Why you should learn Rust

As a Python developer

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About me 👋

- 👩‍💻 Software Engineer at Sentry
- 🐍 Python SDK
- 🦀 Sentry CLI (Rust)

Agenda

1. **Rust vs. Python**
2. Rust’s Safety & Reliability Guarantees
3. Rust Tooling
4. Benefits of learning Rust for Python devs

Rust surfaces many Python runtime errors at compile time

Python

```python
a = None
b = 0

... # a and b are unchanged

print(a >= b) # 🔥 Runtime error!
```

Rust

```rust
let a: Option<i32> = None;
let b = 0;

// ... a and b are unchanged

println!("{}", a >= b); // ❌ compile error
```

Rust

The “fix”

```rust
let a: Option<i32> = None;
let b = 0;

// ... a and b are unchanged

if let Some(a) = a {
    println!("{}", a >= b);
}
```

Rust involves more upfront effort.
The payoff is fewer runtime errors.

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Explicit mutability

What does this output?

Python

```python
numbers = [0, 1, 2, 3]

mystery(numbers)

print(numbers)
```

Uncertain

Rust

```rust
let numbers = vec![0, 1, 2, 3];

mystery(&numbers);

println!("{:?}", numbers);
```

[0, 1, 2, 3]

Explicit mutability

To mutate, variables must be **declared mutable**!

Rust

```rust
let mut numbers = vec![0, 1, 2, 3];

mystery(&numbers);

println!("{:?}", numbers);
```

`mystery` still cannot mutate here!

References also need to be **declared mutable**!

Rust

```rust
let mut numbers = vec![0, 1, 2, 3];

mystery_mut(&mut numbers);

println!("{:?}", numbers);
```

Ownership and **borrowing rules** ensure **memory safety** at **compile time** without garbage collection

Ownership

```
let hello = String::from("Hello, world!");
foo(hello);

println!("{}", hello); // compile error
```

Ownership

Why?

```
let hello = String::from("Hello, world!");
foo(hello); // hello is moved into foo here
// foo then drops hello

println!("{}", hello); // compile error
```

Ownership

Fix

```
let hello = String::from("Hello, world!");
foo(hello.clone());

println!("{}", hello);
```

Ownership

Other fix, with borrowing

```
let hello = String::from("Hello, world!");
foo2(&hello);

println!("{}", hello);
```

```
fn foo(s: String) {
    println!("{}", s);
}
```

```
fn foo2(s: &str) {
    println!("{}", s);
}
```

Borrowing

Single borrows

Rust

```rust
let mut numbers = vec![0, 1, 2, 3];

mystery(&numbers);

println!("{:?}", numbers);
```

Immutable

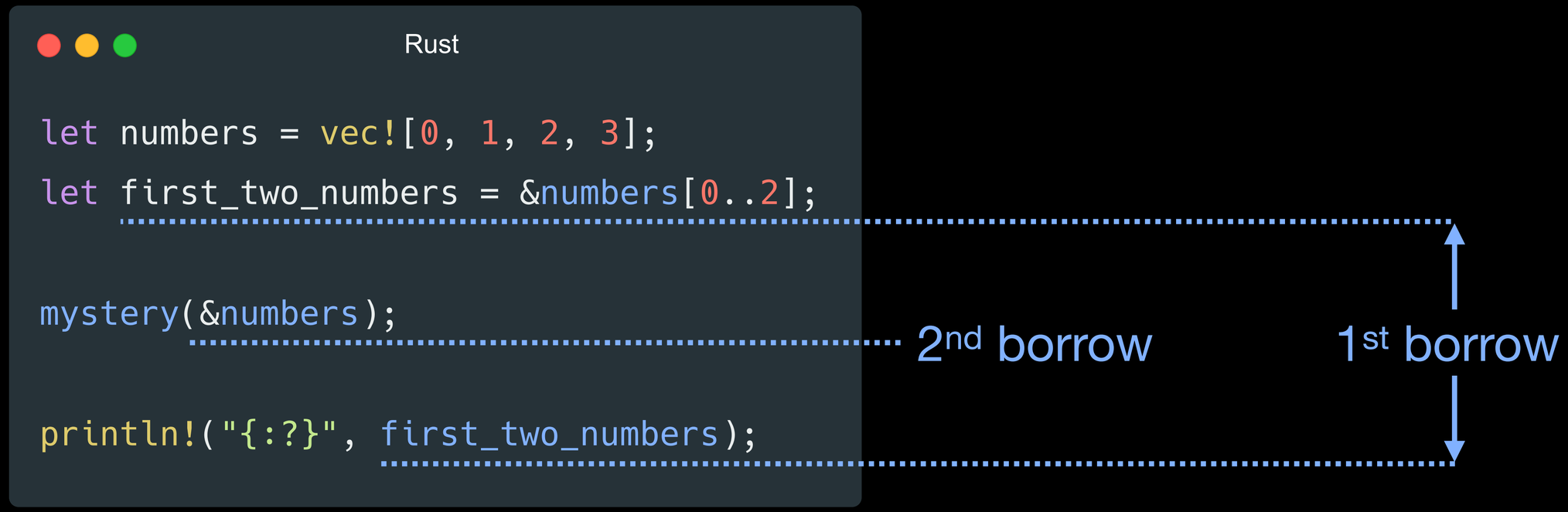
Rust

```rust
let mut numbers = vec![0, 1, 2, 3];

mystery_mut(&mut numbers);

println!("{:?}", numbers);
```

