

Chapter 11: Concluding Remarks

Challenges & Opportunities

Prof. Yechiam Yemini (YY)
Computer Science Department
Columbia University

Notes

- Biology is quickly transforming:
 - From experimental to in-silico discovery + experimental validation
 - From components to systems
- Requires new computational techniques
 - Statistical modeling and analysis of large scale systems
 - Temporal & structural network analysis
- Computational biology is evolving to address these changes

Nature Builds Systems Differently

- Evolution through copy-change-select
- Optimizing robustness (?): noise, mutations...
- Hierarchical modularity (?): conserved core + add-ons
- Challenge: computational reverse-engineering

3

Numerous Exciting Challenges

- Interactions between networks:
 - Regulatory, metabolic, protein-protein, signaling...
- Network evolution, conservation and homology
- Deriving component features from network role
 - E.g., domain folding from p2p network role
- Computing the impact of disease on network operations
 - E.g., compute impact of cancer on the P53 network
- Computational drug design
-

4

