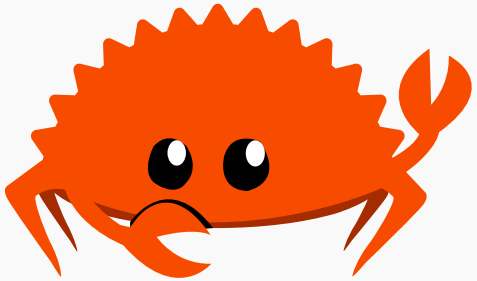
Rust

A boring and expressive language

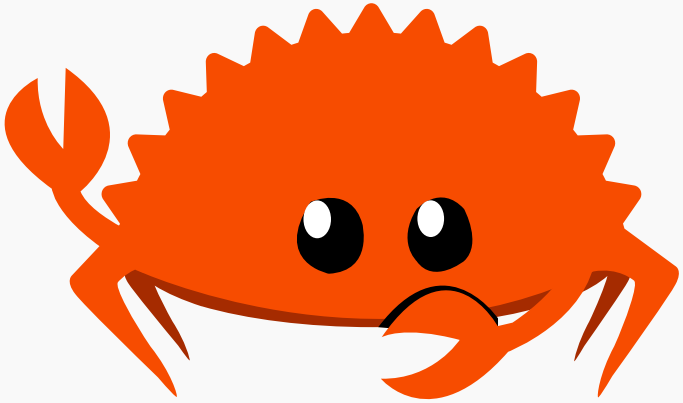
Victor Diez Ruiz



```
1  fn main() {
2    println!("Hello 🦀");
3  }
```

Why Rust rocks

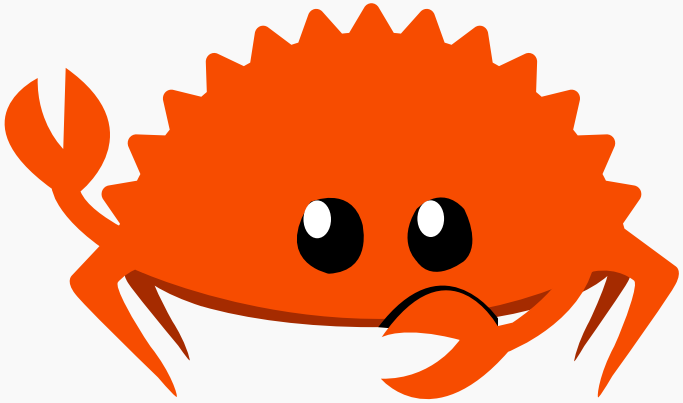
1. Lifetimes & Ownership
2. Inmutability by default
3. Algebraic Data Types
4. Error handling
5. Pattern Matching
6. Traits
7. Macros
8. Ecosystem



Lifetimes & Ownership

Save the environment

```
1  fn main() {
2      let a = 2;
3      let b = 3;
4      println!("{}", a + b);
5  }
```



Save the environment

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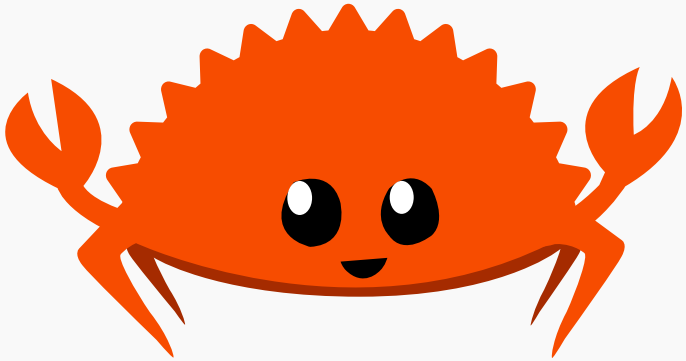
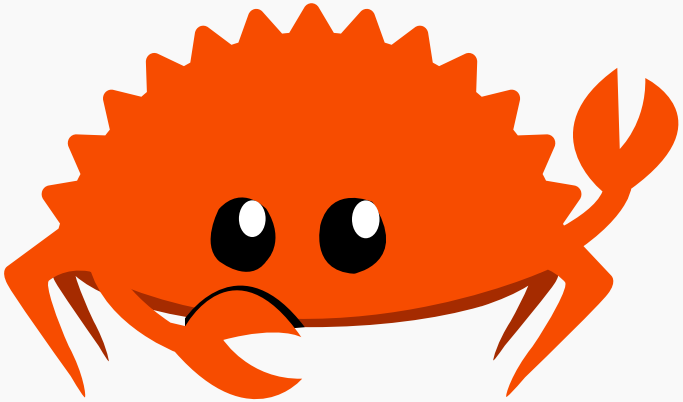
4      println!("{}", a + b);
5  } </scope>
```



Everything eventually dies



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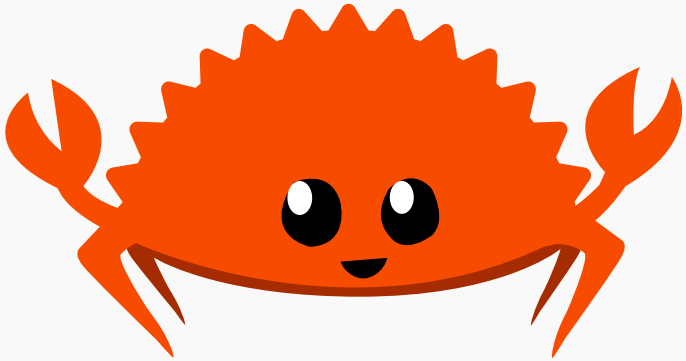

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2      let a = 2;
3      { <'b>
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7  } </'a>
```

