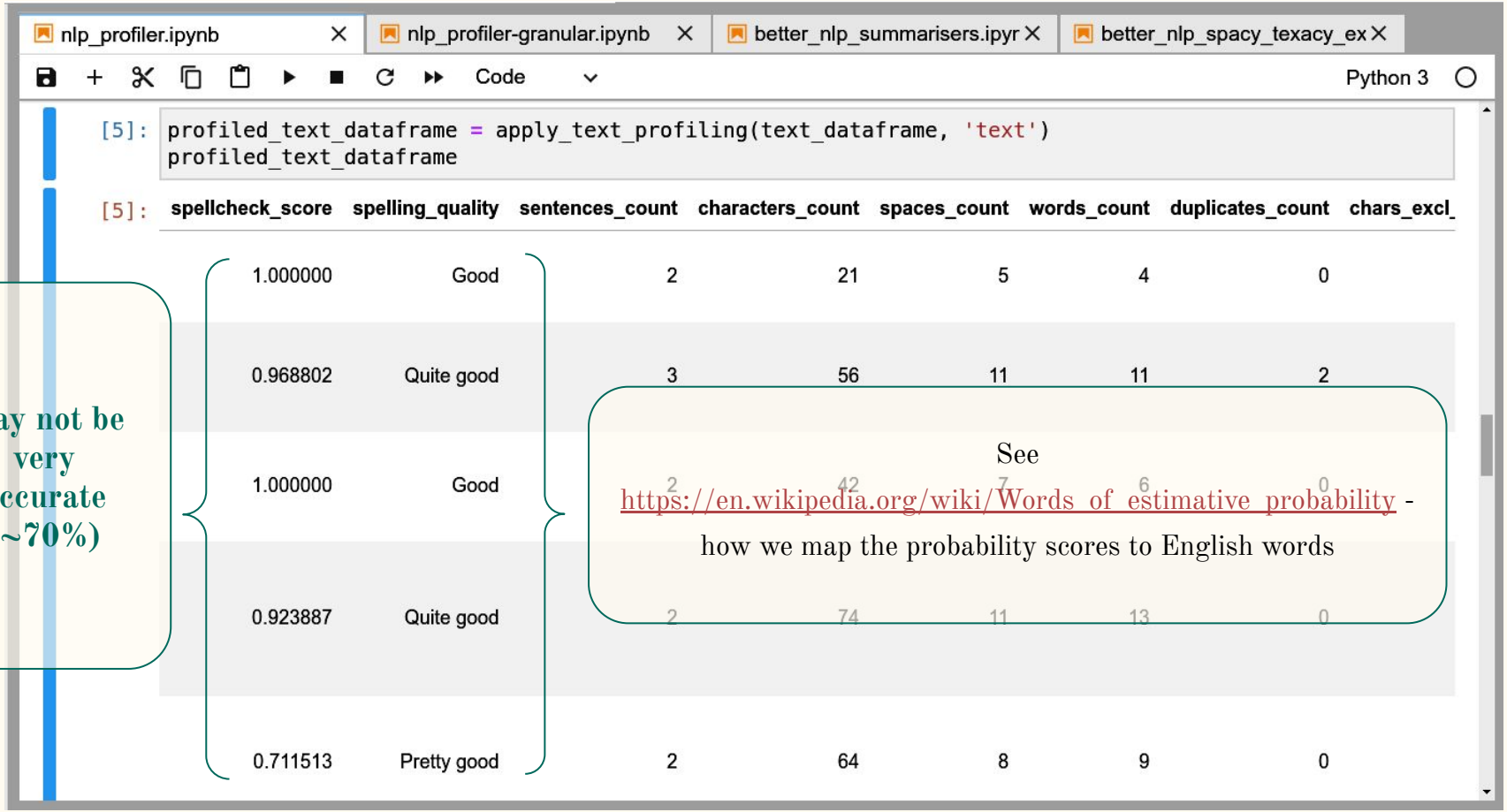
- Did you notice anything unusual about the chatbots?
- What can we do to make it better?
- Can we use other models?
- Can we add more bots to the network?
- Can we make them make pass the Turing test?
- Is it a good idea?
- Any other ideas come to mind?

Demo: NLP Profiler

About the demo: NLP Profiler

- **Notebook & code on GitHub:**
  https://github.com/neomatrix369/awesome-ai-ml-dl/blob/master/examples/better-nlp/notebooks/jupyter/nlp_profiler.ipynb
  (https://github.com/neomatrix369/awesome-ai-ml-dl/blob/master/examples/better-nlp/library/org/neomatrix369/nlp_profiler.py)
- Simple python library-like module
- Liken to `pandas-profiling` but a lot simpler
- Tried to emulate Pandas' `describe()` function
- Can run on CLI (with changes) or `import` into a notebook
- Illustrates some use cases using a simple dataset
- More features can be built on top of the existing ones
- Can be integrated into the Better NLP library


nlp_profiler.ipynb
nlp_profiler-granular.ipynb
better_nlp_summarisers.ipyr
better_nlp_spacy_texacy_ex
Code
Python 3
[5]: profiled_text_dataframe = apply_text_profiling(text_dataframe, 'text')
profiled_text_dataframe
[5]:
text
sentiment_polarity_score
sentiment_polarity
sentiment_subjectivity_score
sentiment_subjectivity
spellcheck_score
0 I love ⚽ very much 😁.
0.380000
Positive
0.43
Objective/subjective
1.000000
1 2833047 people live in this area. It is not a ...
-0.106818
Negative
0.55
Objective/subjective
0.968802
2 2833047 people live
0.136364
Positive
0.50
Objective/subjective
1.000000
3 sentence doesn't seem to too many commas,...
0.375000
Positive
0.75
Pretty subjective
0.923887
4 Todays date is 04/28/2020 for format
0.000000
Neutral
0.00
Very objective
0.711513
We can make better use of these continuous values!
Fuzzy mapping of scores to human-readable terms

