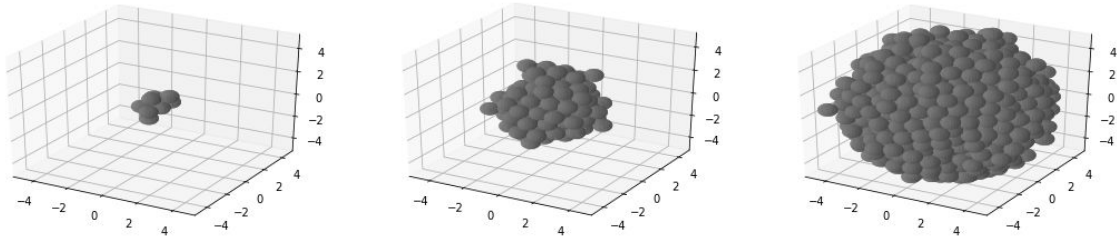


# Assessment of Julia vs. Python for a cell mechanics application



Julia [1] is a relatively new programming language quickly gaining popularity for use in Data Science and Scientific Computing. It promises to combine the ease of code development of a scripting language with the performance of a compiled language. It is a direct competitor to the Python programming language [2], the current go-to language for quick development of research codes in the above fields due to its very good scientific software stack, but lacking in brute performance.

Using our code CBMOS, a native Python implementation enabling the simulation of growing cell populations, we want to evaluate how Julia and its promise of increased performance over Python holds up in the reality of software development of a research code. To this end we propose a project to port CBMOS to Julia and to evaluate how much faster a Julia implementation really can be. If successful, this would enable us to simulate even larger cell populations.



Goals of the project:

1. Port the CBMOS code from Python to Julia
2. Evaluate the performance of the Julia implementation in comparison to the Python version, in terms of runtime, flexibility and ease of programming
3. Optionally: make the comparison fairer by increasing the performance of the Python implementation by using just-in-time (JIT) compilation libraries such as numba.

What you can gain from working on this project:

- Programming experience in Julia and Python (We expect interested students to be familiar with at least one of them)
- Hands-on experience in the usage of software development tools such as git and profiling tools
- Insight into the research area of Computational Biology, more specifically discrete cell-based modeling [3], see also the webpage of our research group [4]

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References:

- [1] <https://julialang.org/>, [2] <https://www.python.org/>,  
[3] [https://en.wikipedia.org/wiki/Cell-based\\_models](https://en.wikipedia.org/wiki/Cell-based_models), [4] <https://hellanderlab.research.it.uu.se>