

# EvoLP.jl

A playground for evolutionary computation in Julia

Xavier F. C. Sánchez Díaz

# Outline

- A brief overview of Evolutionary Computation
- The problem
- The framework
- An example
- In the works
- FAQ and trivia

# Evolutionary Computation

It is a branch of Computational Intelligence (the older term for AI [the true AI, not dumb statistical function approximators])<sup>1</sup> that solves optimisation problems using evolution-inspired algorithms.

<sup>1</sup>: browse TDT4136 syllabus if you think otherwise

# Evolutionary Computation

It is a branch of Computational Intelligence (the older term for AI [the true AI, not dumb statistical function approximators])<sup>1</sup> that solves optimisation problems using evolution-inspired algorithms.

Shameless plug to my Oct. 2021 presentation: <https://saxarona.github.io/project/evo-intro/>

<sup>1</sup>: browse TDT4136 syllabus if you think otherwise

# Evolutionary Computation

It is a branch of Computational Intelligence (the older term for AI [the true AI, not dumb statistical function approximators])<sup>1</sup> that solves optimisation problems using evolution-inspired algorithms.

Shameless plug to my Oct. 2021 presentation: <https://saxarona.github.io/project/evo-intro/>

***"I want a tool for prototyping evolutionary solvers such that I can swap a thing or two and see how it affects the run"***

<sup>1</sup>: browse TDT4136 syllabus if you think otherwise

# The problem

1. DEAP was old and very bad
  - a. They sort the population to get top  $k$  when  $k \ll$  population
  - b. It was for Python 2
2. Python is slow
  - a. Vectorising (numpy/scipy) EC feels *unnatural*
  - b. Conda is a mess
3. C++ is great but
  - a. I did not want to deal with memory addresses (again)
  - b. I hate objects. Functions are way cooler

Therefore, Julia.

# There was *Evolutionary.jl*

- Inconsistent
- Very odd software patterns (a type for an iteration of an algorithm???)
- Documentation was lackluster
- Focused too much on solvers

# EvoLP – The taxonomy

A computational unit for each *step* in the evolution process:

- Initialisation
- Selection
- Crossover
- Mutation
- Survival

# EvoLP – The taxonomy

A computational unit for each *step* in the evolution process:

- Initialisation (generic)
- Selection (generic)
- Crossover (generic)
- Mutation (generic)
- Survival (algorithm dependent)

# EvoLP – The taxonomy

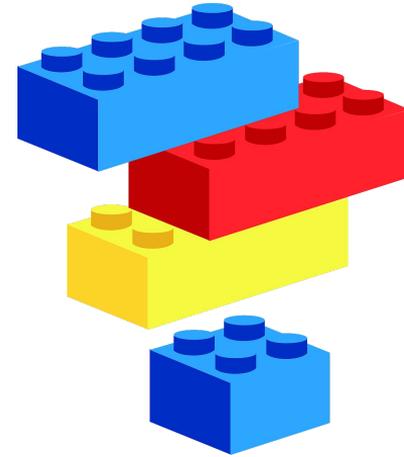
A computational unit for each *step* in the evolution process:

- Population Generators
- Selectors
- Recombinators
- Mutators

# EvoLP – The taxonomy

A **block** for each *step* in the evolution process:

- Population Generators
- Selectors
- Recombinators
- Mutators



# EvoLP – The taxonomy

A **block** for each *step* in the evolution process:

- Population Generators
- Selectors
- Recombinators
- Mutators
- Test functions
- Result reporting
- Statistics computing
- Built-in solvers

# EvoLP – The taxonomy

A **block** for each *step* in the evolution process:

- Population Generators
- Selectors
- Recombinators
- Mutators
- Test functions
- Result reporting
- Statistics computing
- Built-in solvers

# EvoLP – An example

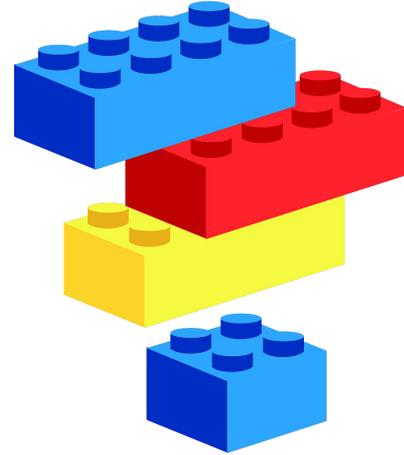
See [here](#) or [here](#).

# EvoLP – In the works

- More examples
- Multi-objective support
- More test functions
- Type for solution encoding
- Parallelisation
  - Planning an MPI approach to simulate Islands on IDUN

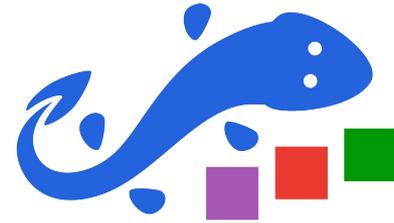
# EvoLP – FAQ and trivia

- LP stands for *LekePlass*!