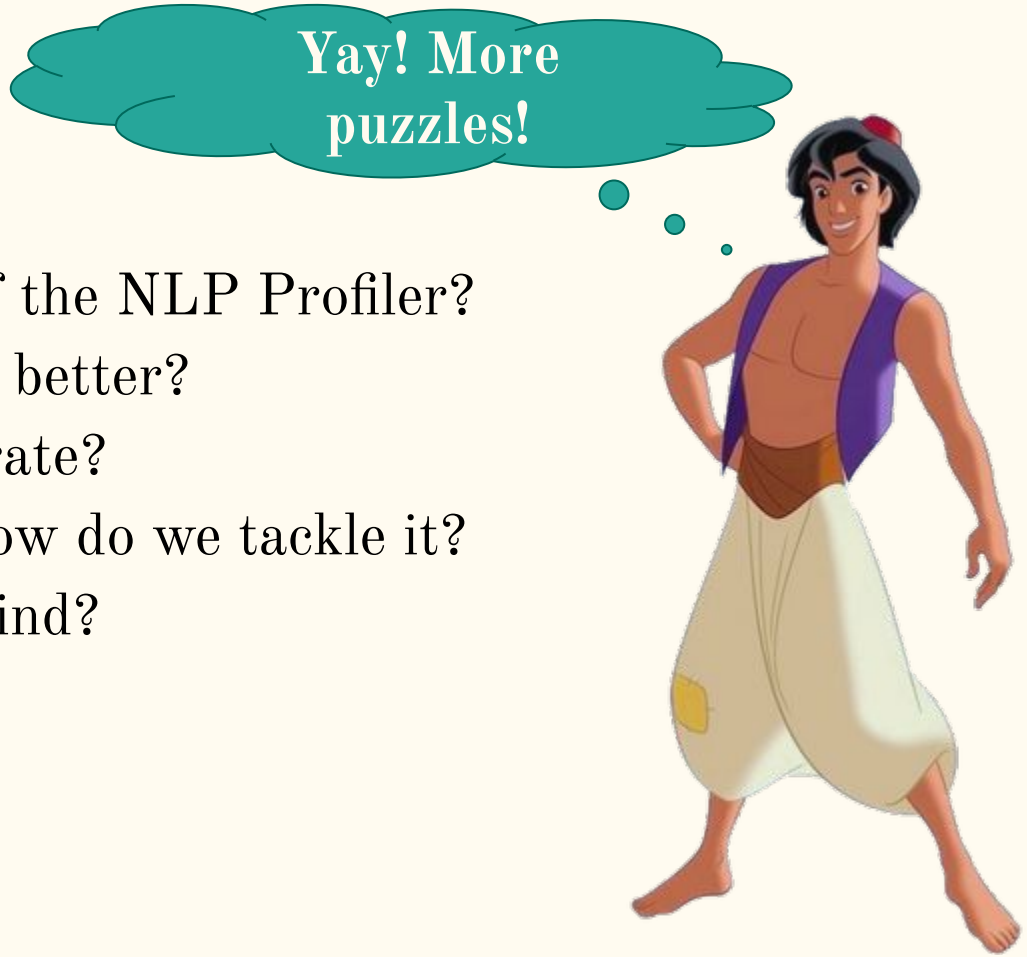


May not be very accurate (~70%)

See https://en.wikipedia.org/wiki/Words_of_estimative_probability - how we map the probability scores to English words

Puzzles: NLP Profiler

- What are the limitations of the NLP Profiler?
- What can we do to make it better?
- Can we make it more accurate?
- If we have scaling issues how do we tackle it?
- Any other ideas come to mind?



Throwing oneself at the deep-end

Build sample apps (similar to the demos), use simple ideas, improve, share, rinse and repeat!

