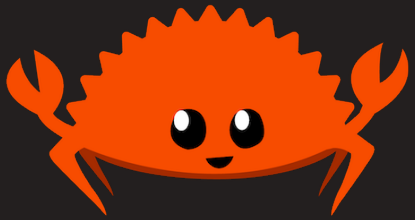
Intro to Machine Learning in Rust



Rust Munich 2024/3 - 15.10.2024

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Education

2019	Abitur
2019-2023	Bachelor of Mechatronics
currently	Master of Applied Research

Work

2020-2021	Student assistant
	GitLab-Server, automatic creation of VMs, internal Software
2021-2022	Working student at Hilti
	Porting an internal simulation tool from Matlab to Rust
2022-2021	Internship and bachelor thesis at GROB-WERKE
	Optical quality control based on CAD data

Rust

Relm4	Idiomatic GUI framework based on gtk-rs
tuxedo-rs	Rust libraries for interacting with hardware from TUXEDO Computers
plotters	A rust drawing library for high quality data plotting

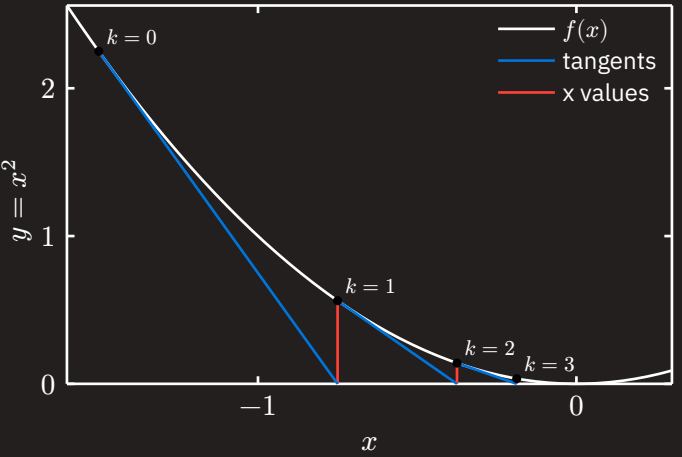
Why do ML in Rust?

- Cargo
- Easy deployment
- Compile-time checks
- Higher efficiency
- Single-language from libraries to application

Fundamental idea

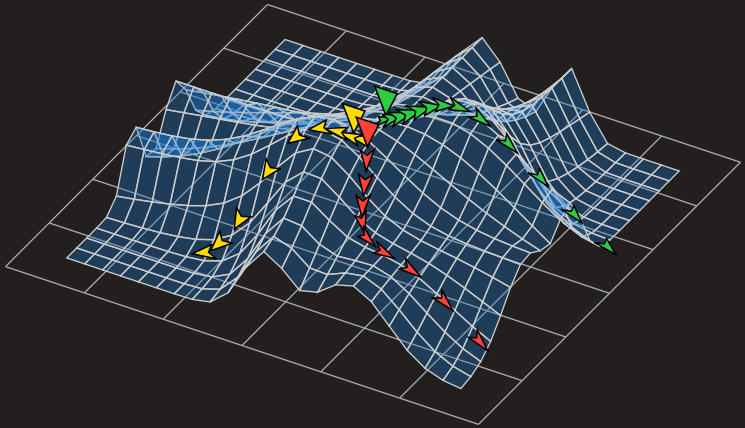
Imagine a function $f(x_1, x_2, ...)$ that distinguishes crabs from gophers...

Newtons method



$$x_{k+1} = x_k - \frac{f'(x_k)}{f(x_k)}$$

Gradient descent



Are we ML yet?

*Yes**

tch-rs

- 55k downloads per month
- 4.3k stars
- Goal: Thin Rust wrapper for the PyTorch C++ api (libtorch)
- Focus: Provide a nice wrapper, nothing more

candle

- 36k downloads per month
- 15.6k stars
- Goal: Provide PyTorch-like functionality without Python
- Focus: Deployment of AI models

Burn

- 6k downloads per month
- 8.6k stars
- Goal: Flexible, efficient and portable deep learning framework
- Focus: Batteries-included, somewhat opinionated AI framework
- Special feature: Exchangeable backends and `no_std` support

Code example with burn

Let’s build a music composer AI

Note	C	D	E	F	G	A	B
Representation (G)	0	0	0	0	1	0	0

Length	$\frac{1}{16}$	$\frac{1}{8}$	$\frac{1}{6}$	$\frac{1}{4}$	$\frac{1}{3}$	$\frac{1}{2}$	1
Representation $(\frac{1}{4})$	0	0	0	1	0	0	0

Code example with burn

Let’s jump into the code!

Thanks for having me!

I'm looking for a part time remote job starting end of February.

Feel free to contact me:

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- github.com/AaronErhardt