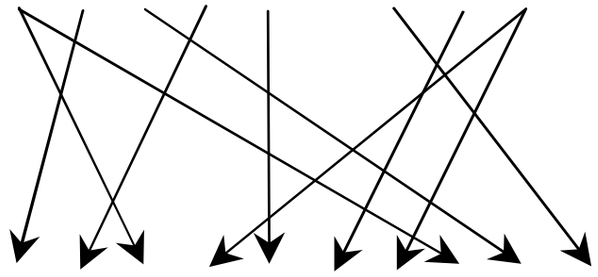
Topological Support (ML)

Bootstrapping

Original alignment

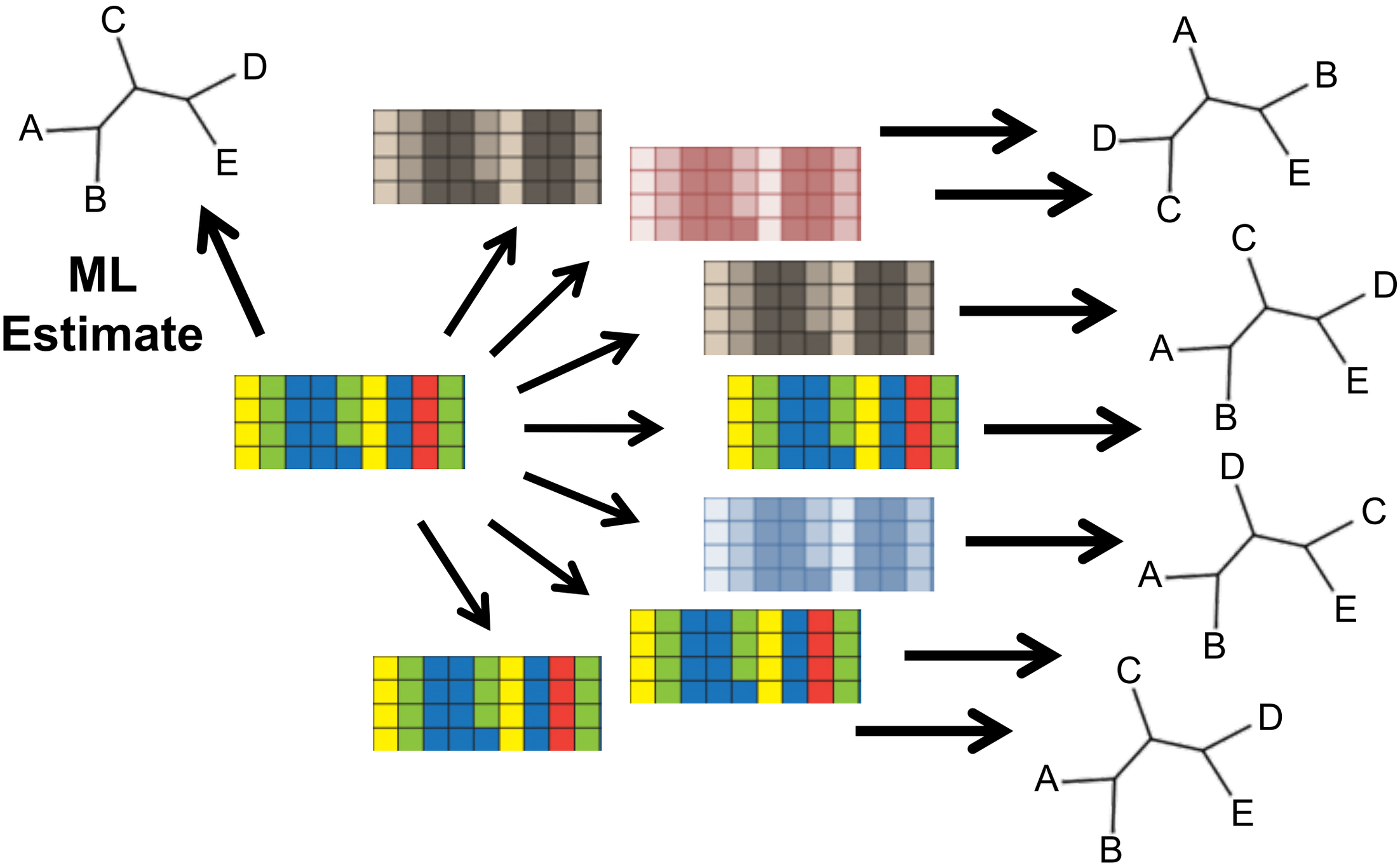
Site	1	2	3	4	5	6	7	8	9	10
human	N	E	N	L	F	A	S	F	I	A
chimpanzee	N	E	N	L	F	A	S	F	A	A
bonobo	N	E	N	L	F	A	S	F	A	A
gorilla	N	E	N	L	F	A	S	F	I	A
orangutan	N	E	D	L	F	T	P	F	T	T
Sumatran	N	E	S	L	F	T	P	F	I	T
gibbon	N	E	N	L	F	T	S	F	A	T



