

Siavash Mirarab

CONTACT INFORMATION	Department of Electrical and Computer Engineering UC San Diego 9500 Gilman Drive, Mail code 0407 La Jolla, CA 92093-0407	phone: 858 822 6245 e-mail: smirarab@ucsd.edu http://eceweb.ucsd.edu/~smirarab/ google scholar: http://goo.gl/gEswQ5
ACADEMIC POSITIONS	UC San Diego , San Diego, CA, United States Department of Electrical and Computer Engineering <i>Assistant Professor</i>	July 2015 – present
EDUCATION	<i>Ph.D</i> University of Texas at Austin , Austin, Texas, Department of Computer Science <ul style="list-style-type: none">• Advisors: Prof. Tandy Warnow, Prof. Keshav Pingali• Novel scalable approaches for multiple sequence alignment and phylogenetic reconstruction <i>Master of Science</i> University of Waterloo , Waterloo, Ontario, Canada, Department of Electrical and Computer Engineering <ul style="list-style-type: none">• Advisors: Prof. Ladan Tahvildari• Thesis: A Bayesian Framework for Software Regression Testing University of Tehran , Tehran, Iran Department of Electrical and Computer Engineering <i>Bachelor of Science</i>	Jan. 2011 – July 2015 Sept. 2006 – Sept. 2008 Sept. 2001 – Dec. 2005
MAJOR AWARDS	NSF CAREER award Alfred P. Sloan Research Fellow. Honorable Mention for the 2015 ACM Doctoral Dissertation Award. Howard Hughes Medical Institute International Student Fellowship. National Science and Engineering Research Council of Canada (NSERC), Canada Graduate Scholarship (CGS-D) converted to PGS-D outside Canada.	2019 2017 2016 2012 - 2015 2011- 2012
OTHER AWARDS	UT, Austin, Computer Science, Bert Kay Dissertation Award, 2015 UT, Austin, College of Natural Sci., Dean’s Excellence Award, 2011 UT, Austin, Graduate Dean’s Prestigious Fellowship Award, 2011, 2012, 2013, 2014 University of Texas at Austin, MCD fellowship	
RESEARCH FUNDING	NSF: III-1845967: “CAREER: Robust & scalable genome-wide ...” \$549k (5 years) NSF-1815485 : “III: SMALL: New algorithms for genome ...” \$500k (3 years) NSF-1565862: “CRII: III: Using genomic context to ...” \$170k (2 years) NIH-CFAR: “Accuracy of HIV transmission network ...” \$439K (2 years) Sloan foundation fellowship and other gifts and grants. ≈\$150K (2 years)	2019 2018 2016 2016 2016–2018

1. Qiyun Zhu, Uyen Mai, Wayne Pfeiffer, Stefan Janssen, Francesco Asnicar, G Sanders, Jon, Pedro Belda-ferre, Gabriel A Al-ghalith, Evguenia Kopylova, Daniel Mcdonald, John B Yin, Shi Huang, Nimaichand Salam, Jian-yu Jiao, Zijun Wu, Z Xu, Kalen Cantrell, Yimeng Yang, Erfan Sayyari, Maryam Rabiee, James T Morton, Dan Knights, Wen-jun Li, Curtis Huttenhower, Nicola Segata, Larry Smarr, **Siavash Mirarab**, and Rob Knight. Phylogenomics of 10,575 genomes reveals evolutionary proximity between domains Bacteria and Archaea. *Nature Communications*, In press, 2019.
2. James H Leebens-Mack*, Michael S Barker*, Eric J Carpenter*, Michael K Deyholos*, Matthew A Gitzendanner*, Sean W Graham*, Ivo Grosse*, Zheng* Li, Michael Melkonian*, **Siavash Mirarab***, Martin Porsch*, Marcel Quint*, Stefan A Rensing*, Douglas E Soltis*, Pamela S Soltis*, Stevenson*, and the rest of One Thousand Plant Transcriptomes Initiative. One thousand plant transcriptomes and the phylogenomics of green plants. *Nature*, 574(7780):679–685, 2019.
3. Metin Balaban, Shahab Sarmashghi, and **Siavash Mirarab**. APPLES: Scalable Distance-based Phylogenetic Placement with or without Alignments. *Systematic Biology*, syz063, 2019.
4. Maryam Rabiee and **Siavash Mirarab**. INSTRAL: Discordance-Aware Phylogenetic Placement Using Quartet Scores. *Systematic Biology*, syz045, aug 2019.
5. Erfan Sayyari, Ban Kawas, and **Siavash Mirarab**. TADA: phylogenetic augmentation of microbiome samples enhances phenotype classification. *Bioinformatics*, 35(14):i31–i40, 2019.
6. Lei Chen, Qiang Qiu, Yu Jiang, Kun Wang, Zeshan Lin, Zhipeng Li, Faysal Bibi, Yongzhi Yang, Jinhuan Wang, Wenhui Nie, Weiting Su, Guichun Liu, Qiye Li, Weiwei Fu, Xiangyu Pan, Chang Liu, Jie Yang, Chenzhou Zhang, Yuan Yin, Yu Wang, Yue Zhao, Chen Zhang, Zhongkai Wang, Yanli Qin, Wei Liu, Bao Wang, Yandong Ren, Ru Zhang, Yan Zeng, Rute R. da Fonseca, Bin Wei, Ran Li, Wenting Wan, Ruoping Zhao, Wenbo Zhu, Yutao Wang, Shengchang Duan, Yun Gao, Yong E. Zhang, Chunyan Chen, Christina Hvilsum, Clinton W. Epps, Leona G. Chemnick, Yang Dong, **Siavash Mirarab**, Hans Redlef Siegismund, Oliver A. Ryder, M. Thomas P. Gilbert, Harris A. Lewin, Guojie Zhang, Rasmus Heller, and Wen Wang. Large-scale ruminant genome sequencing provides insights into their evolution and distinct traits. *Science*, 364(6446):eaav6202, 2019.

