Predicting functionality of protein-DNA interactions by integrating diverse evidence - DTU Orbit (24/10/2017)

Predicting functionality of protein-DNA interactions by integrating diverse evidence

Chromatin immunoprecipitation (ChIP-chip) experiments enable capturing physical interactions between regulatory proteins and DNA in vivo. However, measurement of chromatin binding alone is not sufficient to detect regulatory interactions. A detected binding event may not be biologically relevant, or a known regulatory interaction might not be observed under the growth conditions tested so far. To correctly identify physical interactions between transcription factors (TFs) and genes and to determine their regulatory implications under various experimental conditions, we integrated ChIP-chip data with motif binding sites, nucleosome occupancy and mRNA expression datasets within a probabilistic framework. This framework was specifically tailored for the identification of functional and nonfunctional DNA binding events. Using this, we estimate that only 50% of condition-specific protein-DNA binding in budding yeast is functional. We further investigated the molecular factors determining the functionality of protein-DNA interactions under diverse growth conditions. Our analysis suggests that the functionality of binding is highly condition-specific and highly dependent on the presence of specific cofactors. Hence, the joint analysis of both, functional and non-functional DNA binding, may lend important new insights into transcriptional regulation.

General information
State: Published
Organisations: Department of Systems Biology, Center for Biological Sequence Analysis
Authors: Ucar, D. (Intern), Beyer, A. (Ekstern), Parthasarathy, S. (Ekstern), Workman, C. (Intern)
Pages: I137-I144
Publication date: 2009
Main Research Area: Technical/natural sciences

Publication information
Journal: Bioinformatics
Volume: 25
Issue number: 12
ISSN (Print): 1367-4803
Ratings:
BFI (2017): BFI-level 2
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 6.42
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): CiteScore 6.06
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): CiteScore 5.5
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): CiteScore 5.78
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): CiteScore 6.73
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): CiteScore 5.61
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 2
Scopus rating (2010): CiteScore 5.61
ISI indexed (2010): ISI indexed yes
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 2
Scopus rating (2009): CiteScore 5.61
ISI indexed (2009): ISI indexed yes
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 2