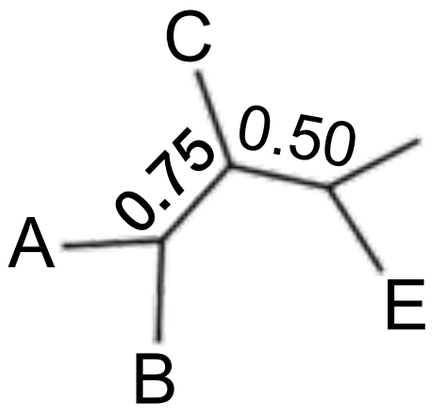
Bootstrap sample

Site	2	4	1	9	5	8	9	1	3	7
human	E	L	N	I	F	F	I	N	N	S
chimpanzee	E	L	N	A	F	F	A	N	N	S
bonobo	E	L	N	A	F	F	A	N	N	S
gorilla	E	L	N	I	F	F	I	N	N	S
orangutan	E	L	N	T	F	F	T	N	D	P
Sumatran	E	L	N	I	F	F	I	N	S	P
gibbon	E	L	N	A	F	F	A	N	N	S

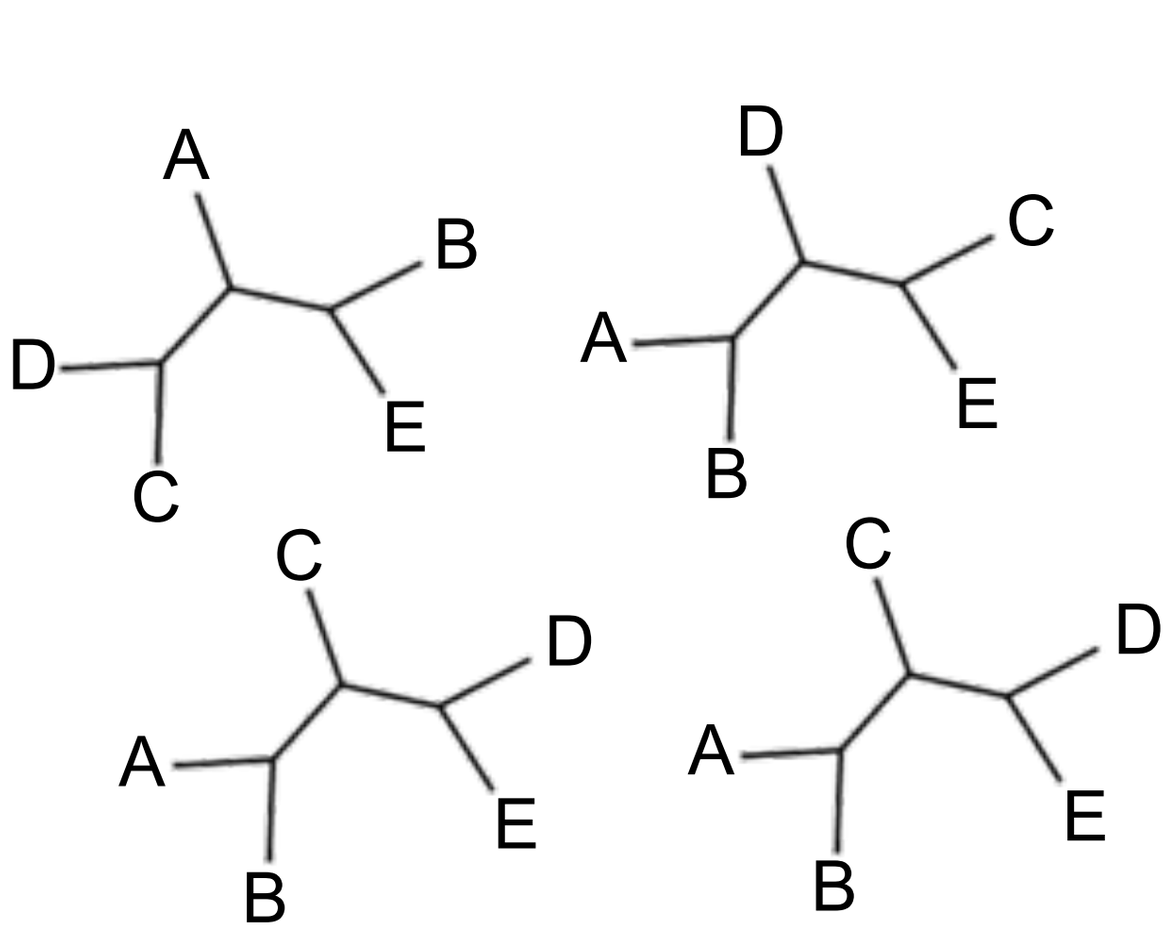
Bootstrapping



Bootstrapping



ML Estimate



Bootstrapping

Interpretations of the bootstrap:

-Repeatability

