

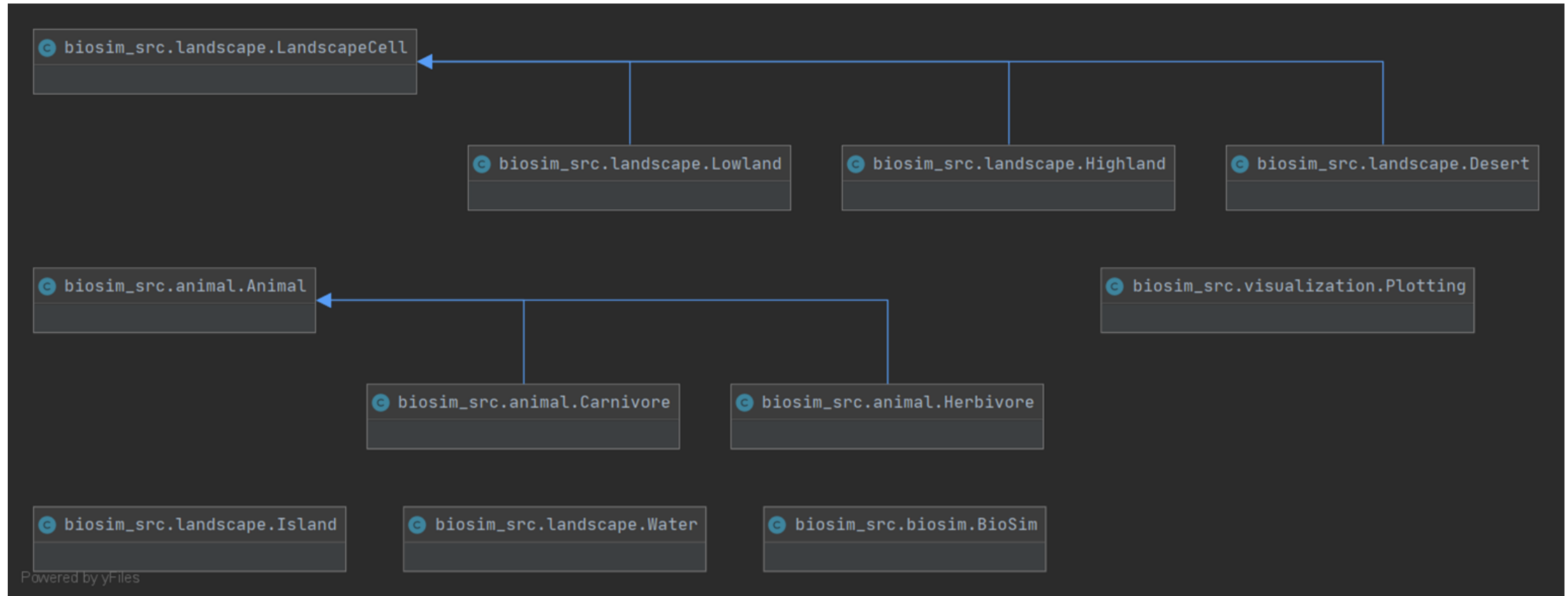
Norwegian University
of Life Sciences

Modelling the Ecosystem of Rossumøya