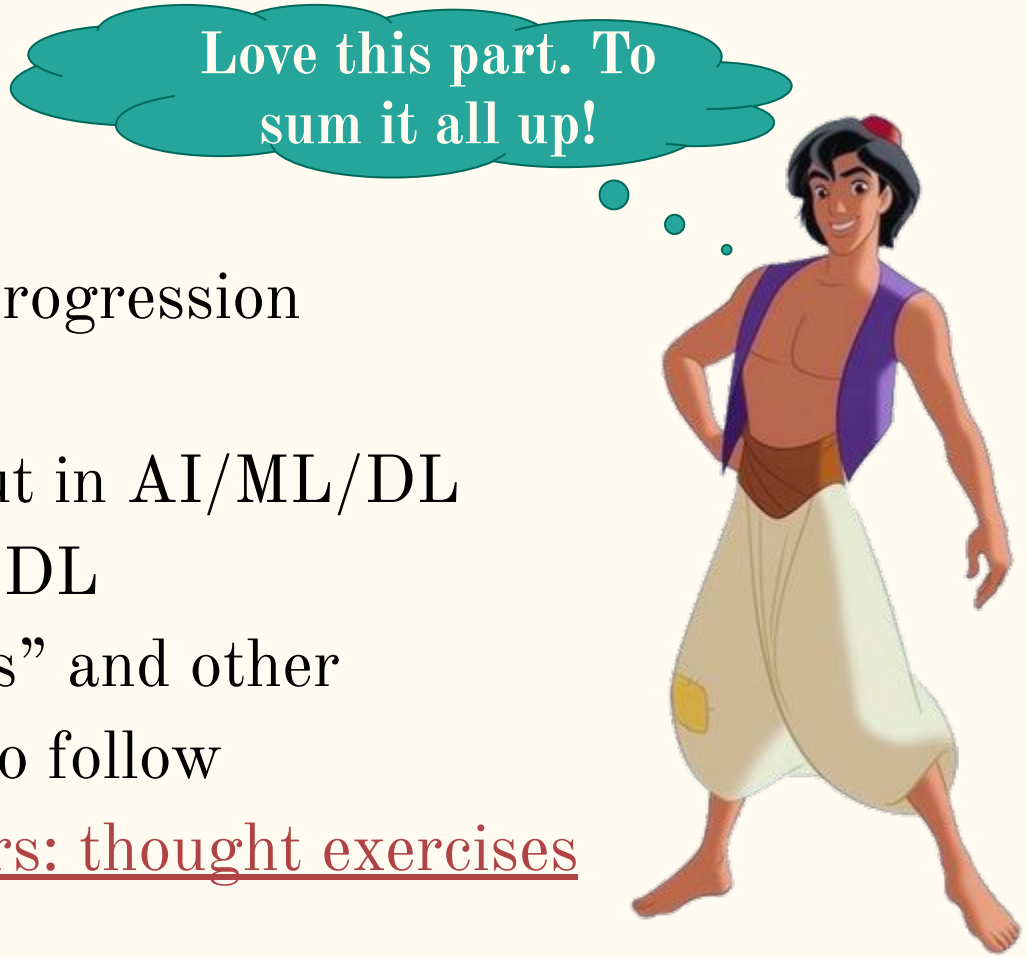
How do I learn?

See previous talks &

Appendix section

Summary

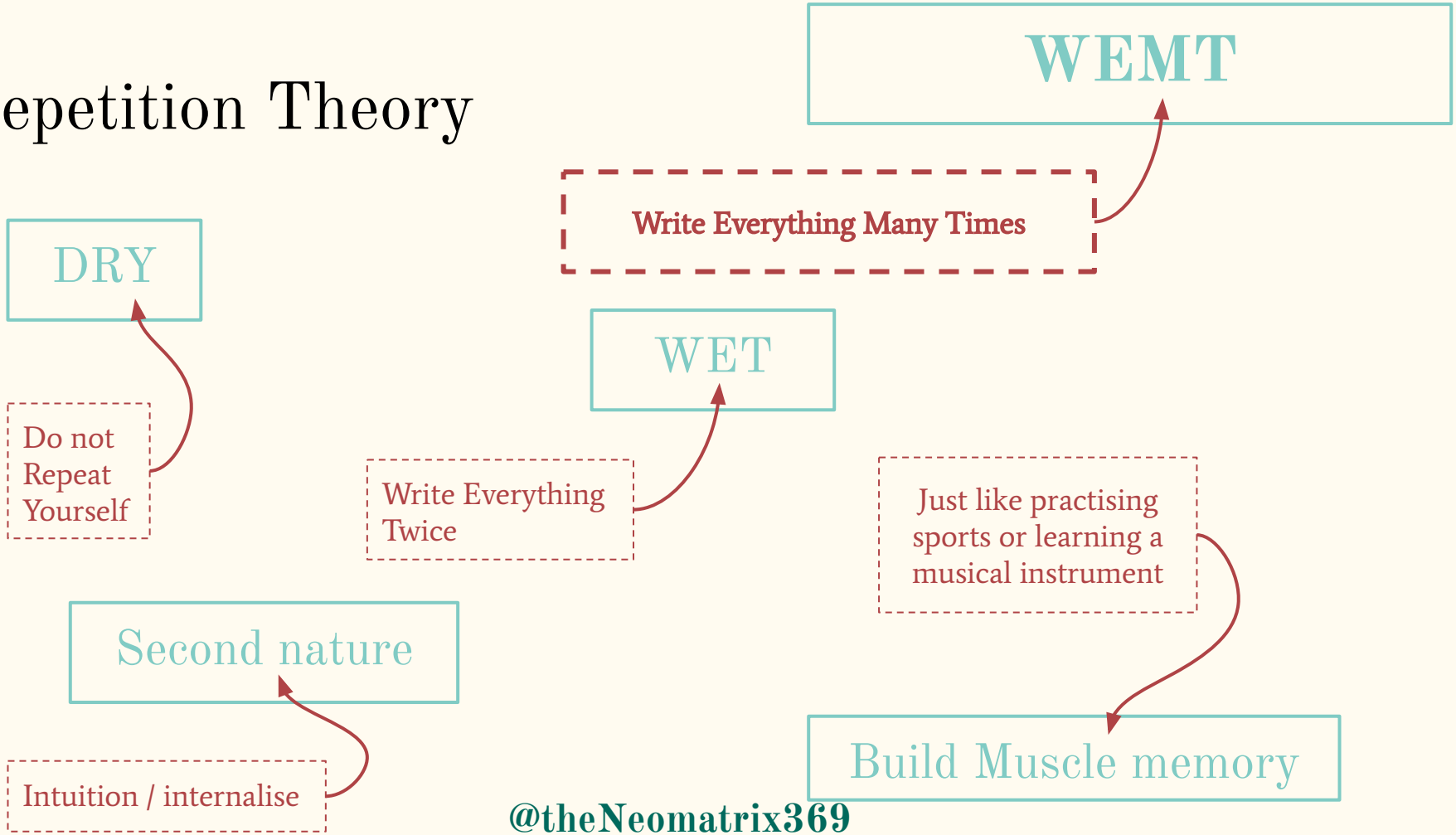
- Timeline of my career progression
- Demos & projects
- Things I'm excited about in AI/ML/DL
- Components of AI/ML/DL
- Links to "Previous talks" and other "Learning Resources" to follow
- Masters & Grandmasters: thought exercises in the Appendix section



