



## UvA-DARE (Digital Academic Repository)

### Genetic regulatory networks inference : modeling, parameters estimation & model validation

Fomekong Nanfack, Y.

**Publication date**  
2010

[Link to publication](#)

#### **Citation for published version (APA):**

Fomekong Nanfack, Y. (2010). *Genetic regulatory networks inference : modeling, parameters estimation & model validation*. [Thesis, fully internal, Universiteit van Amsterdam].

#### **General rights**

It is not permitted to download or to forward/distribute the text or part of it without the consent of the author(s) and/or copyright holder(s), other than for strictly personal, individual use, unless the work is under an open content license (like Creative Commons).

#### **Disclaimer/Complaints regulations**

If you believe that digital publication of certain material infringes any of your rights or (privacy) interests, please let the Library know, stating your reasons. In case of a legitimate complaint, the Library will make the material inaccessible and/or remove it from the website. Please Ask the Library: <https://uba.uva.nl/en/contact>, or a letter to: Library of the University of Amsterdam, Secretariat, P.O. Box 19185, 1000 GD Amsterdam, The Netherlands. You will be contacted as soon as possible.

---

## List of Figures

---

1.1	A hypothetical model for morphogen positional information. . .	3
1.2	Parallel vs. sequential segmentation . . . . .	5
1.3	Fluorescent labeling of proteins in <i>Drosophila</i> embryos . . . . .	7
1.4	Simple Representation of gene regulation . . . . .	8
1.5	Reverse engineering diagram . . . . .	11
2.1	Optimization landscape behaviour. . . . .	24
3.1	Fitness evolution of a (1+1)-ES minimizing a sphere model . . . .	45
3.2	Fitness-based complete-migration topology . . . . .	49
4.1	Segmentation pattern of the adult <i>Drosophila melanogaster</i> . . . . .	56
4.2	Early development of the <i>Drosophila melanogaster</i> embryo . . . . .	57
4.3	Maternal genes along the A-P axis . . . . .	58
4.4	Hypothetical Gap gene network . . . . .	59
4.5	Stained gene expression . . . . .	62
4.6	Stages and time points of the gap-gene circuit . . . . .	63
4.7	Integrated gap gene data . . . . .	65
4.8	Barplot comparison of different ES settings . . . . .	72
4.9	Simulation of a gene circuit . . . . .	74
4.10	ES fitness landscape . . . . .	74
4.11	Comparison of ESs convergence . . . . .	75
4.12	ESDS landscape . . . . .	76
5.1	Simulated profiles of gap gene expression . . . . .	81
5.2	Gastrulation profile clusters . . . . .	84
5.3	Dendrogram based on circuits profile . . . . .	85

5.4	Correlation between different gastrulation groups . . . . .	87
5.5	Temporal normalized average gene expression data . . . . .	88
5.6	Circuits' patterns with stable long term dynamics . . . . .	90
5.7	Circuits' patterns with oscillating long term dynamics . . . . .	91
5.8	Parameters causing different long term dynamics . . . . .	97
6.1	Scatter plot of the non weights . . . . .	103
6.2	Scatter plot of the weights . . . . .	104
6.3	Parameters distribution . . . . .	105
6.4	Parameter correlation matrix. . . . .	109
6.5	Correlation between decay and production . . . . .	110
6.6	Scatter plots of parameters that regulate <i>hb</i> . . . . .	112
6.7	Scatter plots of parameters that regulate <i>Kr</i> . . . . .	113
6.8	Scatter plots of parameters that regulate <i>gt</i> . . . . .	114
6.9	Scatter plots of parameters that regulate <i>kni</i> . . . . .	115
6.10	Effect of the promoter threshold . . . . .	117
6.11	Reverse engineering from synthetic data . . . . .	118
6.12	Reverse engineering from synthetic noisy data . . . . .	119
6.13	Scatter plot of synthetic circuits' parameters . . . . .	120
6.14	Scatter plot of synthetic circuits' parameters weight . . . . .	121
6.15	Synthetic parameter correlation matrix. . . . .	122
7.1	Stochastic simulation of gene circuits . . . . .	134
7.2	Phase plane comparison of gene circuit . . . . .	135
7.3	Correlation between domain stochastic score and parameters. . .	137
7.4	Stochastic domain score vs. parameters . . . . .	138
7.5	Parameter perturbation . . . . .	139
7.6	Distribution of sensitivity interval versus parameter value . . . .	141
7.7	The correlation pattern based on sensitivity intervals . . . . .	142
7.8	Intensity plot of the SI . . . . .	143
7.9	SI vs. parameter standard deviation. . . . .	143
7.10	Scatter plot of pattern scores versus average circuit sensitivity . .	145
7.11	Stochastic domain score vs. parameters sensitivity . . . . .	146