Origins and losses of parasitism

an analysis of the phylogenetic tree of life with a parsimony-like algorithm

Introduction

Definitions

Taxonomic tree – Taxonomy is the classification, identification and naming of organisms. It si usually richly informed by phylogenetics, but remains a methodologically and logically distinct discipline. The Taxonomic levels are Kingdom, Phylum, Class, Order, Family, Genus, Species and maybe some superclasses between them.

coarser classification

In each level the nodes can have more than 2 children

Phylogenetic tree – Phylogenetics is the study of evolutionary history and the relationships among individuals or groups of organisms. The result ot these analysis is a phylogeny or phylogenetic tree. The phylogenetic tree is a hypothesis about the history of the evolutionary relationships of a group of organisms.

A perfect tree would be binary

no levels only time

Parasitism – Parasitism is an interaction relationship between two organisms living together in more or less intimate association in a relationship in which association is disadvantageous or destructive to one of the organisms.

ontology definition of the interaction 'is parasite of' from GloBI the database we use here.

exist very different types of parasites: endoparasites, broodparasitism, ...

40% of species are parasites, but the most of them are understudied.

Issue - Content Requirements

Further on from the master thesis of Marius Bäsler, the consideration of the origins and losses of parasitism in the taxonomic tree of life, I would like to continue with this analysis on the phylogenetic tree of life.

I would like to enhance and evaluate the **T**axonomic **M**ajority **C**ensoring Algorithm (TMC), developed by Marius Bäsler, to a parsimony-like algorithm.

Methodik

Wie im Zeitplan zu sehen, plane ich Implementierung, Evaluierung abzuwechseln und mit dem schreiben zu verknüpfen.

D.h. Implementierung des TMC, erste Evaluierung. -> schreiben

Weiterentwicklung des TMC mit parsimony für nicht binäre bäume, nächste Evaluierung -> schreiben

Evaluierung mithilfe von bekannten subtrees -> eigenen algorithmus anpassen, theoretische Betrachtungen etc -> schreiben

Endgültige Evaluierung, Ergebnisse, Plots erstellen etc -> schreiben

Gliederungsentwurf

... setup from a classic paper: Intro, Methods, results, Discussion, Conclusion

- Abstract, Summary, Preface
- Introduction
  - Definintionen (taxonomy, phylogeny, parasite, parsimony)
  - Motivation
    - Aim of the thesis / Presentation of the problem: not binary ancectral state reconstrunction in a phylogeny-like tree of all eukaryotes
  - Relatd methods or background (Related literature and theoretical focus)
    - Literatur zu ancestral state reconstruction, entwickelte algorithmen, parsimony, likelihood,... Marius thesis
    - algorithmen näher vorstellen: pasimony, TMC
    - Die datenbanken GLOBI und Open Tree of Life für echte Daten
- Methods
  - entwicklung zweier eigener algorithmen: parsimony mit Zahlen, binarisierung des baumes
  - Simulation
  - own scripts
  - (arango db als graphdatenbank)
  - implementierungen in javascript, phyton und AQL
- Results
  - Experiments (incl. Hypothesis, which will be tested)
- Discussion
- Conclusion
- References / Bibliography
- Appendices (Code, ...)

Timetable

1.10. Anmeldung, d.h. 31.3. Abgabe

Oktober: Woche

1. build random binary tree, tag tree
2. forget inner nodes, run parsimony
3. implement parsimony with numbers
4. prune binary tree -> not binary tree

November: Woche

5. run parsimony with numbers and TMC

6. - 8. Evaluation -> compare computed trees with the origin binary tree

Dezember: Evaluation of special subtrees of the real synthesis tree from Open Tree of Life (using biological knowlege)

Jannuar: theoretical analysis of the two parsimony like algorithms -> add changes, adjust the parameters

Februar: last Evaluation / Compairing the different algorithms

März: Proofreading, writing, complete the thesis

Literaturverzeichnis

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Anmerkungen

- Wir haben eine nette Sammlung von FU Masterarbeiten auf dem group drive (S -> MF1 -> group publications -> thesis).

  Da findest Du einige Inspiration