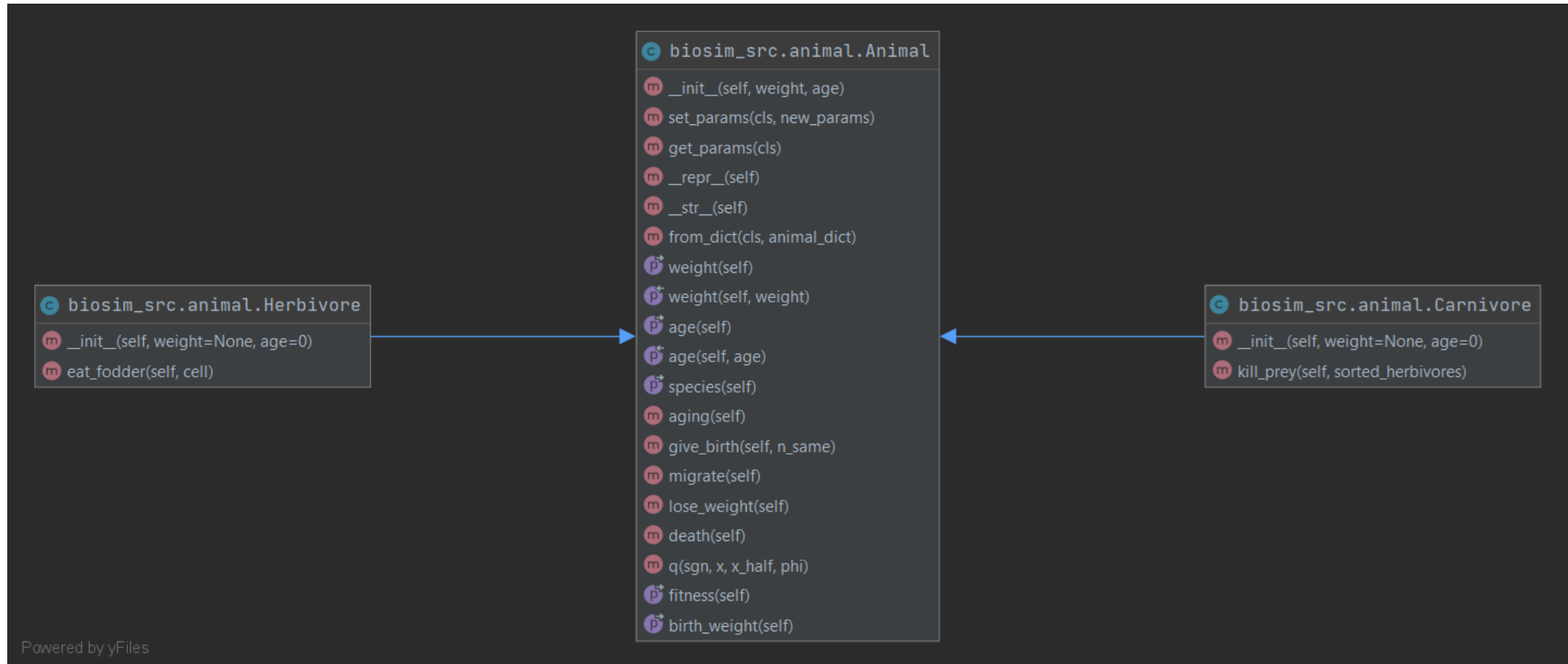
By Anders Mølmen Høst and Petter Kolstad Hetland

