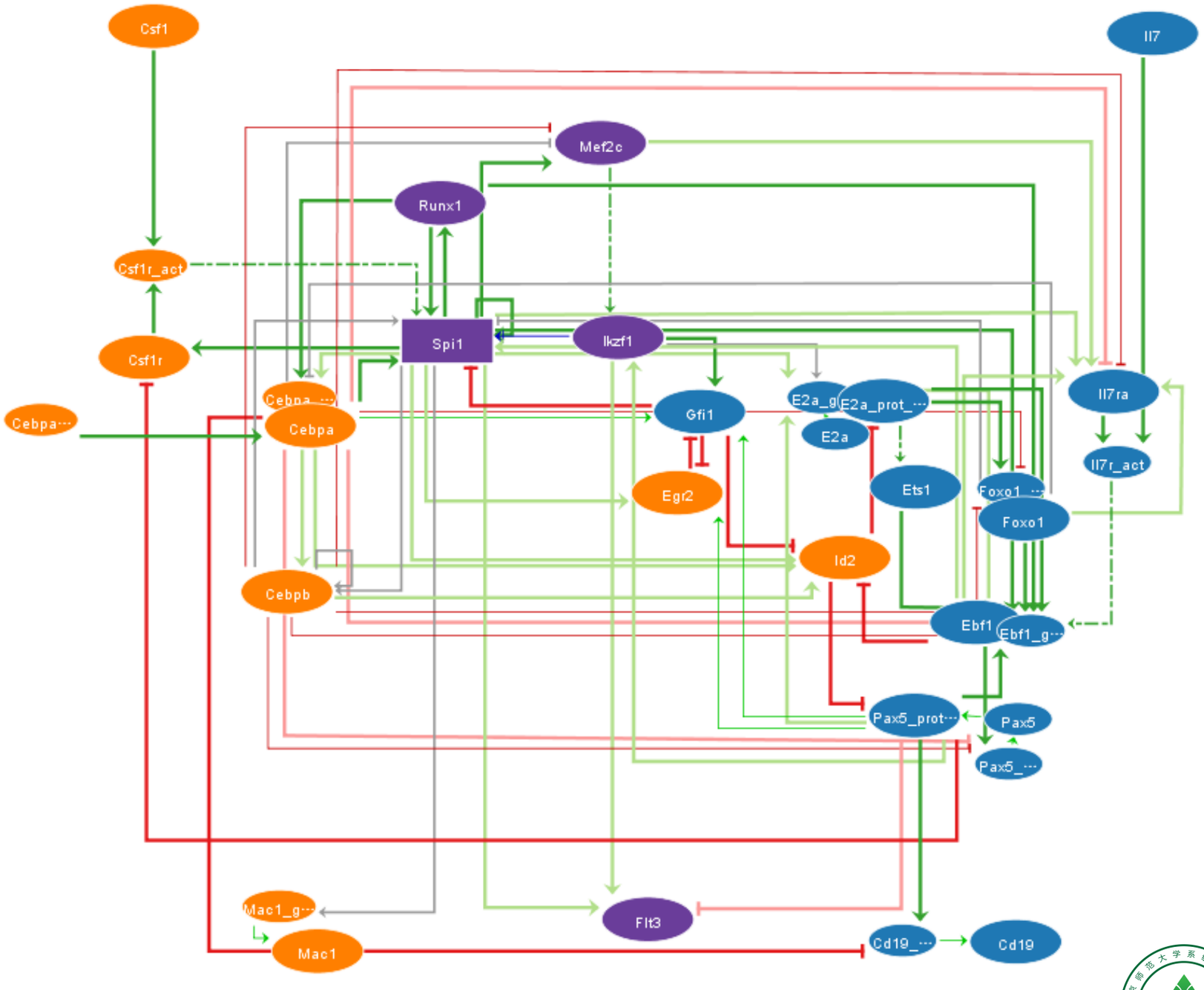
复杂网络大会-集智Special Session

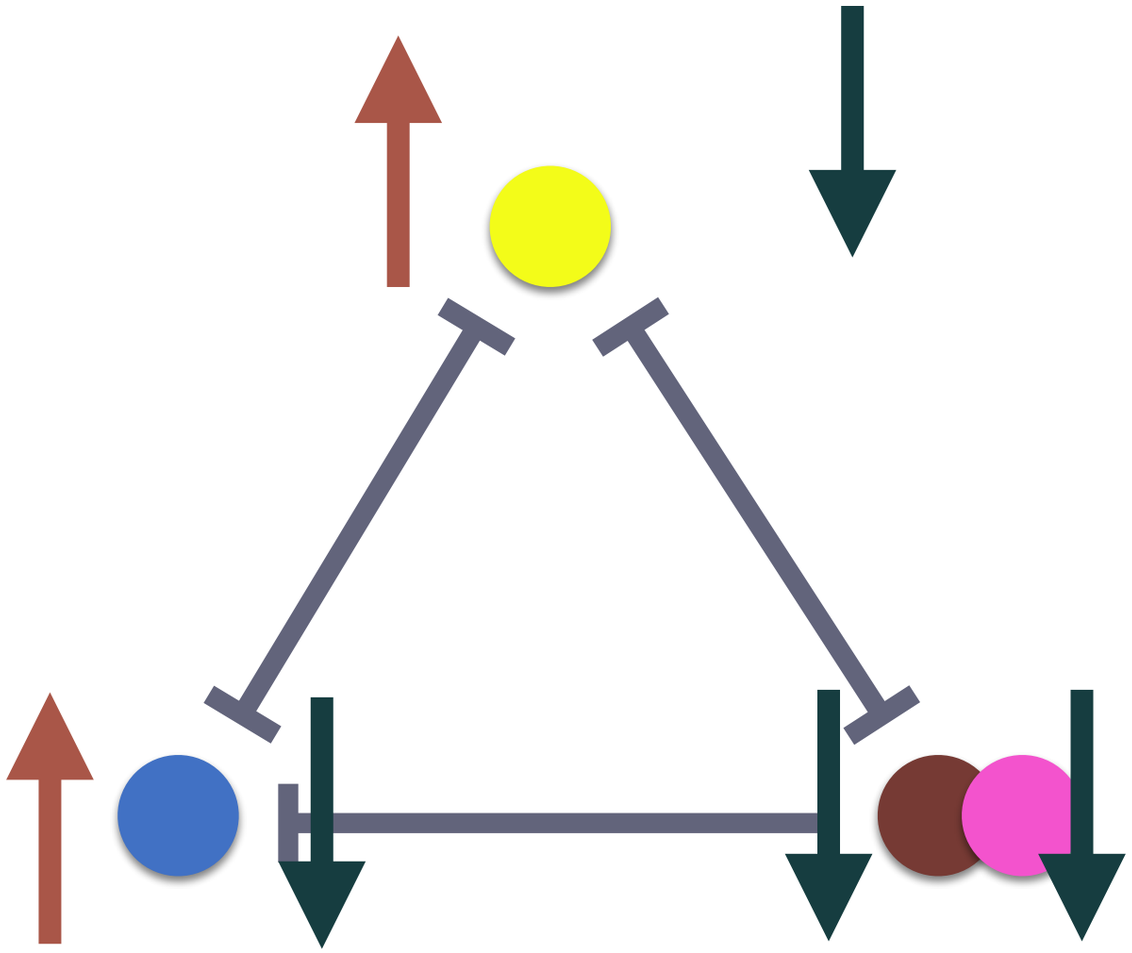