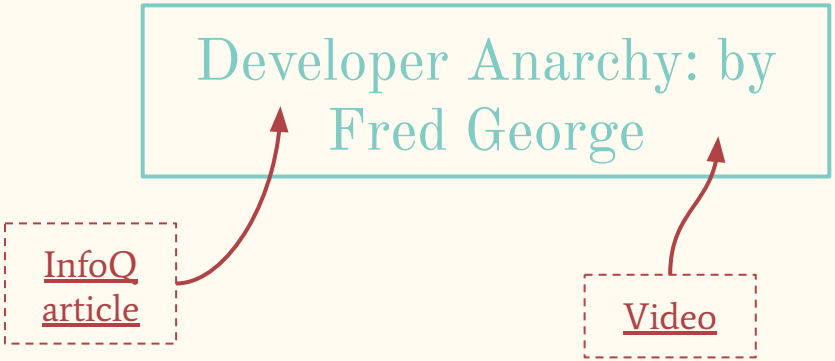
Previous talks

- I recently gave a talk on “nn” things every Java developer should know about AI/ML/DL
- Naturally, getting productive, my journey with Grakn and Graql
- Do we know our data as well as our tools?
- Java N.n: What to know? How to learn?
- Some of my other talks a can be found here and here (and others on Slideshare)

Repetition Theory

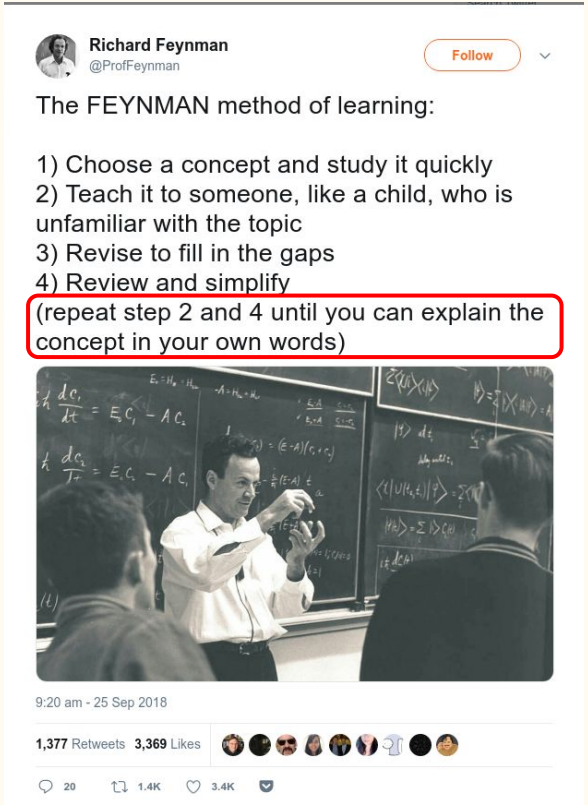


Repetition Theory: WEMT (Write Everything Many Times)



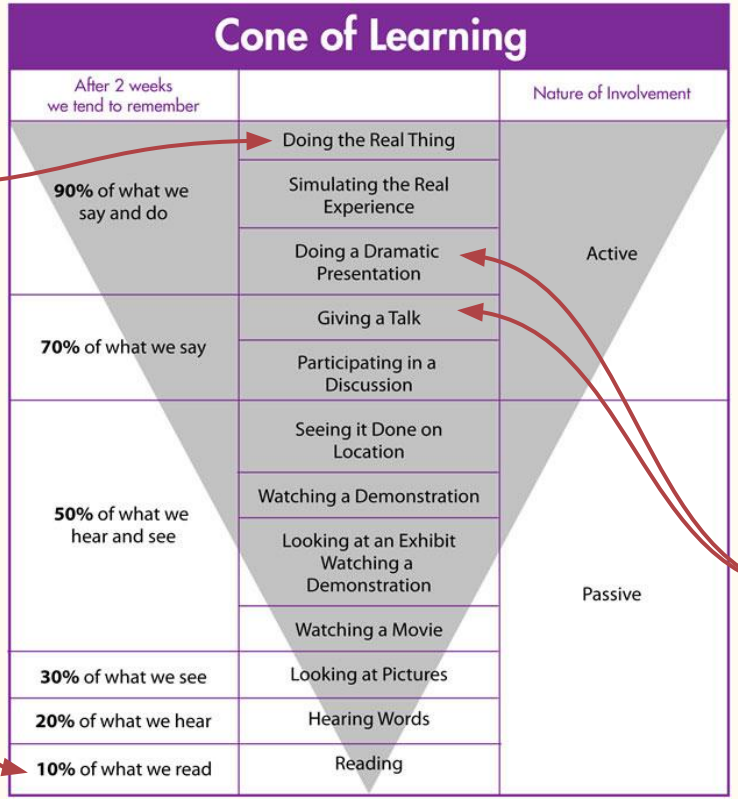
Solving the same problem in many different ways, see Appendix section