Sir that’s mine

```
1  fn main() {
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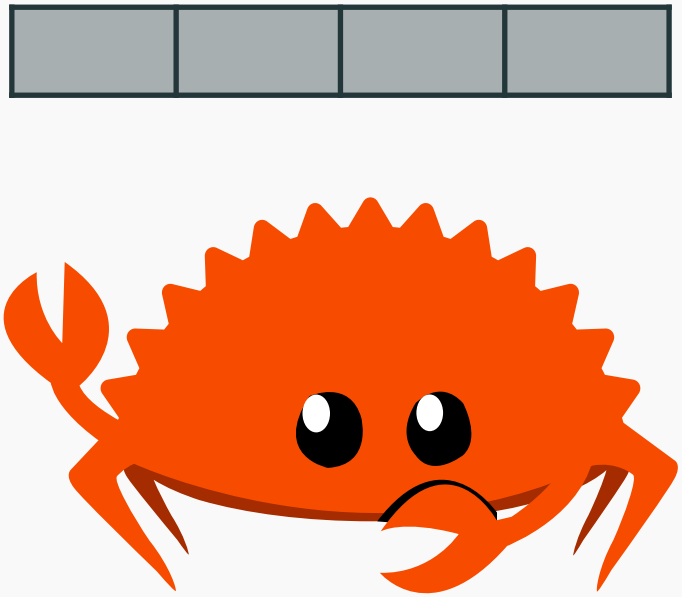

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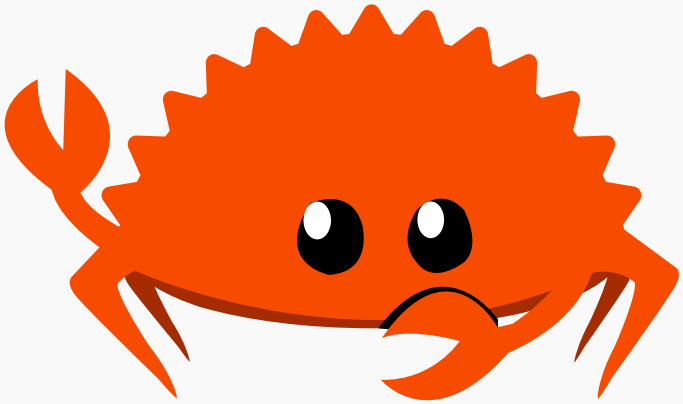

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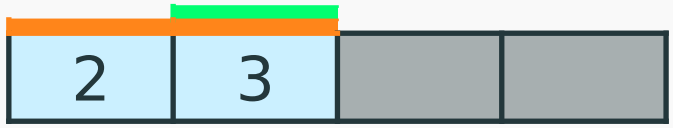

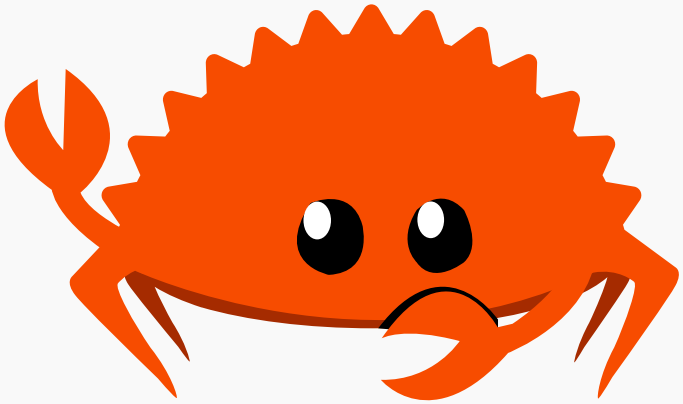

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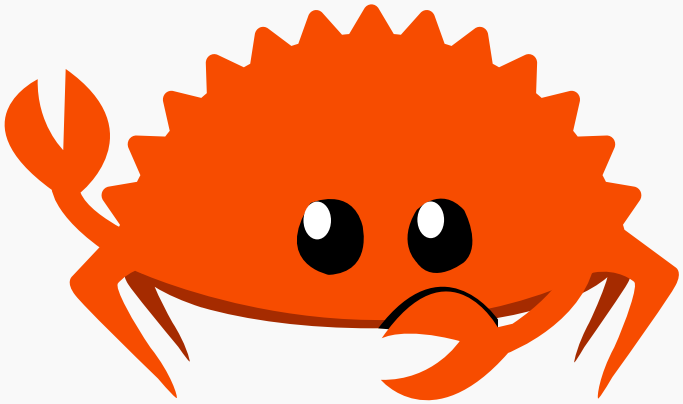

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2      let a: 'a = 2;
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7  } </'a>
```
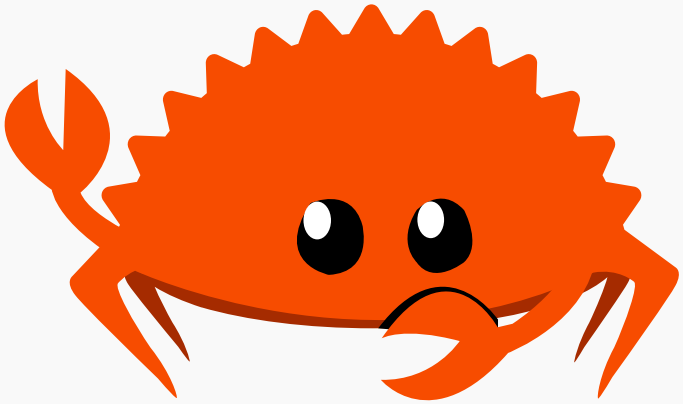
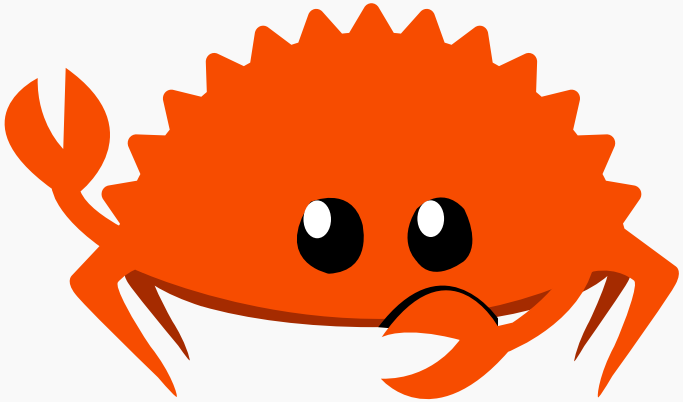



Inmutability by default

Can’t touch this

```
1  fn main() {
2    let a = 2;
3    let mut b = 3;
4
5    a = 3;
6    b = 2;
7  }
```