# 使用深度学习方法重构基因调控网络

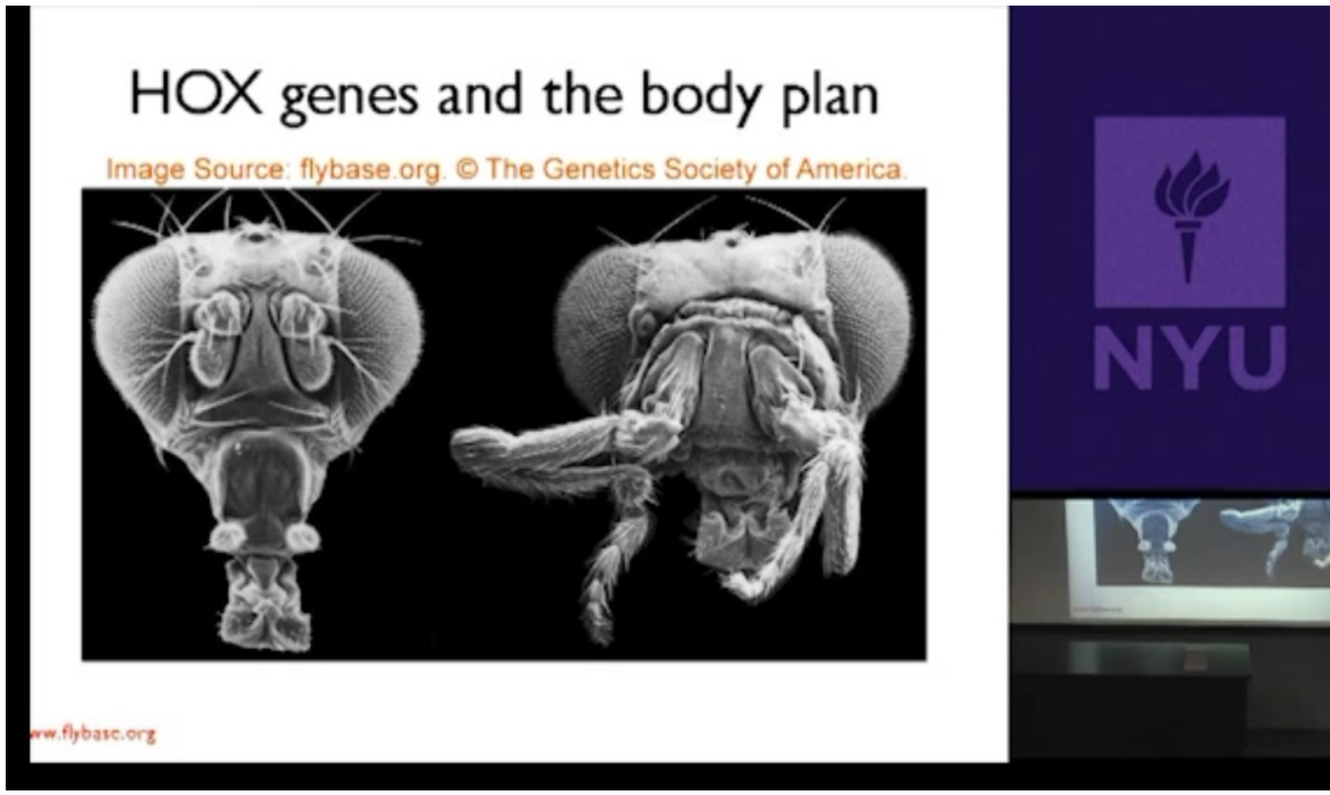
报告人：张章
北京师范大学系统科学学院硕士在读

# Problem Statement