*Equal contributions

7. Shahab Sarmashghi, Kristine Bohmann, M. Thomas P. Gilbert, Vineet Bafna, and **Siavash Mirarab**. Skmer: assembly-free and alignment-free sample identification using genome skims. *Genome Biology*, 20(1):34, 2019.
8. Metin Balaban, Niema Moshiri, Uyen Mai, Xingfan Jia, and **Siavash Mirarab**. TreeCluster: Clustering biological sequences using phylogenetic trees. *PLOS ONE*, 14(8):e0221068, 2019.
9. Niema Moshiri, Manon Ragonnet-Cronin, Joel O Wertheim, and **Siavash Mirarab**. FAVITES: simultaneous simulation of transmission networks, phylogenetic trees and sequences. *Bioinformatics*, 35(11):1852–1861, 2019.
10. Peter Houde, Edward L Braun, Nitish Narula, Uriel Minjares, and **Siavash Mirarab**. Phylogenetic Signal of Indels and the Neoavian Radiation. *Diversity*, 11(7):108, 2019.
11. John Yin, Chao Zhang, and **Siavash Mirarab**. ASTRAL-MP: scaling ASTRAL to very large datasets using randomization and parallelization. *Bioinformatics*, btz211, 2019.
12. Maryam Rabiee, Erfan Sayyari, and **Siavash Mirarab**. Multi-allele species reconstruction using ASTRAL. *Molecular Phylogenetics and Evolution*, 130:286–296, 2019.
13. Shyam Gopalakrishnan, Mikkel-Holger S. Sinding, Jazmín Ramos-Madrigal, Jonas Niemann, Jose A. Samaniego Castruita, Filipe G. Vieira, Christian Carøe, Marc de Manuel Montero, Lukas Kuderna, Aitor Serres, Víctor Manuel González-Basallote, Yan-Hu Liu, Guo-Dong Wang, Tomas Marques-Bonet, **Siavash Mirarab**, Carlos Fernandes, Philippe Gaubert, Klaus-Peter Koepfli, Jane Budd, Eli Knispel Rueness, Mads Peter Heide-Jørgensen, Bent Petersen, Thomas Sicheritz-Ponten, Lutz Bachmann, Øystein Wiig, Anders J. Hansen, and M. Thomas P. Gilbert. Interspecific Gene Flow Shaped the Evolution of the Genus *Canis*. *Current Biology*, 2018.
14. Daniel McDonald and American Gut Consortium. American Gut: an Open Platform for Citizen Science Microbiome Research. *mSystems*, 3(3), 2018.
15. Wolf L. Eiserhardt, Alexandre Antonelli, Dominic J. Bennett, Laura R. Botigué, J. Gordon Burleigh, Steven Dodsworth, Brian J. Enquist, Félix Forest, Jan T. Kim, Alexey M. Kozlov, Ilia J. Leitch, Brian S. Maitner, **Siavash Mirarab**, William H. Piel, Oscar A. Pérez-Escobar, Lisa Pokorny, Carsten Rahbek, Brody Sandel, Stephen A. Smith, Alexandros Stamatakis, Rutger A. Vos, Tandy Warnow, and William J. Baker. A roadmap for global synthesis of the plant tree of life. *American Journal of Botany*, 105(3):614–622, 2018.
16. Stefan Janssen, Daniel McDonald, Antonio Gonzalez, Jose A. Navas-Molina, Lingjing Jiang, Zhenjiang Zech Xu, Kevin Winker, Deborah M. Kado, Eric