Can’t touch this

```
1  fn main() {
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5      a = 3;
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```
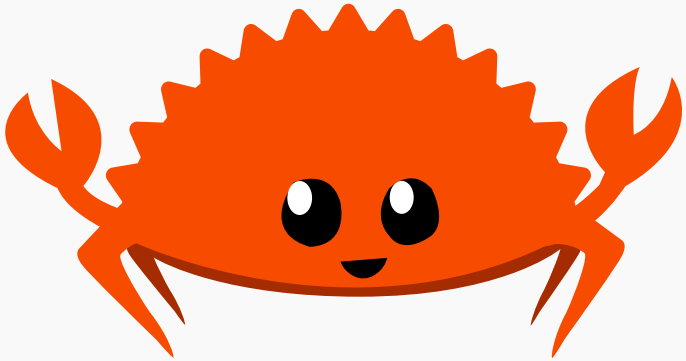
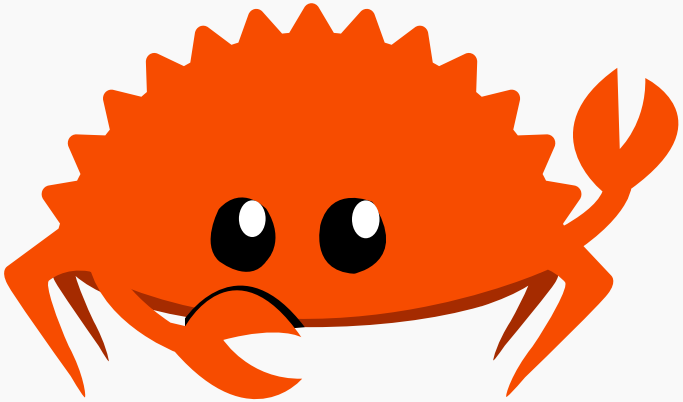



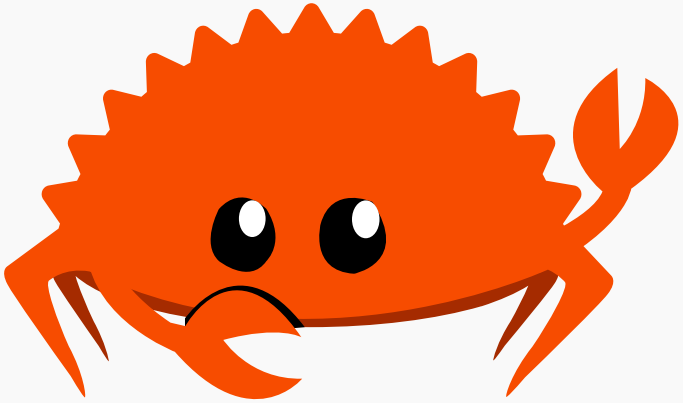
Algebraic Data Types

Types as numbers ?!?!?!



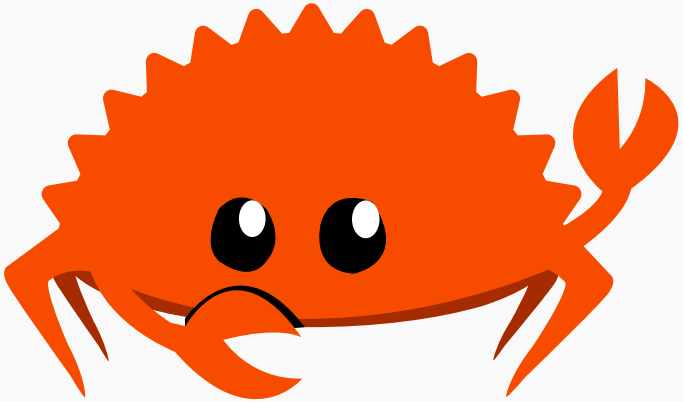
```
bool : { true, false } = 2
```

Types as numbers ?!?!?!



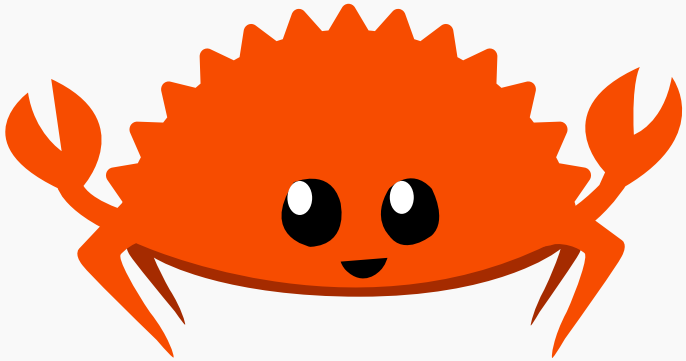
```
bool : { true, false } = 2
u8   : { 0, ..., 255 } = 256
```

Types as numbers ?!?!?!



```
unit : { ()           } = 1
bool : { true, false } = 2
u8   : { 0, ..., 255 } = 256
```

Types as numbers ?!?!?!

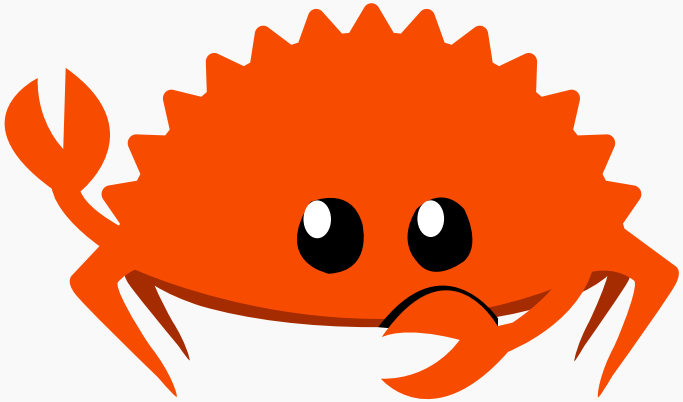


```
!    : {              } = 0
unit : { ()           } = 1
bool : { true, false  } = 2
u8   : { 0, ..., 255  } = 256
```

Math with types ?!?!

Addition

