

# Introduction to Julia Language

TAMIDS Workshop

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# What is Julia?

- ① *Julia* is a generic high-performance programming language<sup>1</sup>
  - **Just-In-Time (JIT)** compilation
  - **Multiple dispatch** creates type-stability
- ② Via multiple dispatch, different programming patterns can be adapted to the application.
- ③ Julia supports high-level syntax that is approachable.



# A quick look at multiple dispatch

## A Generic function

```
julia> function multiply(a,b)
           return a*b
       end
multiply (generic function with 1 method)
```

# A quick look at multiple dispatch

- Type inference in Julia solves the optimized data type<sup>2</sup>.

## Integer Input

```
julia> @code_llvm multiply(1, 1)
; @ REPL[1]:1 within `multiply`
define i64 @julia_multiply_660(i64 signext %0, i64 signext %1) #0 {
top:
; @ REPL[1]:2 within `multiply`
; @ int.jl:88 within `*`
    %2 = mul i64 %1, %0
;
    ret i64 %2
```

- @code\_llvm shows the processed script in intermediate presentation (IR).

# A quick look at multiple dispatch

## Mixed Input

```
julia> @code_llvm multiply(2.0,2)
; @ REPL[1]:1 within `multiply`
define double @julia_multiply_208(double %0, i64 signext %1) #0 {
top:
; @ REPL[1]:2 within `multiply`
; @ promotion.jl:389 within `*`
; @ promotion.jl:359 within `promote`
; @ promotion.jl:336 within `_promote`
; @ number.jl:7 within `convert`
; @ float.jl:146 within `Float64`
    %2 = sitofp i64 %1 to double
# Skip
    ret double %3
}
```

# Significant features

- ① Julia Base and standard library are written in Julia itself.

# Significant features

- ① Julia Base and standard library are written in Julia itself.
- ② Multiple dispatch allows many combinations of argument types
  - Approaching the speed of statically-compiled language like C/Fortran





1. Bezanson, J., Edelman, A., Karpinski, S., and Shah, V.B. (2017). Julia: A fresh approach to numerical computing. *SIAM review* 59, 65–98.
2. Nash, J. (2016). Inference Convergence Algorithm in Julia - Julia Computing.