- Orwoll, Mark Manary, **Siavash Mirarab**, and Rob Knight. Phylogenetic Placement of Exact Amplicon Sequences Improves Associations with Clinical Information. *mSystems*, 3(3):e00021–18, 2018.
17. Chao Zhang, Maryam Rabiee, Erfan Sayyari, and **Siavash Mirarab**. ASTRAL-III: polynomial time species tree reconstruction from partially resolved gene trees. *BMC Bioinformatics*, 19(S6):153, 2018.
 18. Uyen Mai and **Siavash Mirarab**. TreeShrink: fast and accurate detection of outlier long branches in collections of phylogenetic trees. *BMC Genomics*, 19(S5):272, 2018.
 19. Erfan Sayyari and **Siavash Mirarab**. Testing for Polytomies in Phylogenetic Species Trees Using Quartet Frequencies. *Genes*, 9(3):132, 2018.
 20. Erfan Sayyari, James B. Whitfield, and **Siavash Mirarab**. DiscoVista: Interpretable visualizations of gene tree discordance. *Molecular Phylogenetics and Evolution*, 122:110–115, 2018.
 21. Ali Akbari, Joseph J Vitti, Arya Iranmehr, Mehrdad Bakhtiari, Pardis C Sabeti, **Siavash Mirarab**, and Vineet Bafna. Identifying the favored mutation in a positive selective sweep. *Nature Methods*, 15(4):279–282, 2018.
 22. Niema Moshiri and **Siavash Mirarab**. A Two-State Model of Tree Evolution and Its Applications to Alu Retrotransposition. *Systematic Biology*, 67(3):475–489, 2018.
 23. Erfan Sayyari, James B Whitfield, and **Siavash Mirarab**. Fragmentary Gene Sequences Negatively Impact Gene Tree and Species Tree Reconstruction. *Molecular Biology and Evolution*, 34(12):3279–3291, 2017.
 24. Luke R. Thompson, Jon G. Sanders, Daniel McDonald, Amnon Amir, Joshua Ladau, Kenneth J. Locey, Robert J. Prill, Anupriya Tripathi, Sean M. Gibbons, Gail Ackermann, Jose A. Navas-Molina, Stefan Janssen, Evguenia Kopylova, Yoshiki Vázquez-Baeza, Antonio González, James T. Morton, **Siavash Mirarab**, Zhenjiang Zech Xu, Lingjing Jiang, Mohamed F. Haroon, Jad Kanbar, Qiyun Zhu, Se Jin Song, Tomasz Kosciolk, Nicholas A. Bokulich, Joshua Leffler, Colin J. Brislawn, Gregory Humphrey, Sarah M. Owens, Jarrad Hampton-Marcell, Donna Berg-Lyons, Valerie McKenzie, Noah Fierer, Jed A. Fuhrman, Aaron Clauset, Rick L. Stevens, Ashley Shade, Katherine S. Pollard, Kelly D. Goodwin, Janet K. Jansson, Jack A. Gilbert, Rob Knight, and The Earth Microbiome Project Consortium. A communal catalogue reveals Earth’s multiscale microbial diversity. *Nature*, 551(7681), 2017.
 25. Uyen Mai and **Siavash Mirarab**. TreeShrink: Efficient Detection of Outlier Tree Leaves. In *Lecture Notes in Computer Science*, volume 10562 LNBI, 116–140. 2017.