-1 – False Positive Rate from a polytomy

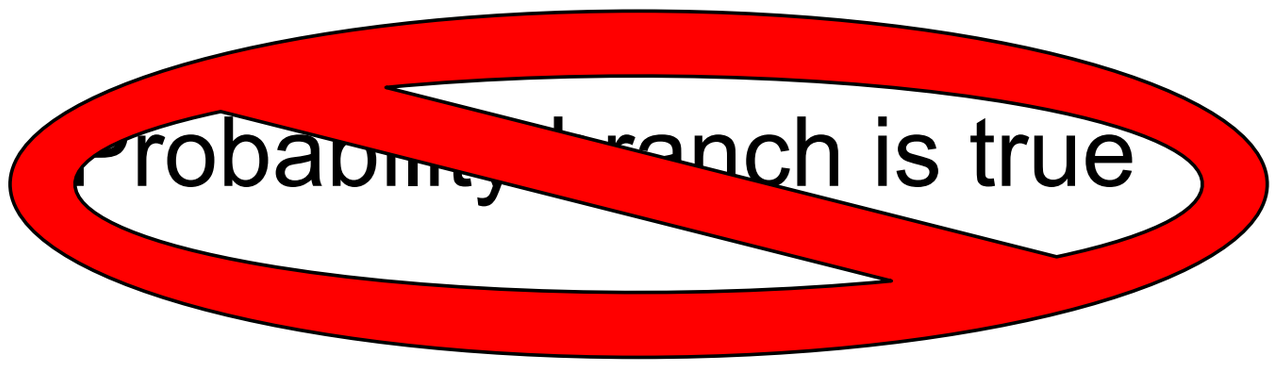
-Probability branch is true

Bootstrapping

Interpretations of the bootstrap:

-Repeatability

-1 – False Positive Rate from a polytomy



Bootstrapping

Cool bootstrapping simulation by Mark Holder.

http://phylo.bio.ku.edu/mephytis/boot-sample.html

Human	G	C	C	A	G	C	T	G	C	T
Chimp	G	C	C	G	G	G	T	A	T	T
Gorilla	G	T	C	A	A	C	T	A	T	G
Orang	C	T	C	A	A	G	T	G	C	G