Mutable

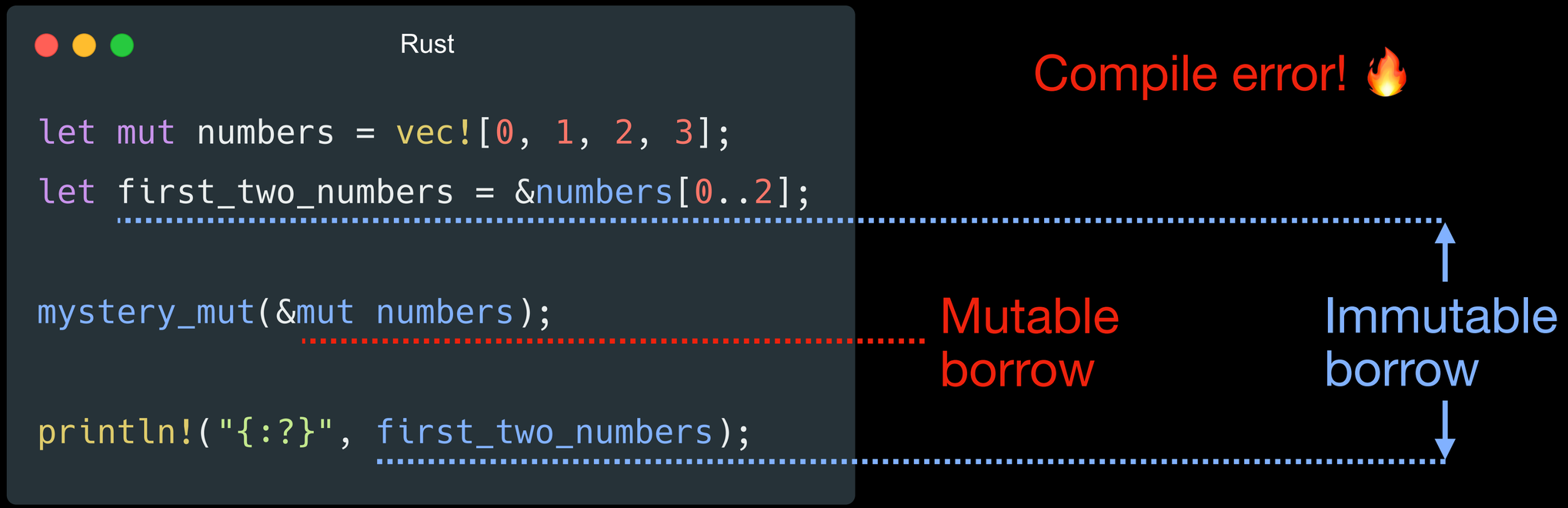
Borrowing

Multiple immutable borrows – ✅



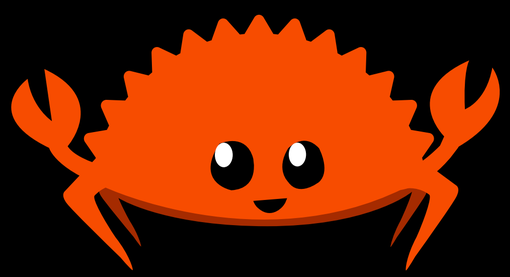
Borrowing

Mutable & immutable borrow – ❌



* multiple mutable borrows also are not permitted ❌

“Fearless concurrency” – if it compiles, it is thread-safe!