26. Chao Zhang, Erfan Sayyari, and **Siavash Mirarab**. ASTRAL-III: Increased Scalability and Impacts of Contracting Low Support Branches. In *Lecture Notes in Computer Science*, volume 10562 LNBI, 53–75. 2017.
27. Uyen Mai, Erfan Sayyari, and **Siavash Mirarab**. Minimum variance rooting of phylogenetic trees and implications for species tree reconstruction. *PLOS ONE*, 12(8):e0182238, 2017.
28. Shubhanshu Shekhar, Sebastien Roch, and **Siavash Mirarab**. Species tree estimation using ASTRAL: how many genes are enough? *IEEE/ACM Transactions on Computational Biology and Bioinformatics*, PP(99):1–1, 2017.
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30. Erfan Sayyari and **Siavash Mirarab**. Anchoring quartet-based phylogenetic distances and applications to species tree reconstruction. *BMC Genomics*, 17(S10):101–113, 2016.
31. Erfan Sayyari and **Siavash Mirarab**. Fast Coalescent-Based Computation of Local Branch Support from Quartet Frequencies. *Molecular Biology and Evolution*, 33(7):1654–1668, 2016.
32. Nam-phuong Nguyen, Michael Nute, **Siavash Mirarab**, and Tandy Warnow. HIPPI: highly accurate protein family classification with ensembles of HMMs. *BMC Genomics*, 17(S10):765, 2016.
33. James E Tarver, Mario dos Reis, **Siavash Mirarab**, Raymond J Moran, Sean Parker, Joseph E. O’Reilly, Benjamin L King, Mary J. O’Connell, Robert J Asher, Tandy Warnow, Kevin J Peterson, Philip C.J. Donoghue, and Davide Pisani. The Interrelationships of Placental Mammals and the Limits of Phylogenetic Inference. *Genome Biology and Evolution*, 8(2):330–344, 2016.
34. **Siavash Mirarab**, Md. Shamsuzzoha Bayzid, Bastien Boussau, and Tandy Warnow. Response to Comment on “Statistical binning enables an accurate coalescent-based estimation of the avian tree”. *Science*, 350(6257):171, 2015.
35. Joel Cracraft, Peter Houde, Simon Y W Ho, David P Mindell, Jon Fjeldså, Bent Lindow, Scott V Edwards, Carsten Rahbek, **Siavash Mirarab**, Tandy Warnow, M Thomas P Gilbert, Guojie Zhang, Edward L Braun, and Erich D Jarvis. Response to Comment on “Whole-genome analyses resolve early branches in the tree of life of modern birds”. *Science*, 349(6255):1460, 2015.
36. Ruth Davidson, Pranjali Vachaspati, **Siavash Mirarab**, and Tandy Warnow. Phylogenomic species tree estimation in the presence of incomplete lineage sorting and horizontal gene transfer. *BMC Genomics*, 16(Suppl 10):S1, 2015.

37. Jed Chou, Ashu Gupta, Shashank Yaduvanshi, Ruth Davidson, Mike Nute, **Siavash Mirarab**, and Tandy Warnow. A comparative study of SVDquartets and other coalescent-based species tree estimation methods. *BMC Genomics*, 16(Suppl 10):S2, 2015.
38. **Siavash Mirarab** and Tandy Warnow. ASTRAL-II: coalescent-based species tree estimation with many hundreds of taxa and thousands of genes. *Bioinformatics*, 31(12):i44–i52, 2015.
39. Nam Nguyen, **Siavash Mirarab**, Keerthana Kumar, and Tandy Warnow. *Genome Biology*, 16(1):124, 2015.
40. Md Shamsuzzoha Bayzid, **Siavash Mirarab**, Bastien Boussau, and Tandy Warnow. Weighted Statistical Binning: Enabling Statistically Consistent Genome-Scale Phylogenetic Analyses. *PLoS ONE*, 10(6):e0129183, 2015.
41. Erich D Jarvis, **Siavash Mirarab**, Andre J Aberer, Bo Li, Peter Houde, Cai Li, Simon Y W Ho, Brant C Faircloth, Benoit Nabholz, and Jason T Howard. Phylogenomic analyses data of the avian phylogenomics project. *GigaScience*, 4(1):4, 2015.
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43. **Siavash Mirarab**, Md. Shamsuzzoha Bayzid, Bastien Boussau, and Tandy Warnow. Statistical binning enables an accurate coalescent-based estimation of the avian tree. *Science*, 346(6215):1250463, 2014.
44. Naim Matasci, Ling-Hong Hung, Zhixiang Yan, Eric J Carpenter, Norman J Wickett, **Siavash Mirarab**, Nam Nguyen, Tandy Warnow, Saravanaraj Ayyampalayam, and Michael Barker. Data access for the 1,000 Plants (1KP) project. *GigaScience*, 3(1):17, 2014.
45. Norman J. Wickett*, **Siavash Mirarab***, Nam Nguyen, Tandy Warnow, Eric Carpenter, Naim Matasci, Saravanaraj Ayyampalayam, Michael Barker, J. Gordon Burleigh, Matthew A. Gitzendanner, Brad R. Ruhfel, Eric Wafula, Joshua P. Der, Sean W. Graham, Sarah Mathews, Michael Melkonian, Douglas E. Soltish, Pamela S. Soltish, Nicholas W. Miles, Carl J. Rothfels, Lisa Pokorný, A. Jonathan Shaw, Lisa DeGironimo, Dennis W. Stevenson, Barbara Surek, Juan Carlos Villarreal, Béatrice Rourev, Hervé Philippe, Claude W. dePamphilis, Tao Chen, Michael K. Deyholos, Regina S. Baucom, Toni M.