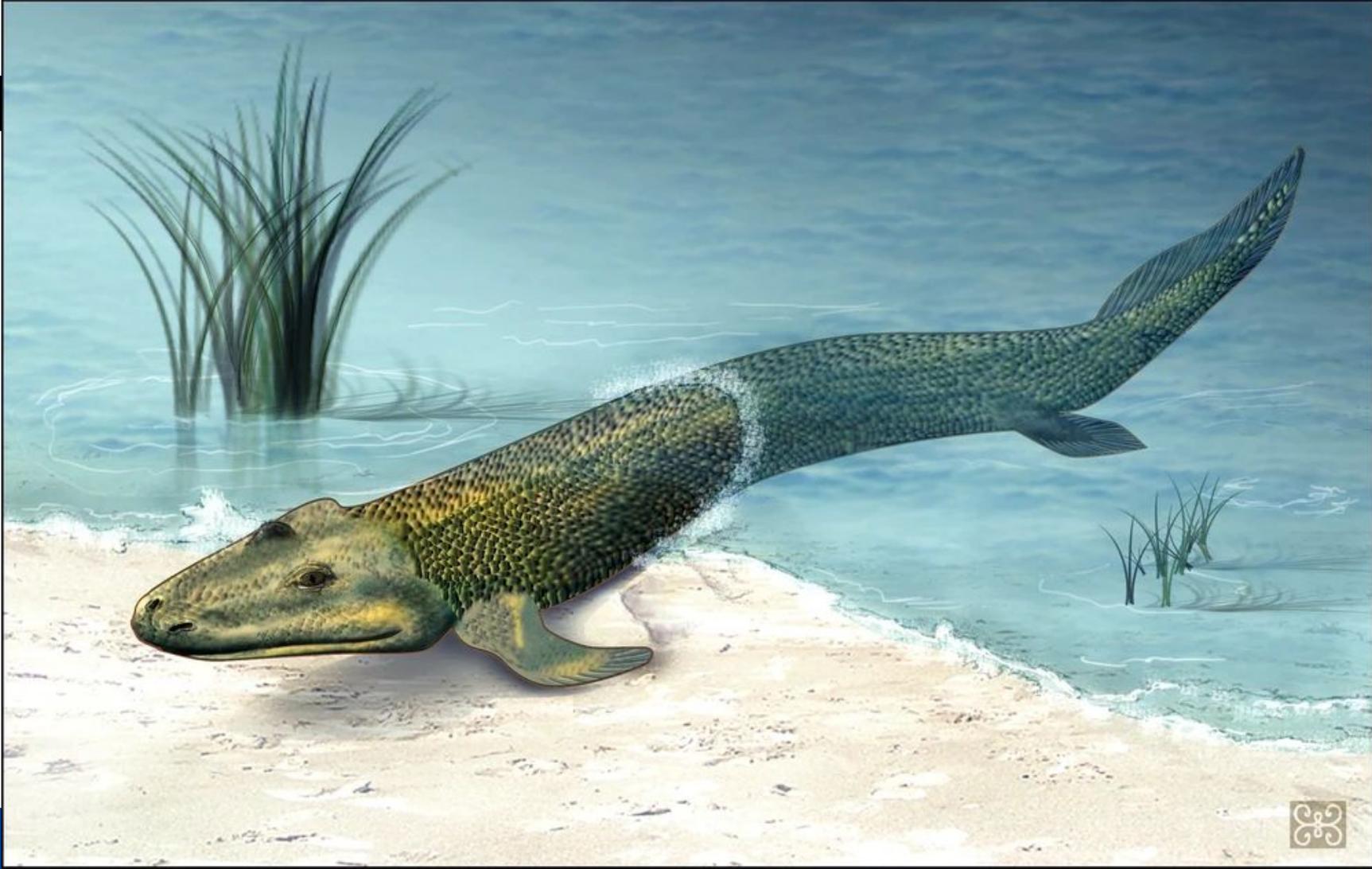


# EvoLP – FAQ and trivia

- LP stands for *LekePlass*!
- The logo features a tiktaalik



# EvoLP.jl



# Evo

- LP
- Th



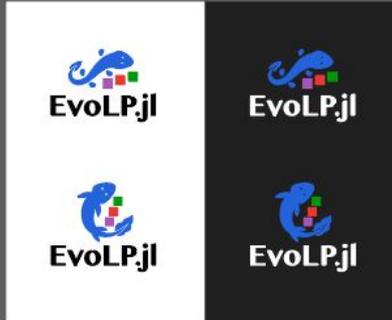
EvoLP



julia



EvoLP.jl



EvoLP.jl  
EvoLP.jl

1. Ev LP.jl Ev LP.jl
2. Ev LP.jl Ev LP.jl
3. EoLP.jl EoLP.jl
4. EvoLP.jl EvoLP.jl



# EvoLP – FAQ and trivia

- LP stands for *LekePlass!*
- The logo features a tiktaalik
- Registration as a Julia package started in Apr 6, 2023