```
bool{2} + unit{1} = {3}
```

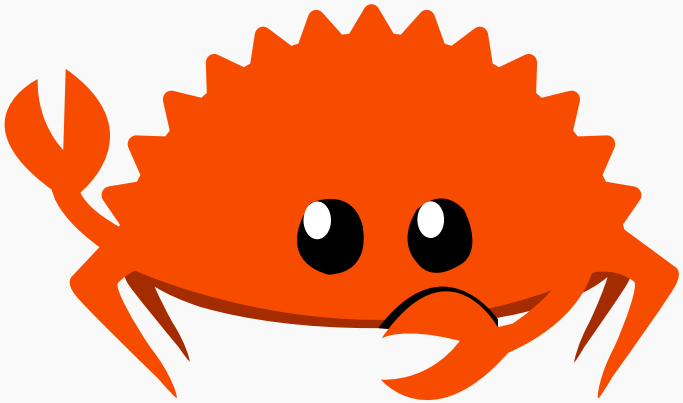


Math with types ?!?!

Addition

`bool{2} + unit{1} = {3}`

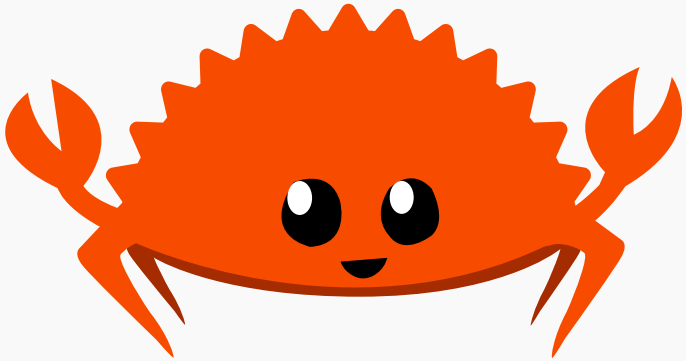
```
1  enum MaybeBool {
2    Some(bool),
3    None
4  }
```



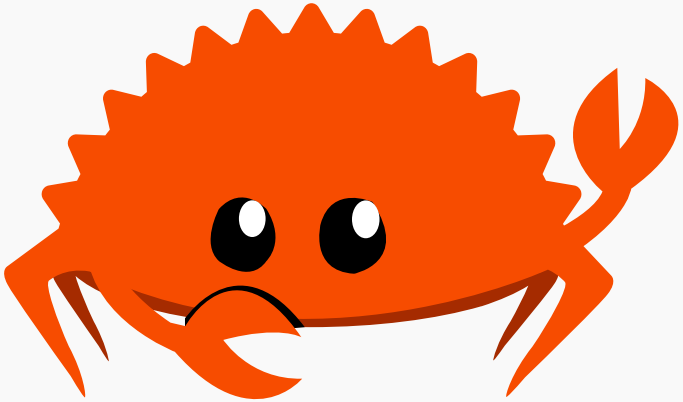
Math with types ?!?!

```
unit{1} * 4 = {4}
```

```
1 enum Directions {
2   North,
3   East,
4   West,
5   South,
6 }
```



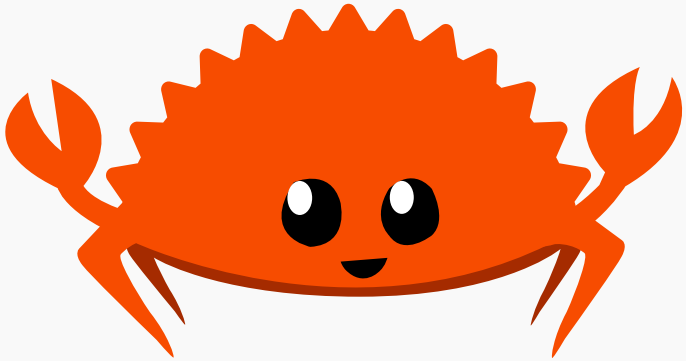
More math with types ?!



Multiplication

```
bool{2} * Direction{4} = {8}
```

More math with types ?!



Multiplication

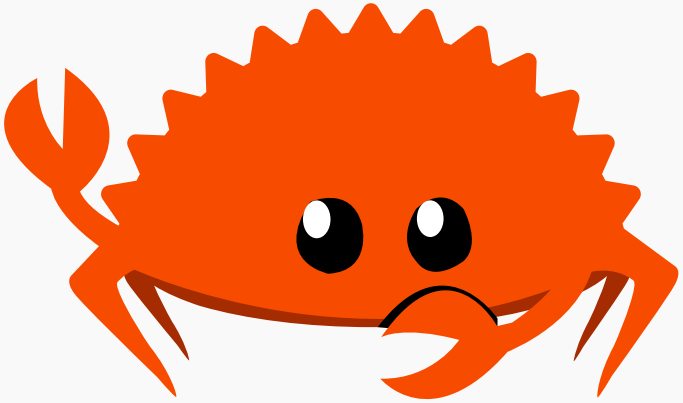
`bool{2} * Direction{4} = {8}`

```
1  struct Robot {
2    lastDir: Direction,
3    enabled: bool
4  }
```

What the **** is $\text{bool}^{\text{bool}}$?!

Exponentiation

```
bool{2} ^ bool{2} = {4}
```

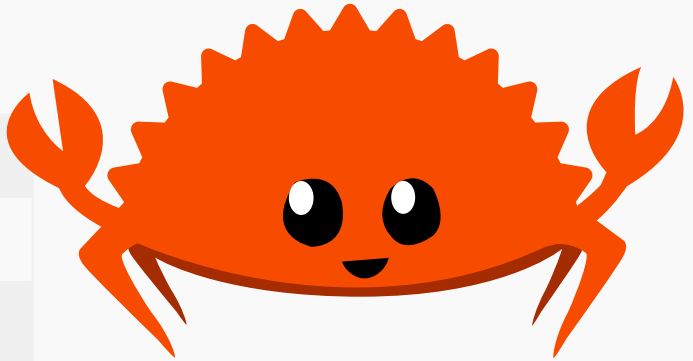


What the **** is $\text{bool}^{\text{bool}}$?!

Exponentiation

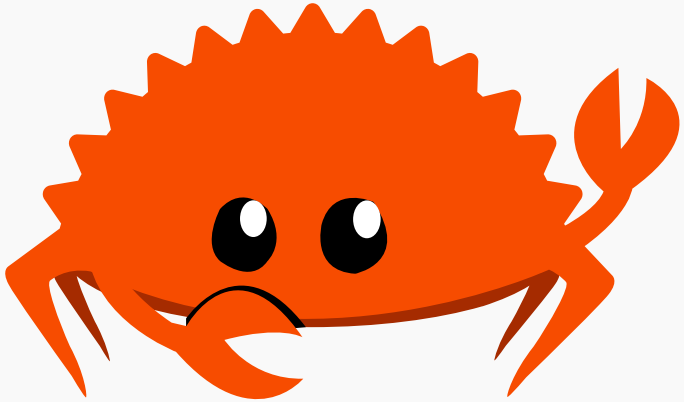
```
bool{2} ^ bool{2} = {4}
```