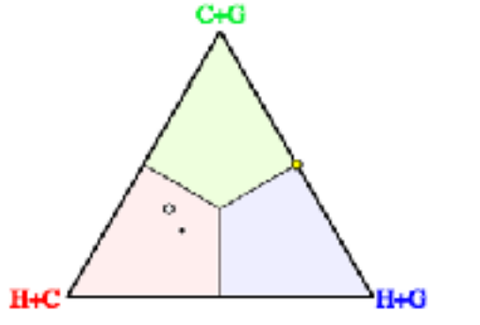
Acid 1 bootstrap rep

Human	G	T	C	G	T	C	C	C	C	C
Chimp	G	T	G	G	T	G	T	T	T	G
Gorilla	G	T	C	G	T	C	T	T	T	C
Orang	C	T	G	C	T	G	C	C	C	G

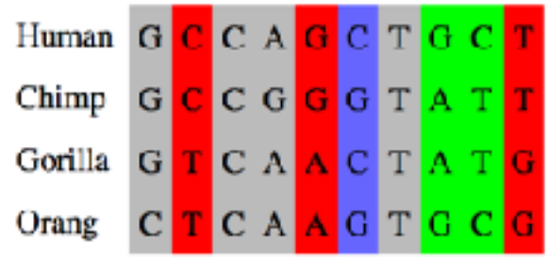
4 replicates:

H+C tree tied with C+G tree on this rep.

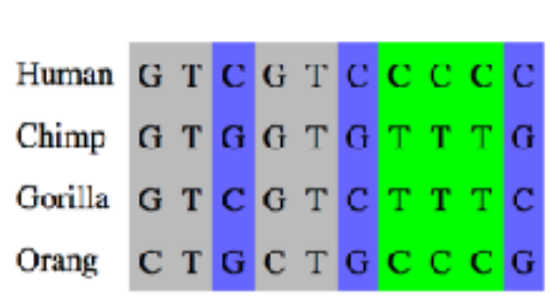
C+G 37.5% E+G 0.0% H+C 62.5%



Bootstrapping



Add 1 bootstrap rep

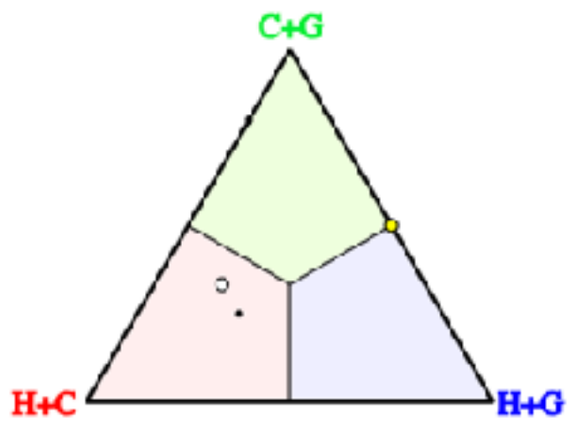


Run this 20 times and let's compare results.