# EvoLP – FAQ and trivia

- LP stands for *LekePlass!*
- The logo features a tiktaalik
- Registration as a Julia package started in Apr 6, 2023
- The paper describing the first tiktaalik fossil found was published exactly 17 years before

# EvoLP – FAQ and trivia

JuliaRegistries / General Public

Watch 11

Fork 370

Star 514

Code Issues 7 Pull requests 114 Actions Security Insights

## New package: EvoLP v0.9.5 #81169

Code

Merged JuliaTagBot merged 1 commit into master from `registrator-evolp-71f1f4bb-v0.9.5-562184013e` 3 weeks ago

Conversation 1

Commits 1

Checks 12

Files changed 5

+24 -0



JuliaRegistrator commented 3 weeks ago • edited

Contributor

- Registering package: EvoLP Apr 6, 2023, 9:32 PM GMT+2
- Repository: <https://github.com/ntnu-ai-lab/EvoLP.jl>
- Created by: @saxarona
- Version: v0.9.5
- Commit: 12e4e2a9712fcd4a37d2c3c64cd3bd3dba1cda11
- Reviewed by: @saxarona
- Reference: [ntnu-ai-lab/EvoLP.jl@12e4e2a](#) #[commitcomment-107873571](#)
- Description: A playground for evolutionary computation in Julia



JuliaRegistrator added the `new package` label 3 weeks ago

Reviewers

No reviews

Assignees

No one assigned

Labels

`new package`

Projects

None yet

Milestone



Published: 06 April 2006



# A Devonian tetrapod-like fish and the evolution of the tetrapod body plan

Edward B. Daeschler Neil H. Shubin &amp; Farish A. Jenkins Jr

Nature 440, 757–763 (2006) | [Cite this article](#)38k Accesses | 300 Citations | 293 Altmetric | [Metrics](#)

## Abstract

The relationship of limbed vertebrates (tetrapods) to lobe-finned fish (sarcopterygians) is well established, but the origin of major tetrapod features has remained obscure for lack of fossils that document the sequence of evolutionary changes. Here we report the discovery of a well-preserved species of fossil sarcopterygian fish from the Late Devonian of Arctic Canada that represents an intermediate between fish with fins and tetrapods with limbs, and provides unique insights into how and in what order important tetrapod characters arose. Although the body scales, fin rays, lower jaw and palate are comparable to those in more primitive sarcopterygians, the new species also has a shortened skull roof, a modified ear region, a mobile neck, a functional wrist joint, and other features that presage tetrapod conditions. The morphological features and geological setting of this new animal are suggestive of life in shallow-water, marginal and subaerial habitats.

## Main

The evolution of tetrapods from sarcopterygian fish is one of the major transformations in the history of life and involved numerous structural and functional innovations, including

You have full access to this article via **Norwegian University of Science & Technology**

Download PDF



## Editorial Summary

### When fins became limbs

The transition between fishes and limbed vertebrates, or tetrapods, occurred over 370 million years ago and required changes to virtually the entire body. Sensational fossil finds, and reinterpretations of old ones, have radically altered thinking on this topic in the past 20 years. But the transition itself – the moment that

[show all](#)

## Associated Content

### A firm step from water to land

Per Erik Ahlberg & Jennifer A. Clack  
Nature | **News & Views** | 05 Apr 2006

Sections

Figures

References

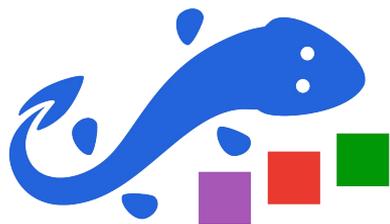
[Abstract](#)[Main](#)[Geological framework](#)[Systematic palaeontology](#)

# EvoLP – FAQ and trivia

- LP stands for *LekePlass!*
- The logo features a tiktaalik
- Registration as a Julia package started in Apr 6, 2023
- The paper describing the first tiktaalik fossil found was published exactly 17 years before
  - That was an absolute coincidence

# EvoLP – FAQ and trivia

- LP stands for *LekePlass!*
- The logo features a tiktaalik
- Registration as a Julia package started in Apr 6, 2023
- The paper describing the first tiktaalik fossil found was published exactly 17 years before
  - That was an absolute coincidence
  - I received the logos in Apr 8



# EvoLP.jl

## Thank you!



Project repo at <https://github.com/ntnu-ai-lab/EvoLP.jl>



Documentation at <https://ntnu-ai-lab.github.io/EvoLP.jl/stable>



```
julia> import Pkg  
julia> Pkg.add("EvoLP")
```

## Acknowledgements

- **Kristine** and **Benedikte** for their support
- **Kerstin** for the GitHub access
- **Ole Jakob** for input on solvers and methods