```
1  fn id   (v: bool) → bool { v     }
2  fn not  (v: bool) → bool { !v    }
3  fn true (_: bool) → bool { true  }
4  fn false(_: bool) → bool { false }
```



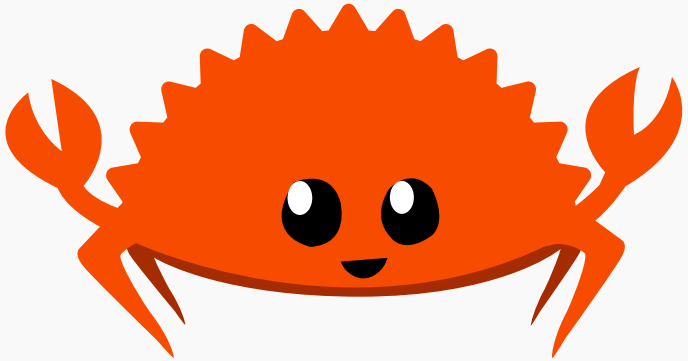
Error handling

I don’t like exceptions



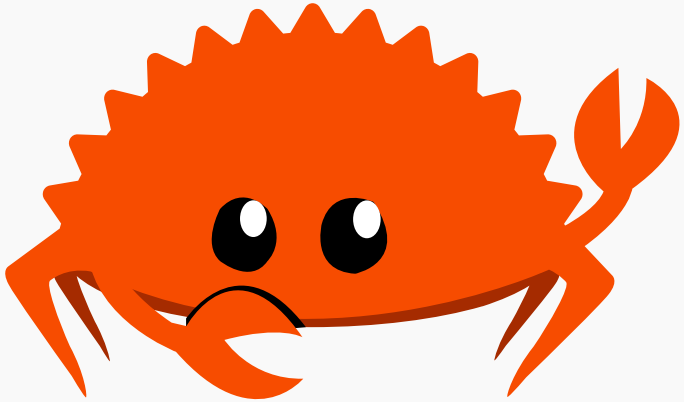
```
1  fn try_parse(input: String)
2     → Option<Phone>;
```

I don’t like exceptions



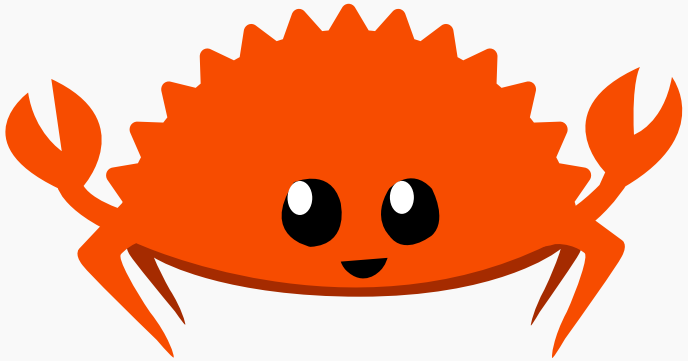
```
1  enum Option<T> {
2    Some(T),
3    None
4  }
```

Without exception



```
1  fn try_parse(input: String)
2     → Result<Phone, ParseError>;
```

Without exception

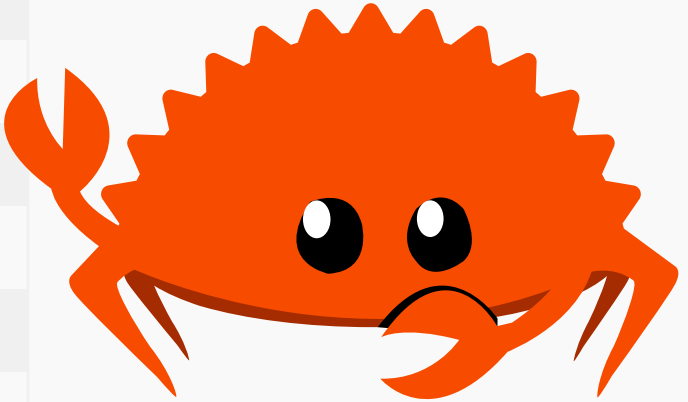


```
enum Result<T, E> {
  Ok(T),
  Err(E)
}
```

Pattern Matching

Not like tinder

```
1 match result {
2   Ok(phone) →
3     println!("tlf: {}", phone),
4   Err(cause) →
5     println!("error: {}", cause)
6 }
```



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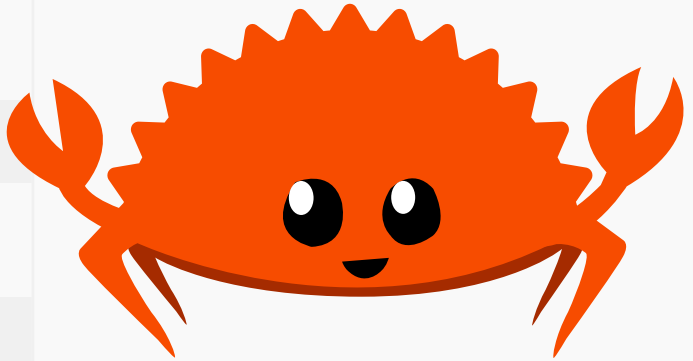
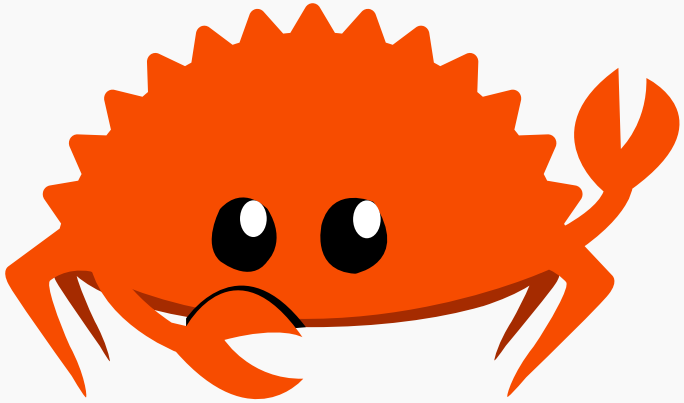
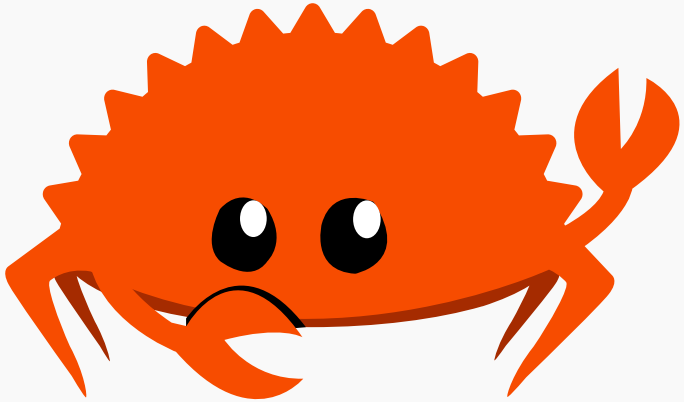


Why stop there?