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- Kutchan, Megan M. Augustin, Jun Wang, Yong Zhang, Zhijian Tian, Zhixiang Yan, Xiaolei Wu, Xiao Sun, Gane Ka-Shu Wong, and James Leebens-Mack. Phylotranscriptomic analysis of the origin and early diversification of land plants. *Proceedings of the National Academy of Sciences (PNAS)*, 111(45):E4859–4868, 2014.
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56. **Siavash Mirarab**, Soroush Akhlaghi, and Ladan Tahvildari. Size-constrained regression test case selection using multicriteria optimization. *IEEE Transactions on Software Engineering*, 38(4):936–956, 2012.
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65. Mehdi Amoui, **Siavash Mirarab**, Sepand Ansari, and Caro Lucas. A genetic algorithm approach to design evolution using design pattern transformation. *Journal of Information Technology and Intelligent Computing*, 1(2):235–244, 2006.

SELECTED
SOFTWARE
(PUBLICLY
AVAILABLE)

ASTRAL (<https://github.com/smirarab/ASTRAL>)

Coalescent-based species tree estimation from gene trees

PASTA (<https://github.com/smirarab/pasta>)

Multiple sequence alignment of ultra-large datasets (up to a million sequences)

SEPP,TIPP,UPP (<https://github.com/smirarab/sepp>)

Phylogenetic placement and taxonomic identification of metagenomic reads

TreeShrink (<https://github.com/uy2/TreeShrink>)

Finding and removing spuriously long branches

DiscoVista (<https://github.com/esayyari/DiscoVista>)

Visualizing phylogenetic discordances

FAVITES (<https://github.com/niemasd/FAVITES>)

Simulating HIV evolution

APPLES (<https://github.com/balabanmetin/apples>)

Phylogenetic placement using distances

INSTRAL (<https://github.com/maryamrabiee/INSTRAL>)

Phylogenetic placement for full genomes

See <http://ecweb.ucsd.edu/~smirarab/software.html> for more.

PROFESSIONAL EXPERIENCE **International Business Machines (IBM)**, Vancouver, British Columbia, Canada
IT Specialist **Sept. 2008 – Dec. 2010**

TEACHING **Course Instructor (University of California, San Diego):**
Graduate: Statistical learning in bioinformatics. **Winter 2016**
Computational evolutionary biology. **2017, 2018**
Introduction to Computer Engineering **2016–2018**

Other:

Software Testing and Quality Assurance (TA), University of Waterloo. **Winter 2007**
Scientific & Technical Communication (TA), University of Tehran. **Fall 2005** Ann Arbor, Michigan, Phylogenomics Symposium and Software School **2015**
UT Austin, Summer school on Phylogenomics and Metagenomics **Summer 2014**
Evolution meetings (NC), Software School on ASTRAL and PASTA **Summer 2014**
UT Austin, Workshop on New Methods for Phylogeny and Alignment Estimation, Tutorials on SEPP and SATe **Winter 2013**

HIGHLIGHTS AND INVITED TALKS UCLA, LA, CA “Genome-wide species tree reconstruction despite discordance” **2018**
ISMB, Chicago, IL “Phylogenomic tree reconstruction” **2018**
Broad Inst., MA, “Taxonomic Profiling using Scalable Phylogenetic Placement” **2017**
RECOMB, Warsaw, Poland, “Statistical binning enables an accurate ...” **2015**
IPAM, UCLA, “Ultra-large multiple sequence alignments”. **2015**
INFORMS, Philadelphia, “Reconstruction of species trees using genomic data”. **2015**
MolPhy-3, Moscow, Russia, “SEPP and TIPP: phylogenetic placement and taxon identification methods for metagenomic”. **2012**

PROFESSIONAL SERVICES Program Committee: ISBM, ECCB, RECOMB-CG **2015, 2017–2019**
Review: Nature Ecology and Evolution, Systematic Biology, PLOS Genetics, Journal of the American Statistical Association, Journal of ACM, IEEE Transaction on Computational Biology and Bioinformatics, Theoretical Population Genetics, Bioinformat-