Repetition Theory: Richard Feynman quote



Cone of Learning

What *you* will be doing!



What "*I*" have be doing!

Reading can be a bit pointless if it does not follow *deliberate practise*

Insight

Writing code is Deep Work
Software Design is Deep Work

Learning websites

- Awesome AI/ML/DL
- Better NLP
- Virgilio | GitHub
- MadeWithML

Coherence with the brain

- Brain indexes knowledge
  - when you are resting
    - sleep and rest
  - let the brain or the mind index away
- Don't overload,
  - instead interleave
  - fill the gaps
  - learn incrementally & iteratively

Book references

- Code Complete
- Clean Code
- Refactoring (Martin Fowler and Joshua Kerievsky)
- Four rules of simple design

Book references

- Approaching (Almost) Any Machine Learning Problem
- How to think like a Scientist!
- Deep Work book
- Getting Things Done: Book | Free Resources

Other Resources

- No need to feel overwhelmed
- Kagglers, read this for inspiration
- See Appendix section of the slide deck

Contact and keep in touch

Use Hashtag: #abhishektalks

- twitter: @theNeomatrix369
- medium: https://medium.com/@neomatrix369
- github: https://github.com/neomatrix369/
- linkedin: https://www.linkedin.com/in/mani-sarkar/
- youtube: channel | playlists
- kaggle: https://kaggle.com/neomatrix369
- about me: https://neomatrix369.wordpress.com/about

Thank You!

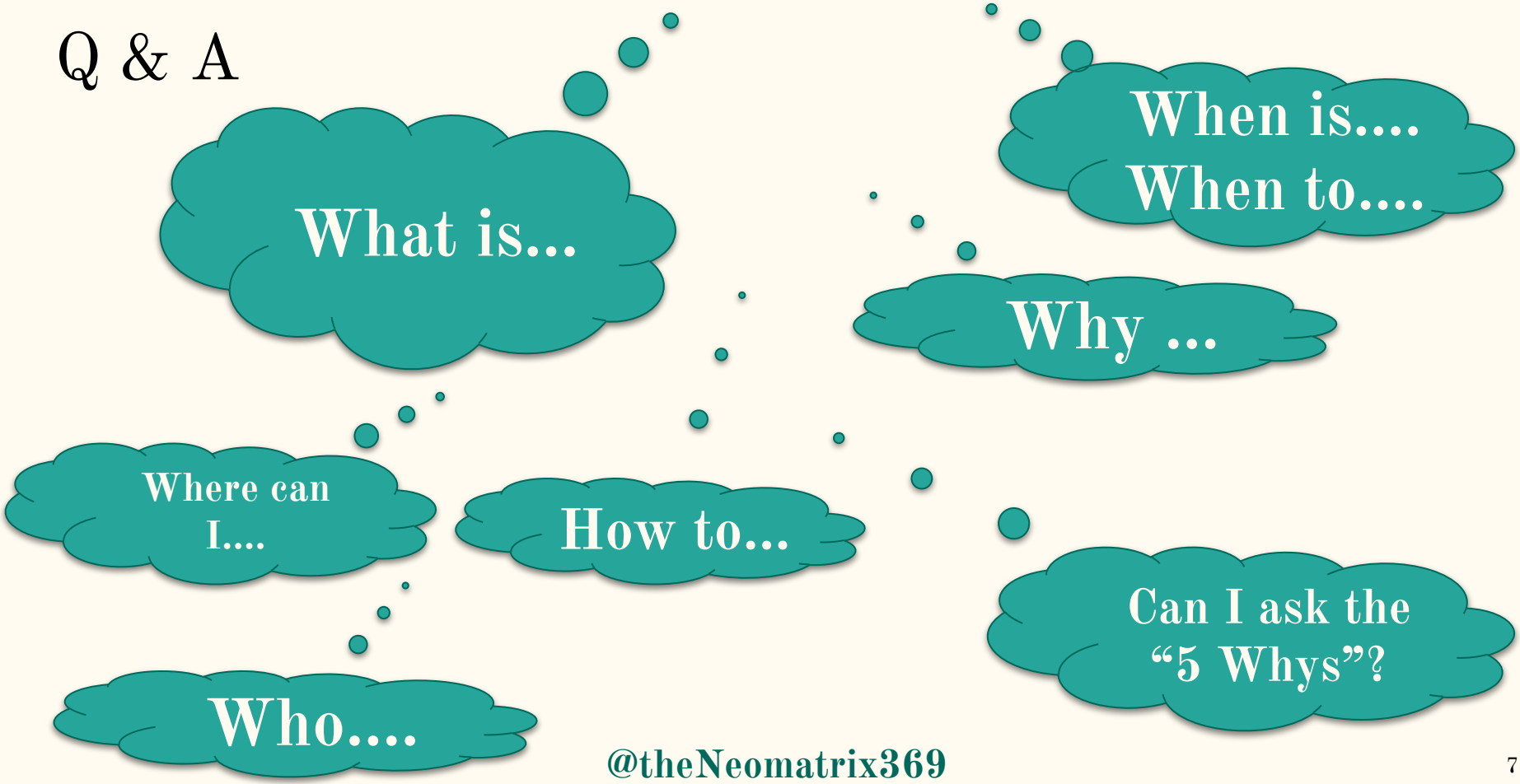
Hey, tell us about Abhishek's new book!