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Compiler warnings

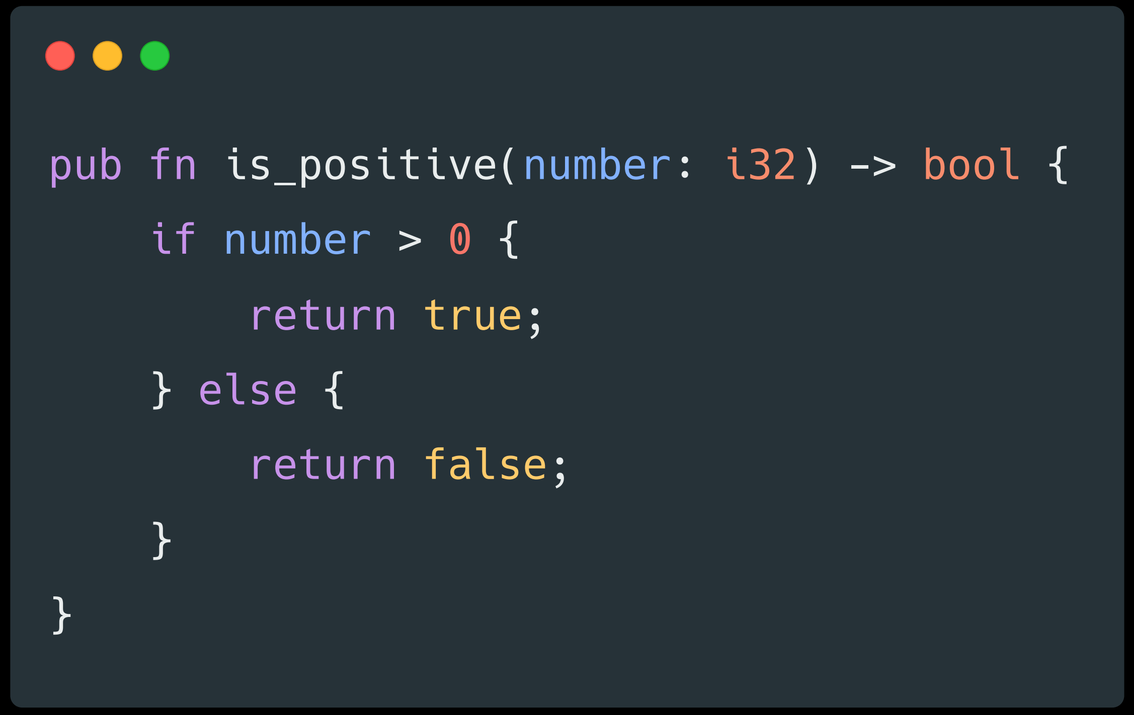
Rust

```rust
let mut numbers = vec![0, 1, 2, 3];
let first_two_numbers = &numbers[0..2];

mystery_mut(&mut numbers);

println!("{:?}", first_two_numbers);
```

```
row `numbers` as mutable because it is also borrowed as immutable
.rs:17:17

umbers = &numbers[0..2];
          ------- immutable borrow occurs here

t numbers);
^^^^^^^^^ mutable borrow occurs here

18 |
19 |     println!("{:?}", first_two_numbers);
   |                       ----------------- immutable borrow later used here
```