```
let Ok(theme) = get_theme()
  else { return CannotGetTheme; };
```

Why stop there?



```
let Ok(theme) = get_theme()
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```
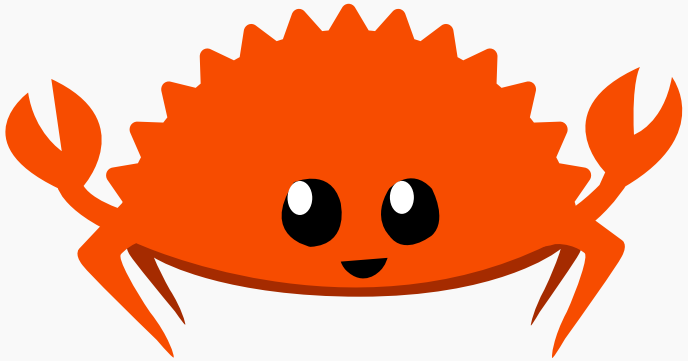

↓

```
let theme = get_theme()?;
```

Why stop there?

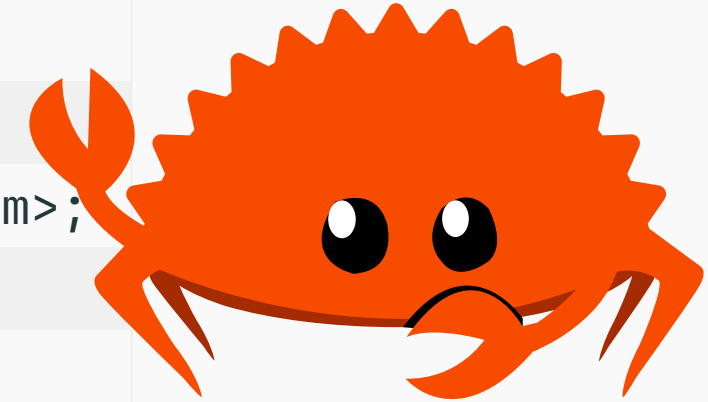


```
while let Some(e) = iter.next()
{
    ...
}
```

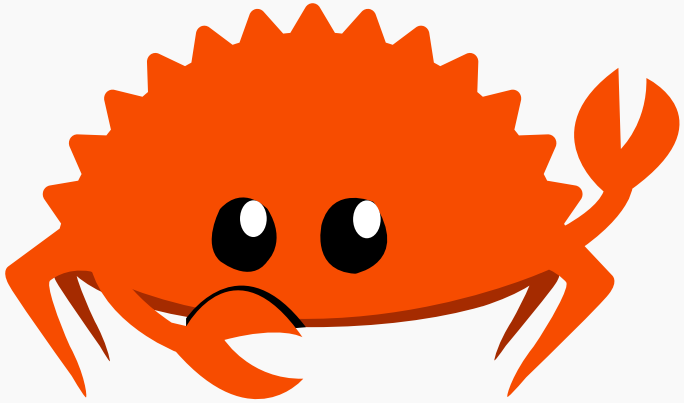
Traits

A good way to *interface* with other code

```
1  trait Iterator {
2    type Item;
3
4    fn next(&mut self) → Option<Self::Item>;
5    fn count(self) → usize
6      where Self: Sized { ... }
7  }
```

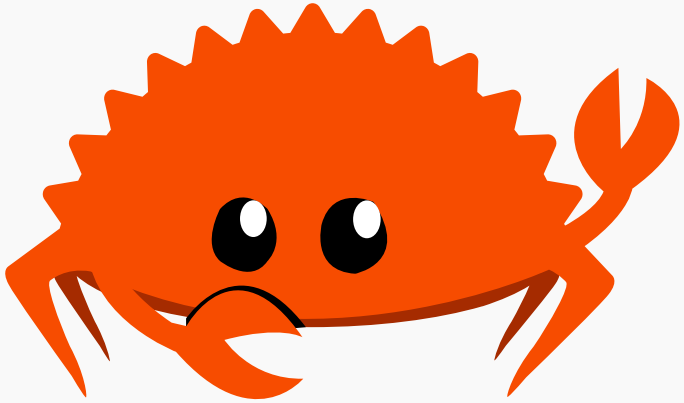


Usefulness is also a trait



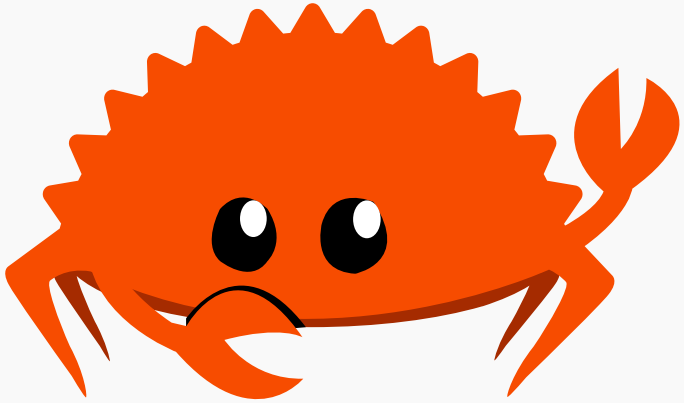
```
1  #[derive(Debug)]
2  struct Foo(i32, String)
```

Usefulness is also a trait



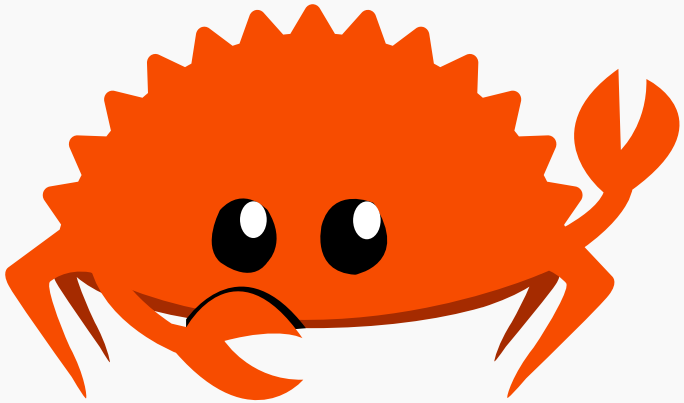
```
impl Default for Foo {
  fn default() → Self {
    Foo(3, "bar".into())
  }
}
```

