

Latexify.jl

and how Julia's metaprogramming makes it useful

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```
Julia> using Latexify
Julia> ex = :(x^n/(k^n + x^n))
Julia> latexify(ex)
```

$$\frac{x^n}{k^n + x^n}$$



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Some supported inputs

Floats

```
latexify( 1.2 )  
1.2
```

Rationals

```
latexify( 3//4 )  

$$\frac{3}{4}$$

```

Symbols

```
latexify( :X_active )  

$$X_{active}$$

```

...

Some supported inputs

Expressions (key functionality)

```
latexify( :(a/(b+c)) )
```

$$\frac{a}{b+c}$$

Some supported inputs

Container types (Arrays, Dicts, etc.)

```
M = [:(c_1*e^(-c_2*t)) 3//4  
      "x/(k+x)"          :X_inactive]  
latexify(M)
```

$$\begin{bmatrix} c_1 \cdot e^{-c_2 \cdot t} & \frac{3}{4} \\ \frac{x}{k+x} & X_{inactive} \end{bmatrix}$$

```
D = Dict{:a=>1.0, :b=>"a^c", :c=>3//4}  
latexify( D )
```

$$\begin{bmatrix} a & 1.0 \\ b & a^c \\ c & \frac{3}{4} \end{bmatrix}$$

Some supported outputs

```
D = Dict{ :a=>1.0, :b=>"a^c", :c=>3//4 }  
latexify( D )
```

$$\begin{bmatrix} a & 1.0 \\ b & a^c \\ c & \frac{3}{4} \end{bmatrix}$$

```
latexify( D; env=:align )
```

$$a = 1.0$$

$$b = a^c$$

$$c = \frac{3}{4}$$

```
latexify( D; env=:tabular )
```

$$a \quad 1.0$$

$$b \quad a^c$$

$$c \quad \frac{3}{4}$$

```
latexify( D; env=:mdtable )
```

\$a\$	\$1.0\$
-------	---------

---:	-----:
------	--------

\$b\$	\$a^{c}\$
-------	-----------

\$c\$	\$\frac{3}{4}\$
-------	-----------------

Print vs. Display (default)

- Outputs a LaTeXString.

```
typeof( latexify("x/y") )
```

```
LaTeXStrings.LaTeXString
```

- Print:

```
Julia> print( latexify("x/y") )
```

```
$\frac{x}{y}$
```

- Display (when supported):

```
Julia> display( latexify("x/y") )
```

$$\frac{x}{y}$$

Julia makes this useful

- Homoiconicity (Expressions)
 - Convertible to \LaTeX
 - Information availability:

```
Julia> f(x) = x/2
Julia> @code_lowered f(1.)
CodeInfo(: (begin
    nothing
    return x / 2
end))
```

- Expressions \rightarrow Macros \rightarrow Domain-specific languages (DSLs)

DiffEqBiological.jl

```
reactions = @reaction_network ReactionDemo begin
    r_1, A + B --> C
    r_2, C --> A
end r_1 r_2
```


DiffEqBiological.jl

```
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```

- Information is available:

```
Julia> reactions.f_func
3-element Array{Expr,1}:
 :(-1 * r_1 * A * B + r_2 * C)
 :(+(-1 * r_1 * A * B))
 :(r_1 * A * B + -1 * r_2 * C)
```

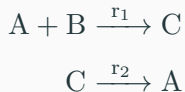
DiffEqBiological.jl

```
reactions = @reaction_network ReactionDemo begin
    r_1, A + B --> C
    r_2, C --> A
end r_1 r_2
```

```
latexify(reactions)
```

```
latexify(reactions; env=:arrow)
```

$$\begin{aligned}\frac{dA}{dt} &= -r_1 \cdot A \cdot B + r_2 \cdot C \\ \frac{dB}{dt} &= -r_1 \cdot A \cdot B \\ \frac{dC}{dt} &= r_1 \cdot A \cdot B - r_2 \cdot C\end{aligned}$$



ParameterizedFunctions.jl

```
ode = @ode_def PositiveFeedback begin
    dx = v_x * y^n_x / (k_x^n_x + y^n_x) - d_x * x
    dy = v_y * x^n_y / (k_y^n_y + x^n_y) - d_y * y
end v_x k_x n_x d_x v_y k_y n_y d_y
```

```
latexify(ode)
```

$$\frac{dx}{dt} = \frac{v_x \cdot y^{n_x}}{k_x^{n_x} + y^{n_x}} - d_x \cdot x$$
$$\frac{dy}{dt} = \frac{v_y \cdot x^{n_y}}{k_y^{n_y} + x^{n_y}} - d_y \cdot y$$

ParameterizedFunctions.jl

```
ode = @ode_def PositiveFeedback begin
    dx = v_x * y^n_x / (k_x^n_x + y^n_x) - d_x * x
    dy = v_y * x^n_y / (k_y^n_y + x^n_y) - d_y * y
end v_x k_x n_x d_x v_y k_y n_y d_y
```

```
latexify(ode.symjac)
```

$$\begin{bmatrix} -d_x & \frac{y^{-1+n_x} \cdot v_x \cdot n_x}{k_x^{n_x} + y^{n_x}} - \frac{y^{-1+2 \cdot n_x} \cdot v_x \cdot n_x}{(k_x^{n_x} + y^{n_x})^2} \\ \frac{x^{-1+n_y} \cdot v_y \cdot n_y}{k_y^{n_y} + x^{n_y}} - \frac{x^{-1+2 \cdot n_y} \cdot v_y \cdot n_y}{(k_y^{n_y} + x^{n_y})^2} & -d_y \end{bmatrix}$$

- Information access in Julia
 - Look for it,
 - Use it (and do cool stuff),
 - Pass it forward in your own packages.

Acknowledgements

PhD supervisor:

Prof. Henrik Jönsson

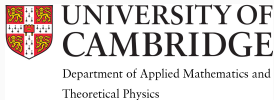
Fellow Julia enthusiast:

Torkel Loman

Reasons why I started with Julia:

Chris Rackauckas

David P. Sanders



Thank you!