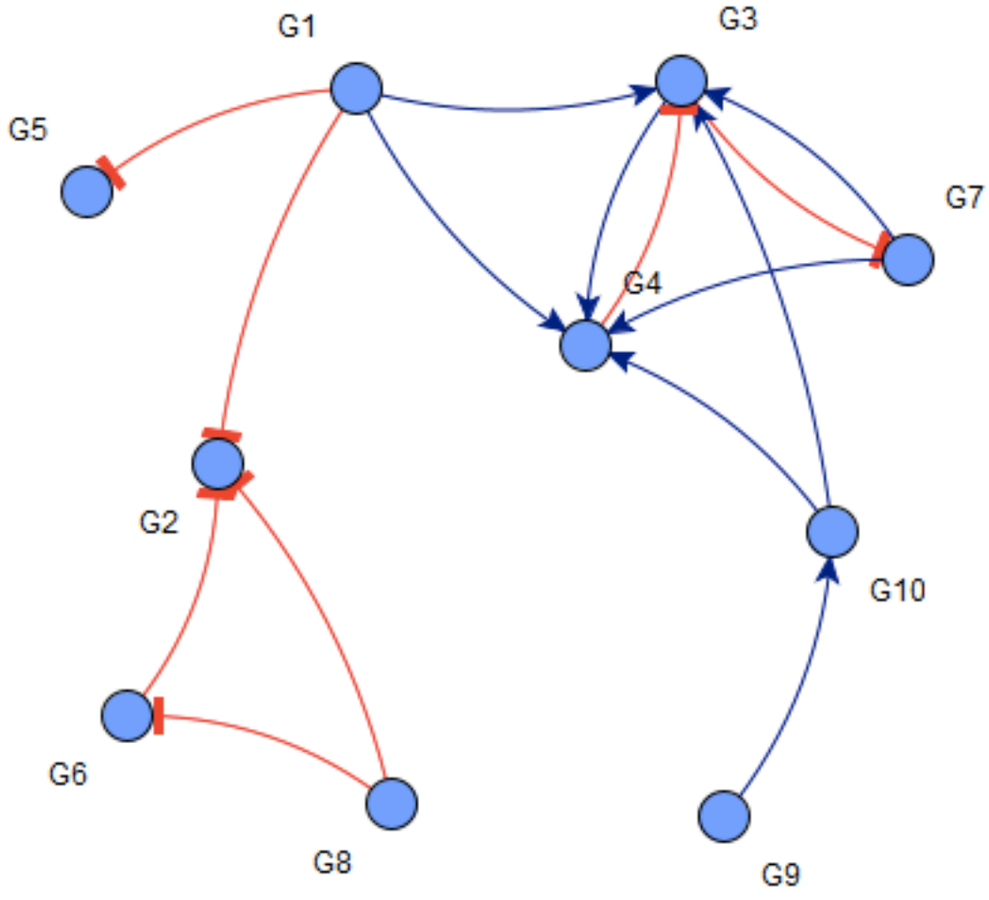
# Significance

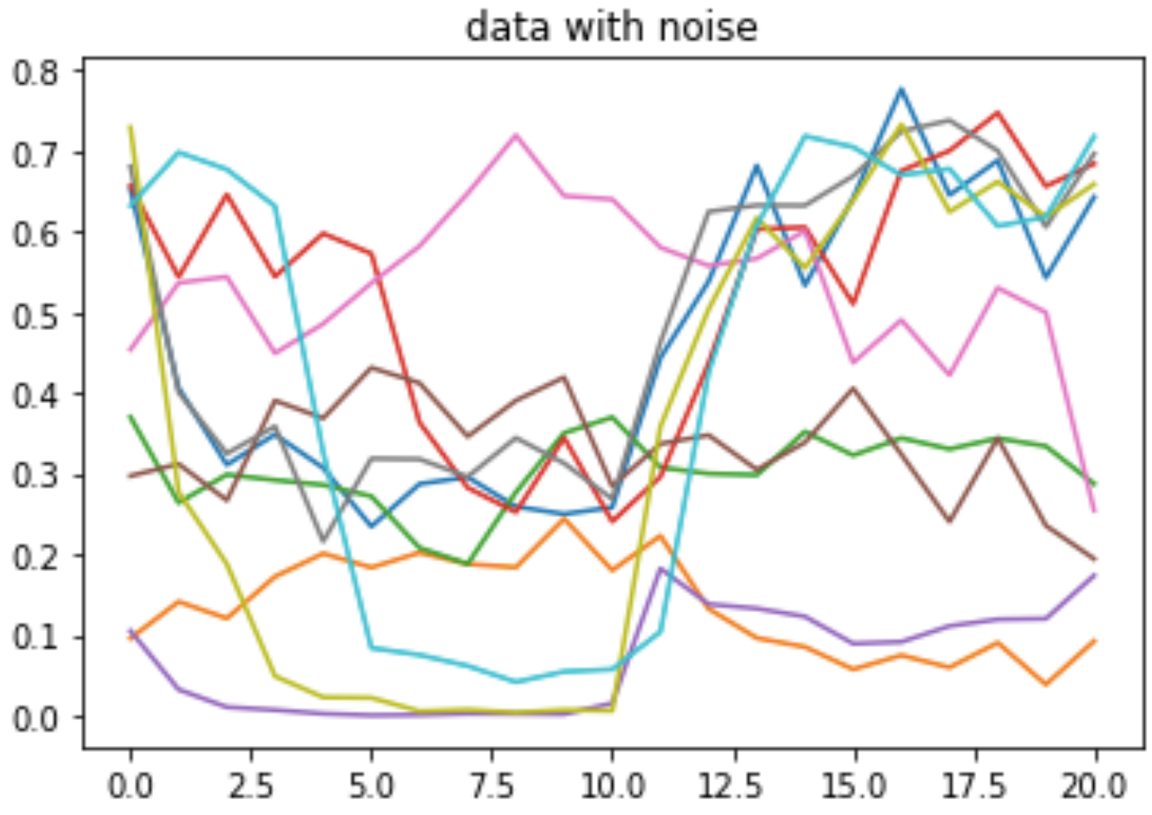