Usefulness is also a trait



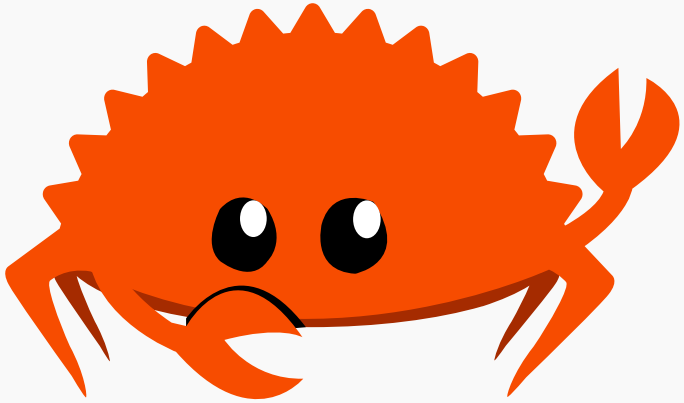
```
#[derive(Clone, Copy)]
struct Vec2D {
    x: f32,
    y: f32
}
```

Usefulness is also a trait



```
impl ops::Add<Self> for Vec2D {
  type Output = Self;

  fn add(
    self,
    other: Self
  ) -> Self::Output {
    ...
  }
}
```

Usefulness is also a trait

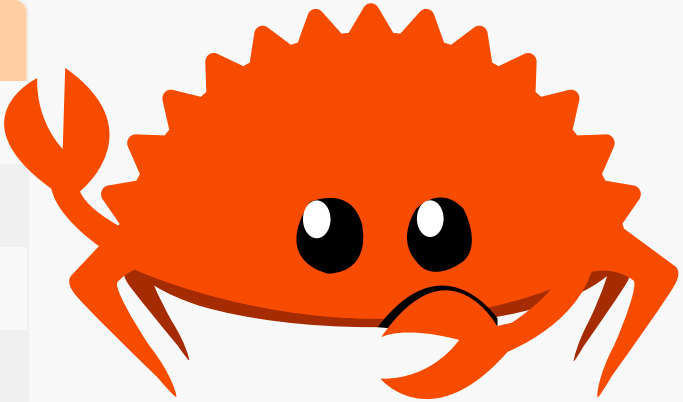


```
1  for i in 0..10 {
2    println!("Hello!");
3  }
```

Macros

Python in Rust !?!?

```
println!("Im a macro!");
let pos = vec![1,2,3];
assert!(true, "Me too");
panic!("BOOM!");
todo!("Too lazy to finish");
```



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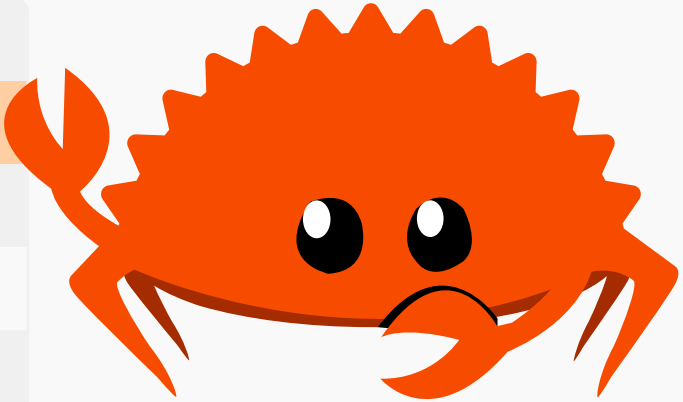

Python in Rust !?!?

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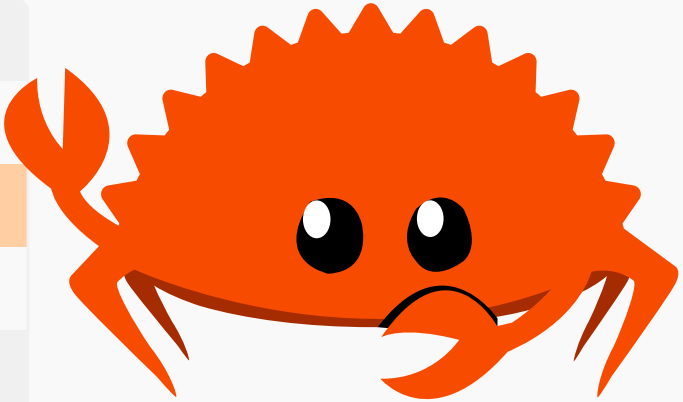

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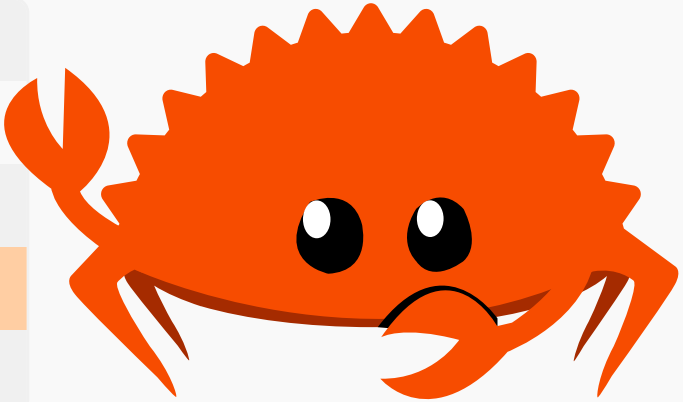