June 22, 2020

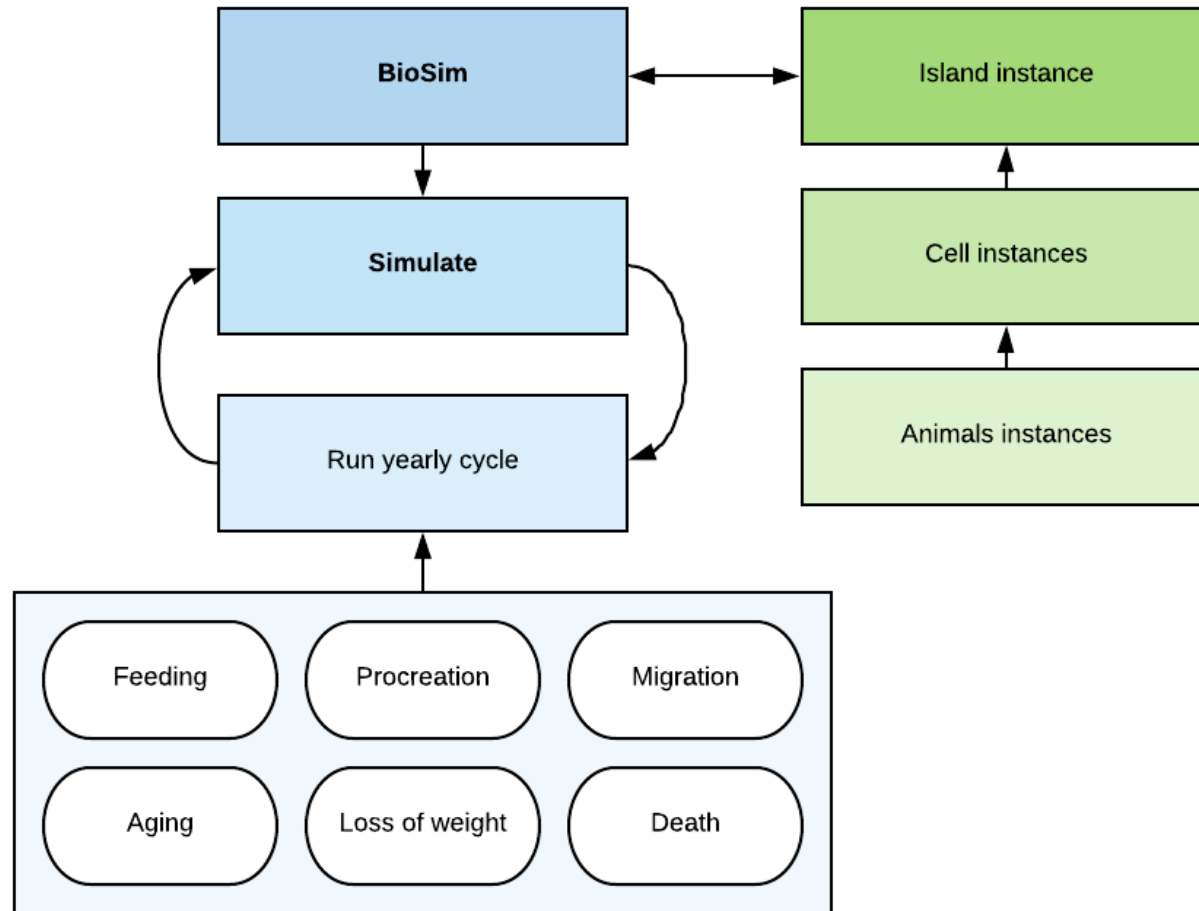
Overall structure



Animal








Structure - Simplified





Testing and documentation

- Testcoverage
- New features → Check test pass → Merge into master
- Statistical tests and mocking
- English variable names
- PEP 8

Element	Statistics, %
 <code>__init__.py</code>	100% lines covered
 <code>animal.py</code>	97% lines covered
 <code>biosim.py</code>	94% lines covered
 <code>landscape.py</code>	97% lines covered
 <code>visualization.py</code>	96% lines covered



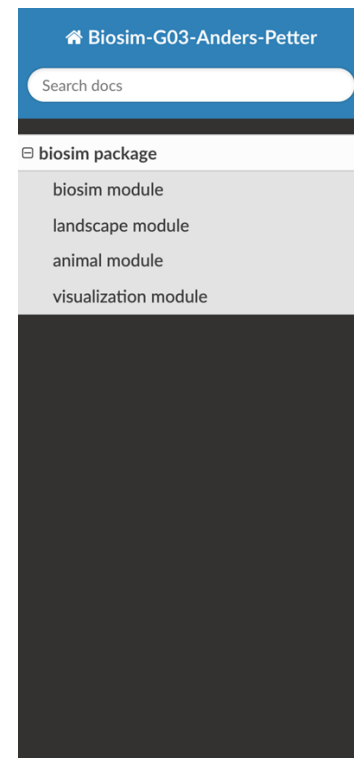
Use and performance

- Optimized Carnivore feeding
- Fitness function: 60% → 17% for feeding (non visual)
- Considerably faster w/o visualization (printed results)

Name	Call Count	Time (ms)		Own Time (ms) ▼	
fitness	66292073	28672	21.4%	22816	17.0%
kill_pre	1290242	23207	17.3%	20200	15.1%
<dictcomp>	1290242	27542	20.5%	13694	10.2%
<built-in method builtins.sorted>	1329939	18007	13.4%	12021	9.0%
<lambda>	53837242	5829	4.3%	5829	4.3%
feeding	39250	84591	63.1%	4734	3.5%
give_birth	3119906	9075	6.8%	4079	3.0%
q	13568238	4076	3.0%	4076	3.0%
weight	25012433	3646	2.7%	3646	2.7%
death	3351309	11682	8.7%	3286	2.4%
run_year_cycle	250	133634	99.6%	2980	2.2%
<method 'random' of '_random.Ra	28571857	2785	2.1%	2785	2.1%
lose_weight	3351309	4079	3.0%	2703	2.0%
eat_fodder	1520375	3596	2.7%	2294	1.7%
migrate	39250	12732	9.5%	2275	1.7%
migrate	3403133	6841	5.1%	2073	1.5%
procreation	39250	13358	10.0%	2066	1.5%

Ease of use

- Only interaction with BioSim needed (interface)
- Customized error messages
- Thorough documentation



add_population(population)

Add a population to specific *island* cells by providing a list of dictionaries.

