

Contents

1	Overview of Network Inference	1
1.1	Inferring Causality	1
1.1.1	Basics of Genomics	2
1.1.2	Observation, Intervention, and Inference	3
1.1.3	The Data	4
1.1.4	Data Sources	4
1.1.5	Basic Data Metrics	5
1.1.6	How to Read This Book	8
1.1.7	How to Use the Software	8
2	Step 1: Clustering Data	11
2.1	Introduction	11
2.1.1	Clustering	11
2.1.2	Biclustering	12
2.2	cMonkey	12
2.2.1	What it Does	12
2.2.2	The Data	12
2.2.3	The Strategy	12
2.2.4	Walkthrough Example on Toy Data	16
2.3	Factor Analysis for Bicluster Acquisition (FABIA)	18
2.3.1	What it Does	18
2.3.2	The Data	19
2.3.3	The Strategy	19
2.3.4	Walkthrough Example on Toy Data	21
3	Step 2: Use Steady State Data for Network Inference	23
3.1	Introduction	23
3.2	Median-Corrected Z-Scores (MCZ)	23
3.2.1	What it Does	23
3.2.2	The Data	24
3.2.3	The Strategy	24

3.2.4	Performance on Examples	25
3.3	Network Identification by Multiple Regression (NIR)	28
3.3.1	What it Does	28
3.3.2	The Data	28
3.3.3	The Strategy	29
3.3.4	Performance on Examples	30
3.4	Gene Network Inference with Ensemble of trees (GENIE3)	34
3.4.1	What it Does	34
3.4.2	The Data	34
3.4.3	The Strategy	34
3.4.4	Performance on Examples	37
3.5	Context Likelihood of Relatedness (CLR)	41
3.5.1	What it Does	41
3.5.2	The Data	41
3.5.3	The Strategy	41
3.5.4	Performance on Examples	42
3.6	Semidefinite Programming	46
3.6.1	What it does	46
3.6.2	The Data	46
3.6.3	The Strategy	46
3.6.4	Performance on Examples	48
4	Step 3: Using Time-Series Data	51
4.1	Introduction	51
4.2	Time-Delay ARACNE	51
4.2.1	What It Does	51
4.2.2	The Data	52
4.2.3	The Strategy	52
4.2.4	Performance on Examples	54
4.3	Time-Lagged Context Likelihood of Relatedness (tlCLR)	56
4.3.1	What it Does	56
4.3.2	The Data	56
4.3.3	The Strategy	56
4.3.4	Performance on Examples	58
4.4	Inferelator	62
4.4.1	What it Does	62
4.4.2	The Data	62
4.4.3	The Strategy	62
4.4.4	Performance on examples	64
4.5	Dynamic Factor Graphs (DFG)	65
4.5.1	What it does	65
4.5.2	The Data	65
4.5.3	The Strategy	65
4.5.4	Performance on examples	67
4.6	Bayesian Network Inference with Java Objects (BANJO)	72

4.6.1	What it does	72
4.6.2	The Data	72
4.6.3	The Strategy	73
4.6.4	Performance on Examples	74
5	Step 4: Pipelines	77
5.1	Consensus Step: Combining Results of Different Approaches	77
5.2	Creating Pipelines and Ensemble Networks	77
5.3	Pipeline 1: Steady State algorithm + Dynamic Factor Graphs	78
5.3.1	What it does	78
5.3.2	The Strategy	78
5.3.3	Performance on examples	78
5.4	Pipeline 2: Inferelator 2.0	82
5.4.1	What it does	82
5.4.2	The Strategy	82
5.4.3	Performance on examples	83
5.5	Ensemble 1: Voting	86
5.5.1	What it does	86
5.5.2	The Strategy	86
5.5.3	Performance on examples	87
5.6	Ensemble 2: Simulated Annealing	90
5.6.1	What it does	90
5.6.2	The Data	90
5.6.3	The Strategy	90
5.6.4	Performance on examples	91
5.7	Conclusions	95
	References	97
	Index	99



<http://www.springer.com/978-1-4614-3112-1>

Network Inference in Molecular Biology

A Hands-on Framework

Lingeman, J.M.; Shasha, D.

2012, IX, 100 p. 58 illus., Softcover

ISBN: 978-1-4614-3112-1