- **Abhishek Thakur**, for organising this session, and giving me a chance to present at this forum
- And to you, for sparing your valuable time and trusting in me

Closing

The pathway to mastery or championing a subject means we must be different and take different approaches, in addition to the ones that have already been taken!

Q & A


What is...
When is....
When to....
Why ...
Where can I....
How to...
Can I ask the "5 Whys"?
Who....

Appendix

Learning by example

DL4J example

- Github
- Blog post

NLP examples

- Example 1
  - Github
  - Blog post
- Example 2
  - Blog post
- Example 3
  - Blog post
- Better NLP

Jupyter Notebook example

- Example 1
  - Github
  - Blog: Exploring NLP concepts using Apache OpenNLP inside a Jupyter notebook
- Example 2
  - Blog post
- Example 3
  - Github
  - Blog post

Apache Zeppelin example

- Github
- Blog posts
  - Apache Zeppelin: stairway to notes* haven!
  - Running Apache Zeppelin on Oracle Cloud Infrastructure

graql-to-english, english-to-graql example

- Presentation
- Github

grCuda example

- Blog posts
  - grCUDA: A Polyglot Language Binding for CUDA in GraalVM. NVIDIA Developer Blog, November 2019.
  - grCUDA: A Polyglot Language Binding. Presentation at Oracle CodeOne 2019, September 2019.
  - Simplifying GPU Access. Presentation at NVIDIA GTC 2020, March 2020
  - Optimizing Machine Learning Performance at Netsuite with GraalVM and NVIDIA GPUs
- Github

graalPython examples

- Blog posts
  - Introduction to the Python implementation for GraalVM
  - Moving from Jython to GraalVM
  - Running Python on GraalVM
- Github

How do I learn?

Top-down, outside in learning, see Rachel Thomas' talk (fast.ai)

Mind-maps, gathering reading lists, organising them, categorising them

Nodes of Knowledge (see Appendix, previous talks)

Automatic chunking, Learning to Learn course by Coursera

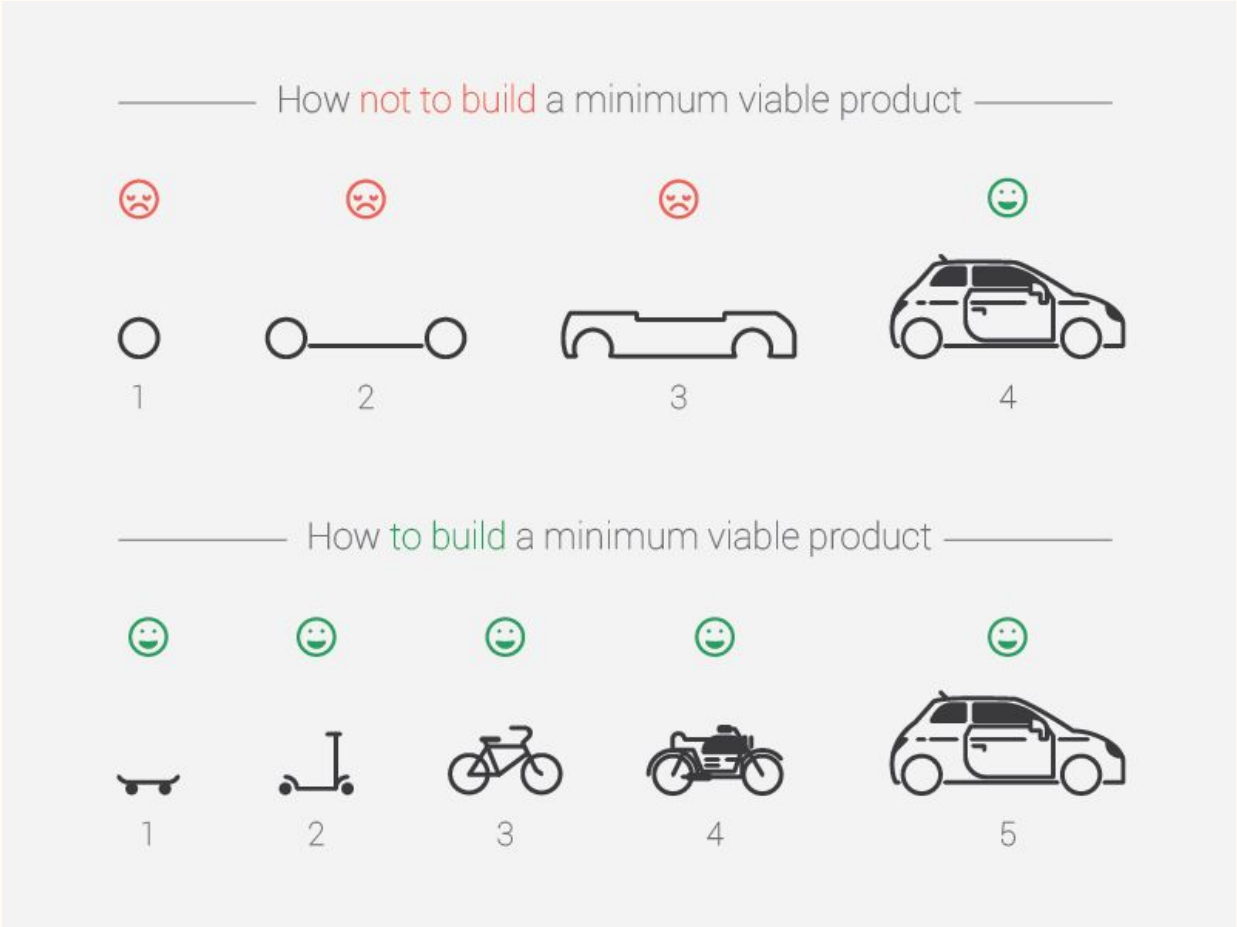
List building: helps know the landscape and understand the context: birds-eye-view