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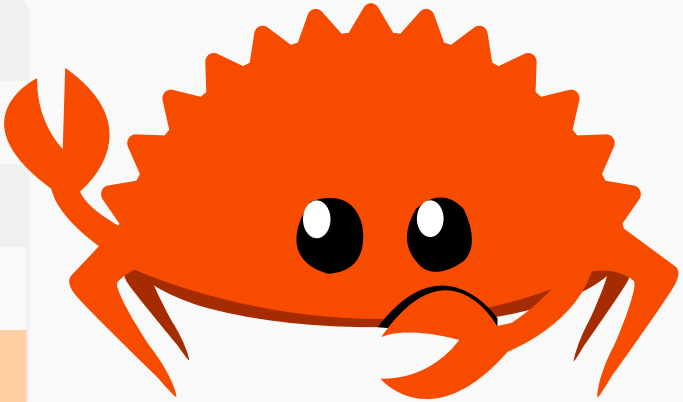
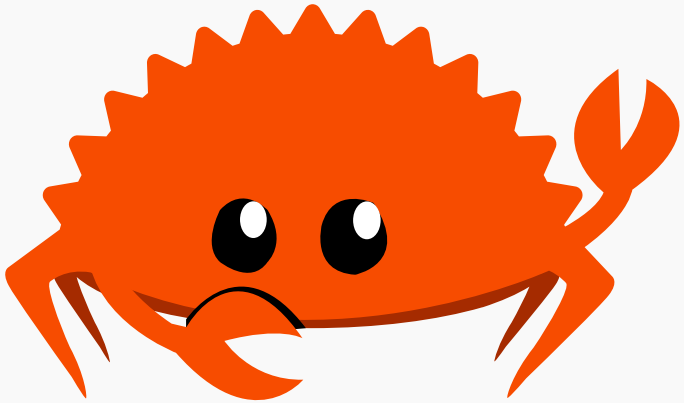


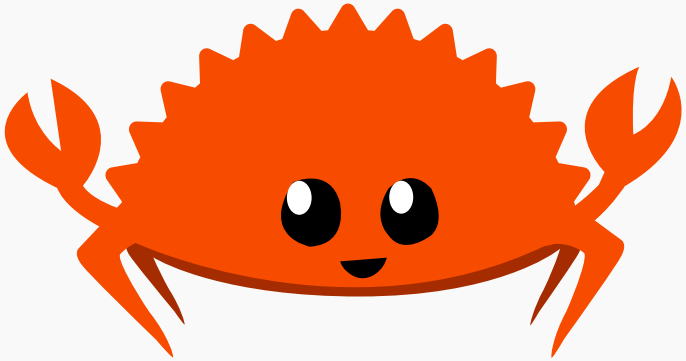
Write macros with macros!



```
1  macro_rules! debug_print {
2    ($expression: expr) ⇒ {
3      println!("{} = {:?}",
4        stringify!($expression),
5        $expression
6      );
7    }
8  }
```

```
1  debug_print!(3 + 3);
```

As easy as `#[derive(Debug)]`



```
#[derive(Debug, Default, Clone, Copy, PartialEq, Eq,
PartialOrd, Ord)]
struct Vec2D {
  x: f32,
  y: f32
}
```

Ecosystem

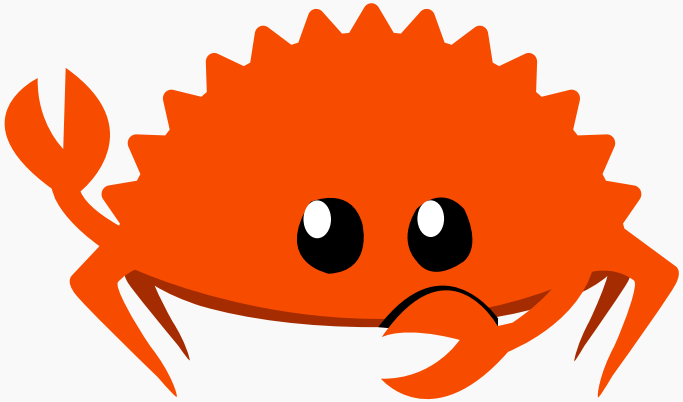
One tool to rule them all

```
cargo new

cargo run

cargo build

cargo add
```



One tool to rule them all

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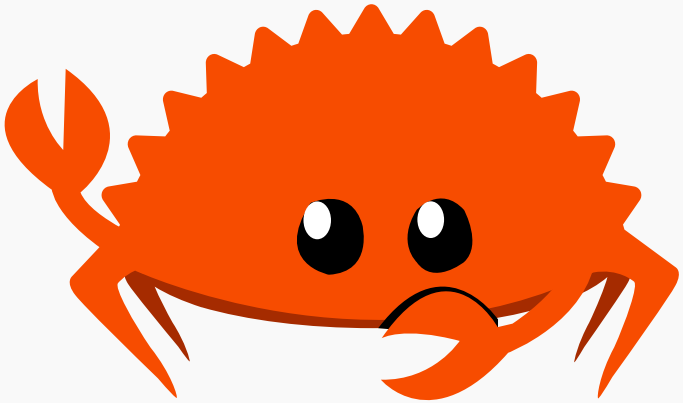
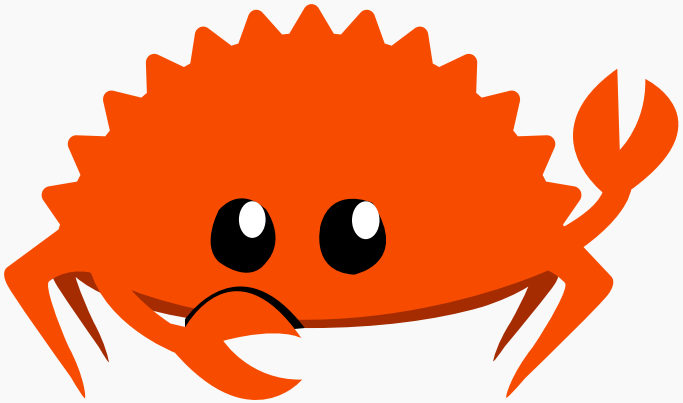
https://crates.io



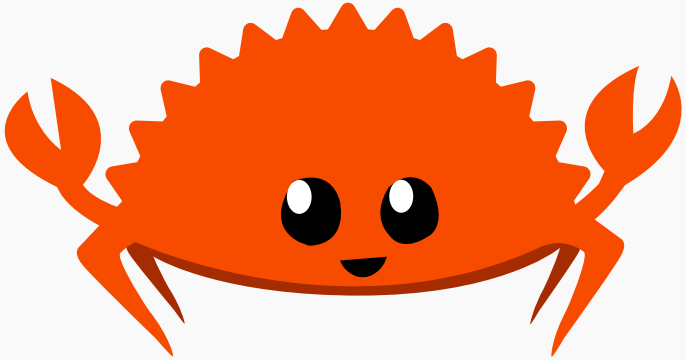
You don’t need docs if you can read code



```
1  /// This is a comment
2  /// that generates docs
3  struct Foo;
```

https://doc.rust-lang.org/std/primitive.array.html

Plant a tree, have a son, write a book



https://github.com/rust-unofficial/awesome-rust