The 10 Second Rule
*How to Maximize Your Productivity
in Machine Learning*

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About Me 🐦 @gar1t

- Programmer (Python, Erlang, C/C++, Java)
- Founder, Guild AI (ML Engineering Toolkit)
- Founder of Chicago ML (4000 member ML user community)
- Previously CloudBees, Director of PaaS operations

This Presentation

- The 10 Second Rule
- Methodology
- Live Example
- Importance of Measurement
- Summary

The 10 Second Rule

Do not ever allow calculations to exceed 10 seconds while you work on a problem.

Radek Osmulski
How to do machine learning efficiently

Benefit

- Let time waiting
- Less distraction

The Science of Waiting

0.1 seconds	System is reacting instantaneously
1 second	Limit for the user's flow of thought to stay uninterrupted
10 seconds	Limit for keeping the user's attention focused on the dialogue

Source: *Nah, Fiona. (2003). A Study on Tolerable Waiting Time: How Long Are Web Users Willing to Wait?*

Short-term memory plays a critical role in human information processing; interference with short-term memory can occur when an individual senses an awareness of waiting after approximately 2 seconds.

Miller, R.B., 1968, Response time in man-computer conversational transaction

The Real Benefit

[Git offers] the kind of performance that actually changes how you work. It's no longer doing the same thing faster. It's allowing you to work in a completely different manner. And that is why performance matters.

Linus Torvalds, Creator of Git

Google Tech Talk, 2007

Why Performance in ML Matters

- Think in terms of *operations*
  - Inputs
  - Outputs
  - Feedback on correctness
- Open up exploration frontier in explore/exploit

10 Second Methodology

Steps for the 10 Second Rule

1. Do no harm
   - Preserve default behavior
   - Avoid changing lines - only add new lines
   - Make changes obvious
2. Put on "development mode" hat, abandon all goals for accuracy
3. Add timing instrumentation
4. Define _10sec flag or similar
5. Define time-related parameters, preserve default behavior
   - Epochs/steps
   - Data set size
   - Model size
6. In a conditional block set _10sec parameter values
7. Start developing!

Live Example

Be Nervous!

- How do you know a change didn't break something?
- How do you measure progress?
- How do you conduct a post mortem?

From *How to do machine learning efficiently*

- "Inspect the data as you go along"
- "Test everything"
- "Start with the simplest model you can think of"
- "Start forming a baseline of what is possible"

Measurement

Simple Yet Effective Experiments

- Run a system process
- Save inputs and outputs in unique "run directory"
  - Source code and other inputs
  - Process output
  - Generated files
- Use tools to inspect and compare

Guild AI

- Open source experiment tracking
- Run your code unmodified
- Same "run directory" approach, just more information
- Integrated tools (TensorBoard, Hiplot, etc)

Recap the Benefits

Step	Benefit
"10 Second" flag	Immediate feedback from changes covering full code path
Timing instrumentation	Be aware how long operations take
Expose hyperparameters	Open exploration frontier
Experiments	Test and establish baselines for comparison
Automation	Save time, try more

Wrapping Up

It's no longer doing the same thing faster. It's allowing you to work in a completely different manner. And that is why performance matters.

Links

- https://medium.com/hackernoon/doing-machine-learning-efficiently-8ba9d9bc679d

- https://github.com/gar1t/2020-08-12-magnimind

- https://guild.ai