List building: helps prioritise, order, remove or add topics you like, or don't like or don't know

End-to-end flow diagrams help a lot!

One may find these methods *unconventional* or *non-mainstream* but they do work and give good results!

How to build and how not to?



Useful advice

See what Subhaditya say about intuition

- His talk on Abhishek's talk series: Talks # 2: Subhaditya Mukherjee - Image restoration using Deep Learning: Dehazing
- And this blog post on "imposter syndrome"

From KDM Delhi Kaggle Expert & Kaggle Master

- Sound advice from : Talks # 2: Subhaditya Mukhe1st Anniverary Meetup #3 || AMA with Mayank Kumar & Siddharth Yadavrjee

Masters and Grandmasters

Why do they inspire us?

- Start early: the amazing performance by little Souparnika Nair
- ...and keep going
- ...meet the masters (the droplets returns to the ocean)

What's a common thread in all of them, in all of their performances?
(thought exercise)

Master of grandmasters?

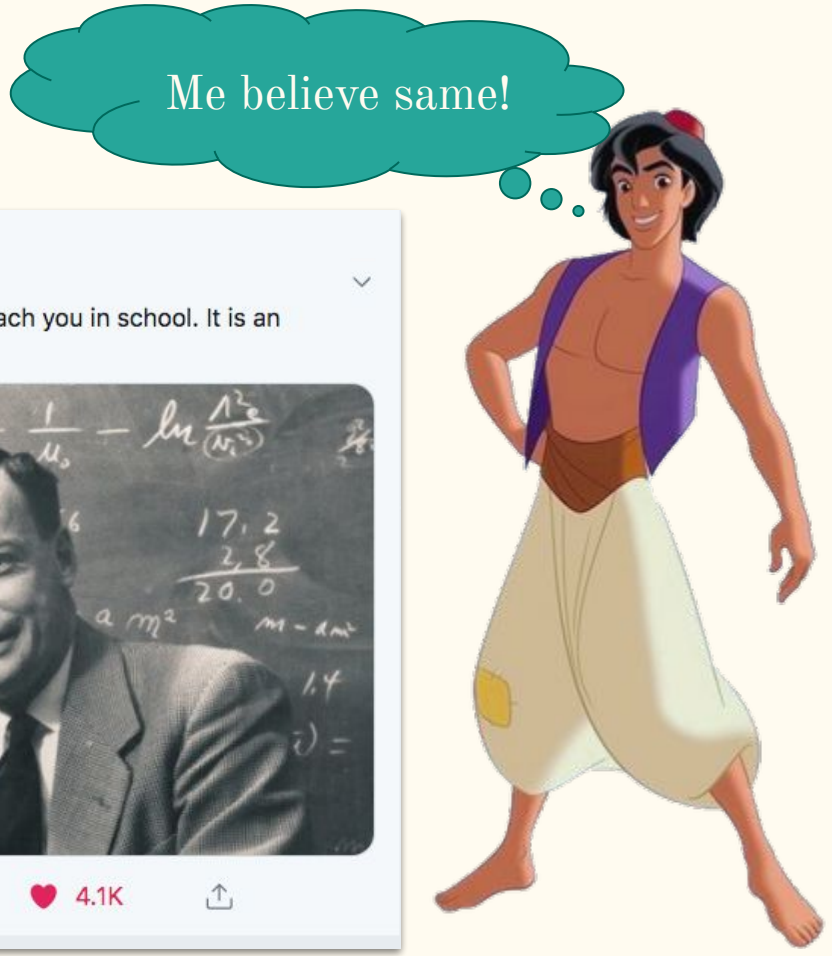
Britain's Got Talent 2020 Souparnika Nair: 10 Year Old Singer Full Audition S14E07

What does it take to become such a talented person? Why? (thought exercise)