Clippy linter

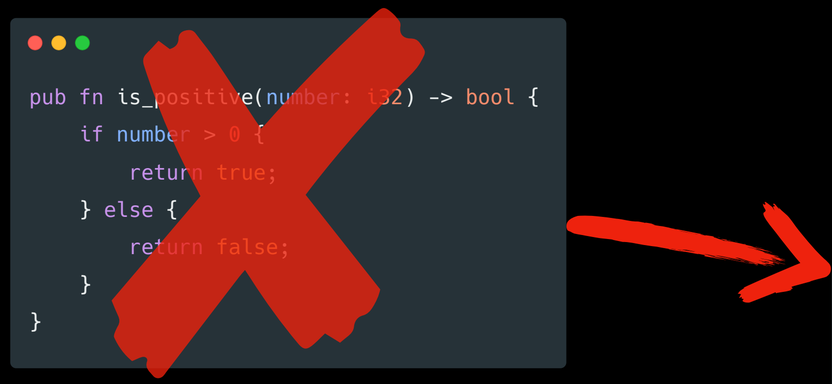
Standard linter in Rust, with standardized default rules



```rust
pub fn is_positive(number: i32) -> bool {
    if number > 0 {
        return true;
    } else {
        return false;
    }
}
```

Clippy linter

Standard linter in Rust, with standardized default rules

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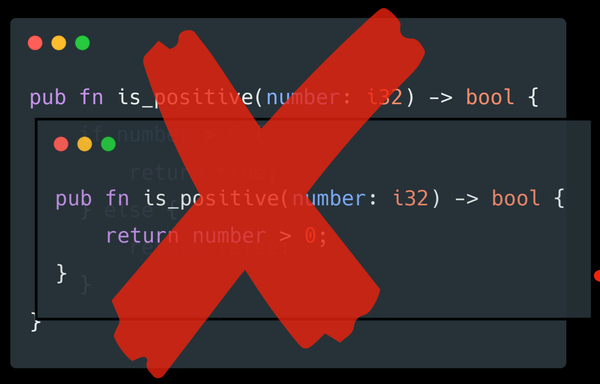

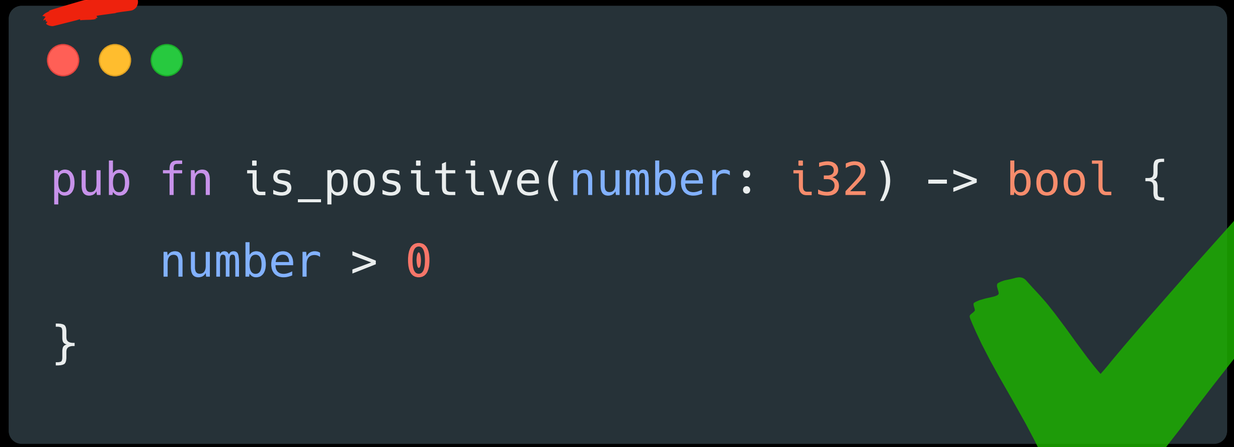

Rustfmt

Standardized formatting for all Rust code

```rust
pub fn clamp_sum(a: i32, b: i32, max: i32) -> i32 {
    let sum = a + b;
    let upper = sum.min(max);
    let lower = 0;
    upper.max(lower)
}
```

Rustfmt

Standardized — and opinionated — formatting for all Rust code

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    b: i32,
    max: i32,
) -> i32 {
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    upper.max(lower)
}
```

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Rust and Python each have their own advantages — optimize by use case

Rust enforces safety concepts, which are good practice, also in Python

Even if you never write Rust, learning Rust will improve your Python skills

Ready to learn Rust?

- Check out *The Rust Programming Language*