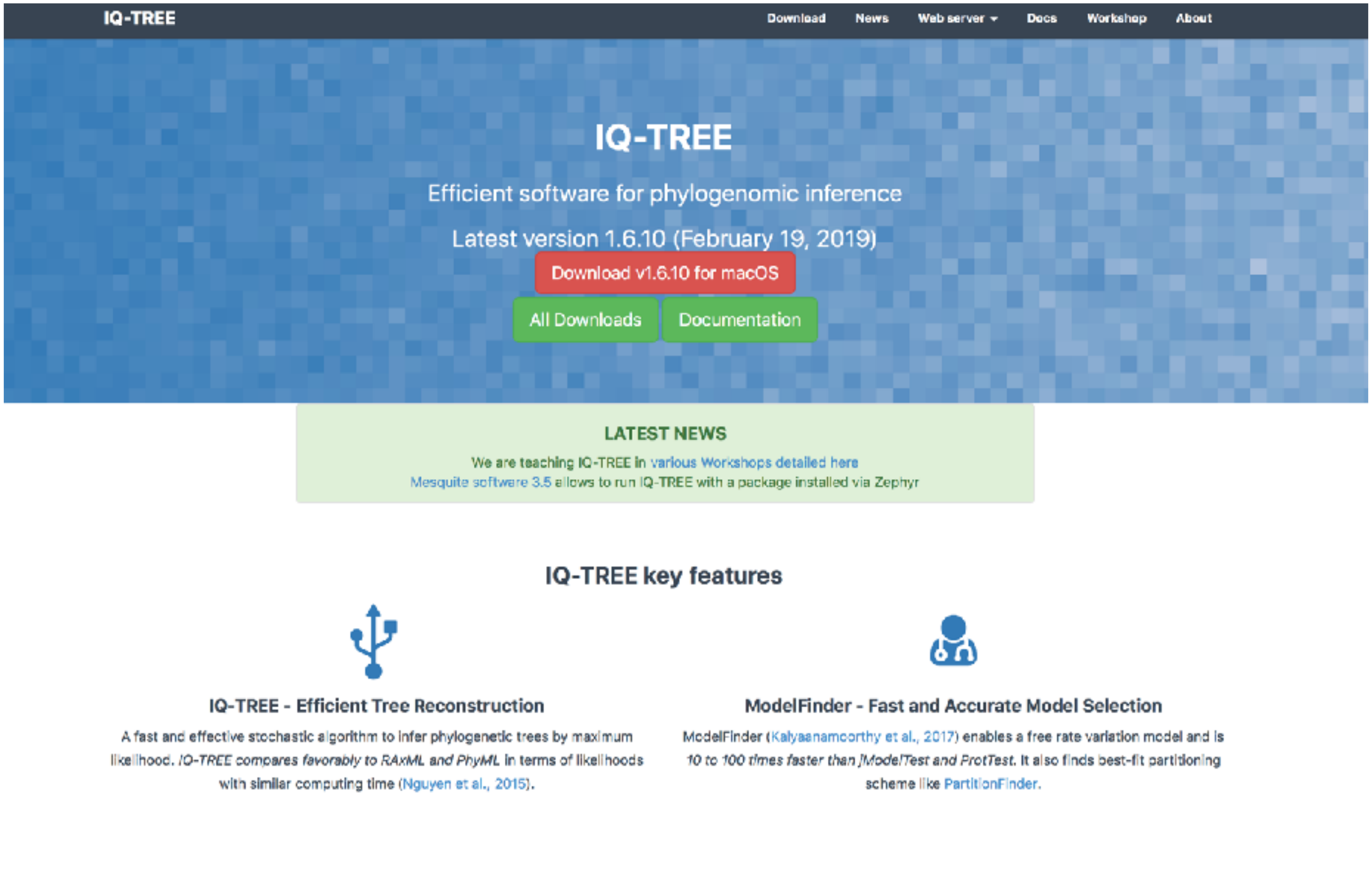
4 replicates:

H+C tree tied with C+G tree on this rep.

C+G 37.5% H+G 0.0% H+C 62.5%



IQTree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IQ-TREE
Efficient software for phylogenomic inference
Latest version 1.6.10 (February 19, 2019)
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We are teaching IQ-TREE in various Workshops detailed here
Mesquite software 3.5 allows to run IQ-TREE with a package installed via Zephyr
IQ-TREE key features
IQ-TREE - Efficient Tree Reconstruction
A fast and effective stochastic algorithm to infer phylogenetic trees by maximum likelihood. IQ-TREE compares favorably to RAxML and PhyML in terms of likelihoods with similar computing time (Nguyen et al., 2015).
ModelFinder - Fast and Accurate Model Selection
ModelFinder (Kalyaanamoorthy et al., 2017) enables a free rate variation model and is 10 to 100 times faster than jModelTest and ProtTest. It also finds best-fit partitioning scheme like PartitionFinder.