



University of Kentucky
UKnowledge

Computer Science Presentations

Computer Science

7-23-2010

Phylotree – a toolkit for computing experiments with distance-based methods for genome coevolution

Elissaveta Arnaoudova
University of Kentucky

Jerzy W. Jaromczyk
University of Kentucky, jurek@cs.uky.edu

Neil Moore
University of Kentucky

Christopher L. Schardl
University of Kentucky, chris.schardl@uky.edu

Ruriko Yoshida
University of Kentucky, ruriko.yoshida@uky.edu

Right click to open a feedback form in a new tab to let us know how this document benefits you.

Follow this and additional works at: https://uknowledge.uky.edu/cs_present

Repository Citation

Arnaoudova, Elissaveta; Jaromczyk, Jerzy W.; Moore, Neil; Schardl, Christopher L.; and Yoshida, Ruriko, "Phylotree – a toolkit for computing experiments with distance-based methods for genome coevolution" (2010). *Computer Science Presentations*. 3.
https://uknowledge.uky.edu/cs_present/3

This Presentation is brought to you for free and open access by the Computer Science at UKnowledge. It has been accepted for inclusion in Computer Science Presentations by an authorized administrator of UKnowledge. For more information, please contact UKnowledge@sv.uky.edu.

POSTER PRESENTATION

Open Access

PhyloTree – a toolkit for computing experiments with distance-based methods for genome coevolution

Elissaveta Arnaoudova¹, Jerzy W Jaromczyk^{1*}, Neil Moore¹, Christopher L Schardl², Ruriko Yoshida³

From UT-ORNL-KBRIN Bioinformatics Summit 2010
Cadiz, KY, USA. 19-21 March 2010

Background

We have developed software called *PhyloTree* as a toolkit for running experiments to study gene cophylogenies for genome evolution using distance-based methods. In particular, the toolkit has been instrumental in conducting processing-heavy experiments with the new “difference of means” statistical method. *PhyloTree* was used to run experiments using simulated data as well as biological sequences of well known host and parasite species, and is distributed with data and configuration files allowing these experiments to be reproduced.

Materials and methods

PhyloTree is organized as a collection of scripts. A single run takes as inputs two input alignments in Nexus format, and consists of a number of bootstrap iterations, comprising the following steps: 1) produce modified sequence alignments by bootstrapping the original alignments; 2) sample trees from the posterior distributions for each of the original and modified alignments using MCMC-based software (MrBayes or BEAST); 3) compute distances among the tree distributions, for example as an average of the pairwise distances between trees in the samples; and 4) check similarity criteria based on these distances. A full experiment consists of one or more runs with different parameters, tree distance methods, and input alignments.

Results and conclusion

PhyloTree supports a number of distance methods for phylogeny trees, including path-difference, matrix tree distance, Robinson-Foulds distance and tree space

geodesic distance. Additional distance methods may be used by supplying programs that take as input Newick-format tree files, and output distances in a simple text-based format. *PhyloTree* can be run in two different modes: interactive (the user is prompted for experiment-specific parameters: number of bootstrap iterations, link files to be used, configuration files for the MCMC software, etc.), and command-line (parameters are specified on the command line or in a configuration file). Whichever mode is used, a configuration file is generated that allows the experiment to be easily reproduced.

The *PhyloTree* package is open-source, and is distributed together with source code for the included third party software. It includes tools, documentation, and guidelines for easy installation and building of the executables on different platforms. The software is available from <http://csurs.csr.uky.edu/phyloTree/>.

Acknowledgements

This work is based upon research supported by the NIH Research Project Grant Program (R01) from the Joint DMS/BIO/NIGMS Math/Bio Program under Grant No. 1R01GM086888-01 and the NSF under Grant No. 0814194.

Author details

¹Department of Computer Science, University of Kentucky, Lexington, KY 40506, USA. ²Department of Plant Pathology, University of Kentucky, Lexington, KY 40546, USA. ³Department of Statistics, University of Kentucky, Lexington, KY 40506, USA.

Published: 23 July 2010

doi:10.1186/1471-2105-11-S4-P6

Cite this article as: Arnaoudova et al.: *PhyloTree* – a toolkit for computing experiments with distance-based methods for genome coevolution. *BMC Bioinformatics* 2010 **11**(Suppl 4):P6.

* Correspondence: jurek@cs.uky.edu

¹Department of Computer Science, University of Kentucky, Lexington, KY 40506, USA