Parameters

population – List of dictionaries specifying population

Example

```
example_pop = {
  'loc': (4,4),
  'pop': [
    {'species': 'Herbivore', 'age': 2, 'weight': 60},
    {'species': 'Herbivore', 'age': 9, 'weight': 30},
    {'species': 'Herbivore', 'age': 16, 'weight': 14}
  ]
}
```

feeding(cell)

Iterates through each animal in the cell and feeds it according to species.

Parameters

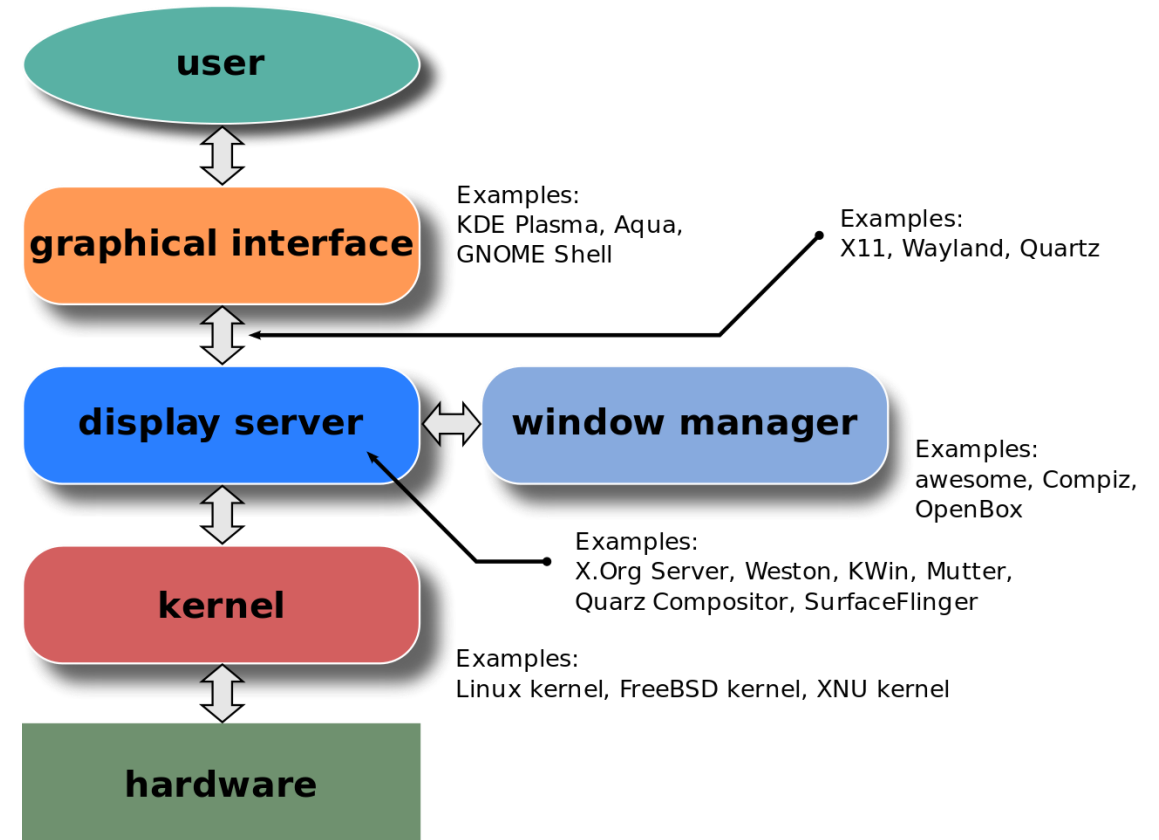
cell (object) – Current cell object where animals should be fed

Note

Herbivore instances will call *eat_fodder* method, while *Carnivore* instances will call *eat_pre* method.

Further development

- GUI
- More customized error messages
- Interface quickstart guide
- Improved scalability
- Fewer lines of code



Source: Wikimedia Commons

How we worked

- Make it work → Make it right → Make it fast
- Effectivized peer-programming (Agile approach)
- Use of KanBan board and branches

Challenges

- Locating minor bugs
- Slowing down to do things 'right'
- Testing



Source: Wikimedia Commons