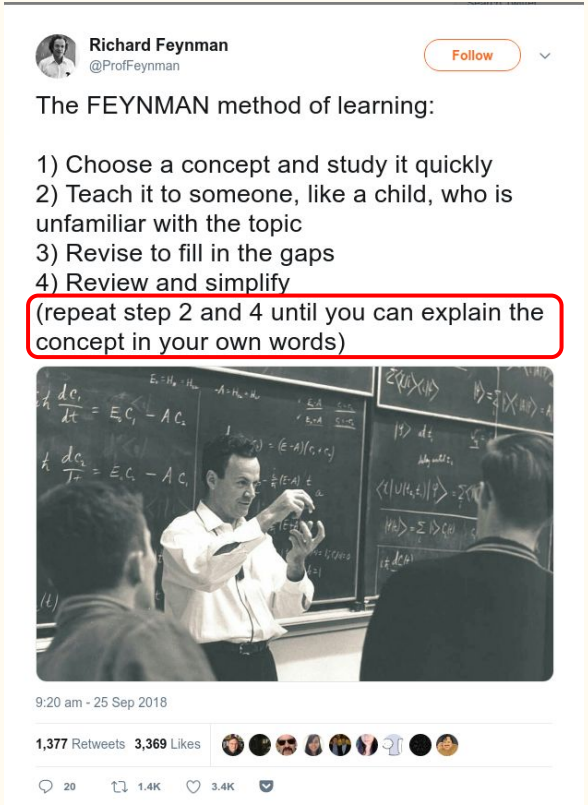
The journey continues, the road maybe long, it's full of learnings that help us grow, many a times a winding points but the milestones keep moving - we are living in such unprecedented times!

Feynman quotes

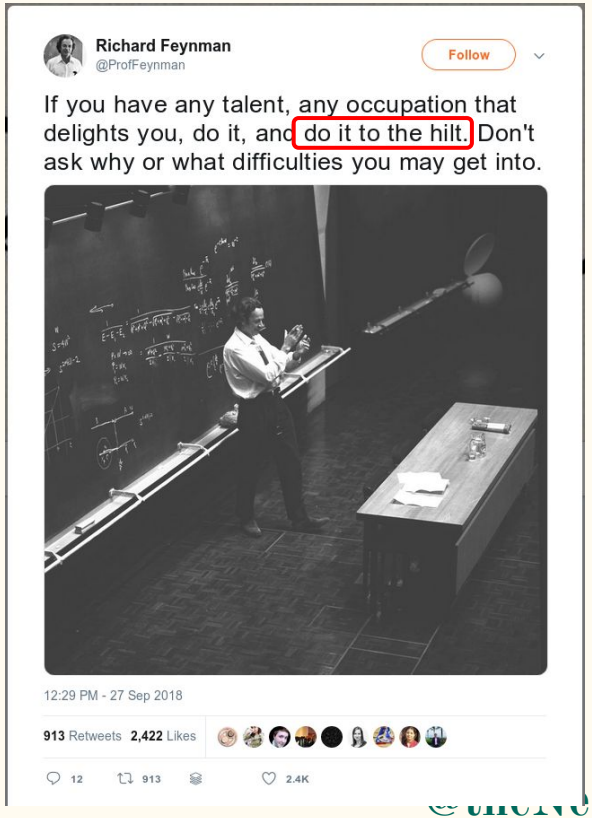
Being wrong isn't bad...

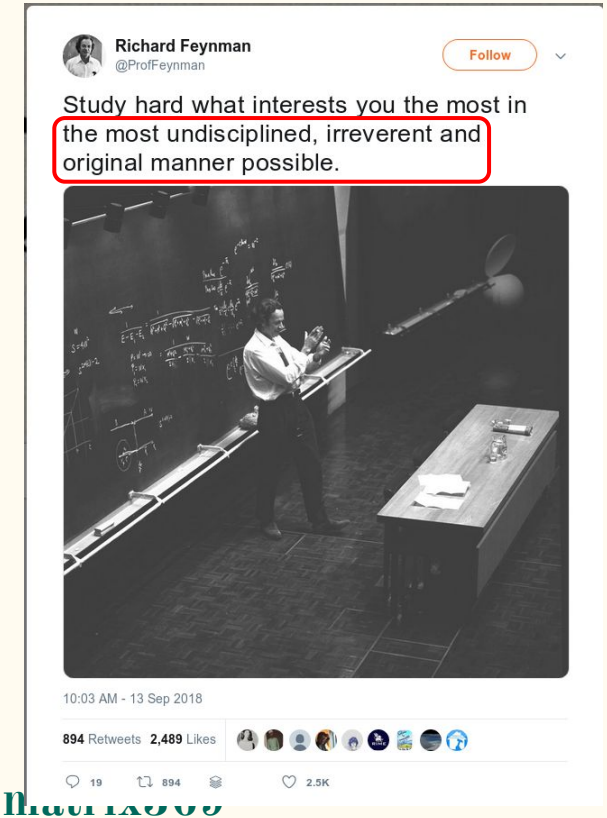


Repetition Theory: Richard Feynman quote



More Richard Feynman quotes...





Other fun stuff

Comedians really know their data!

55 seconds of fun

Link to the video

@theNeomatrix369

Comedians really know their data!

Ellen D. knew her time-series

She made us laugh, so she must know something...

Ellen D. knew her graphs


Call us sidekicks, if you will!
It has been an honour and a pleasure to be here!
We were the mascots!