# Problem Statement

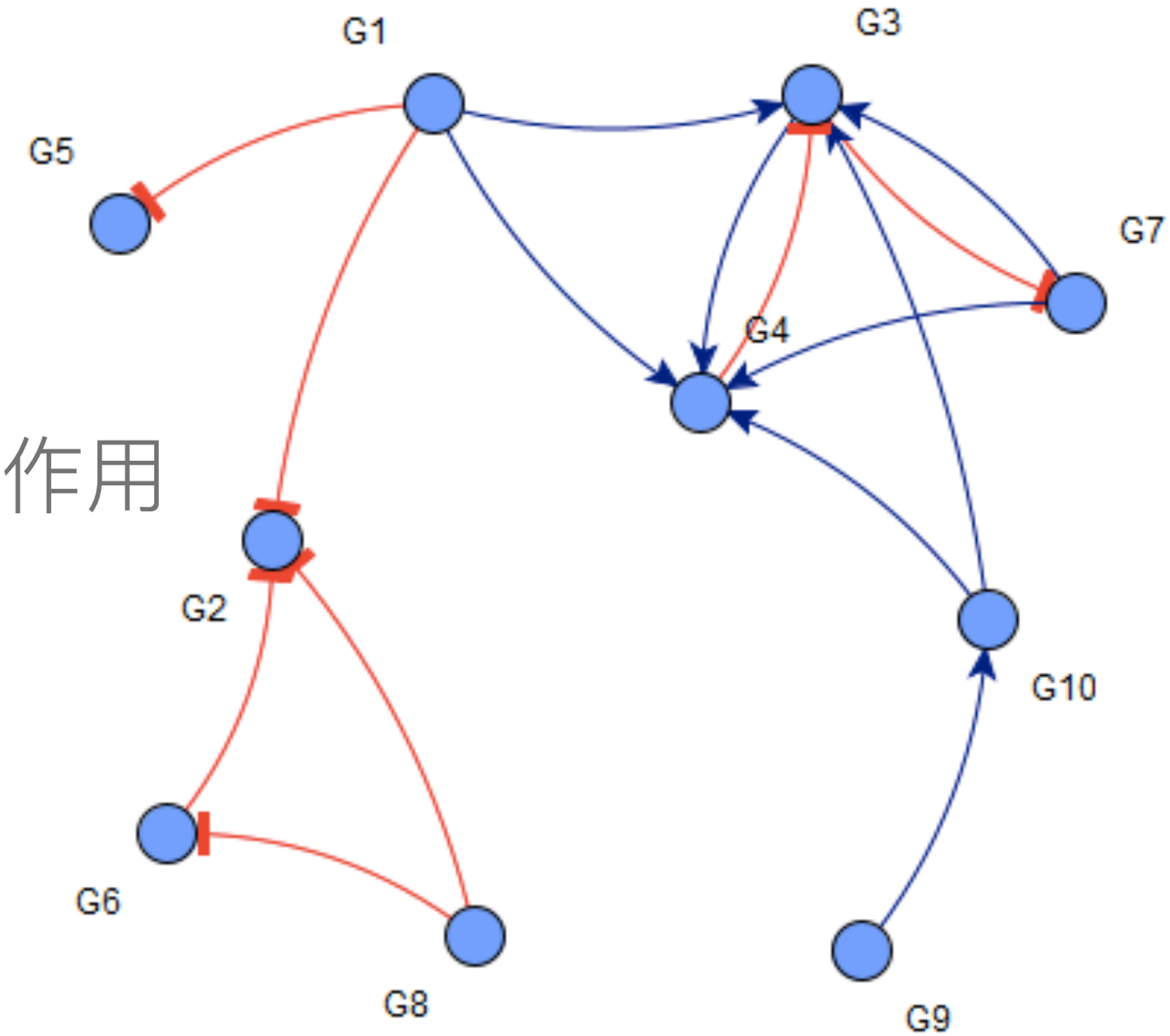
- 从时序数据序列中重构基因调控网络



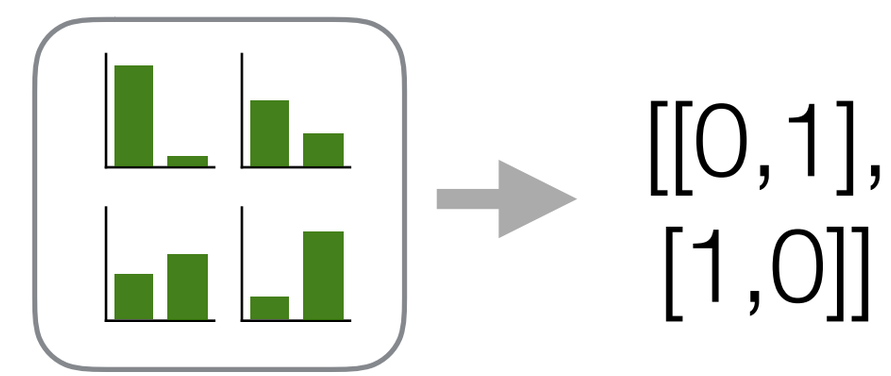
# Mathematical model for Simulation 总结，难度是什么，用图来表示，人们的已有认识

- 高度非线性的动力学过程
- 邻居地位不均等的动力学作用



# 基本思路

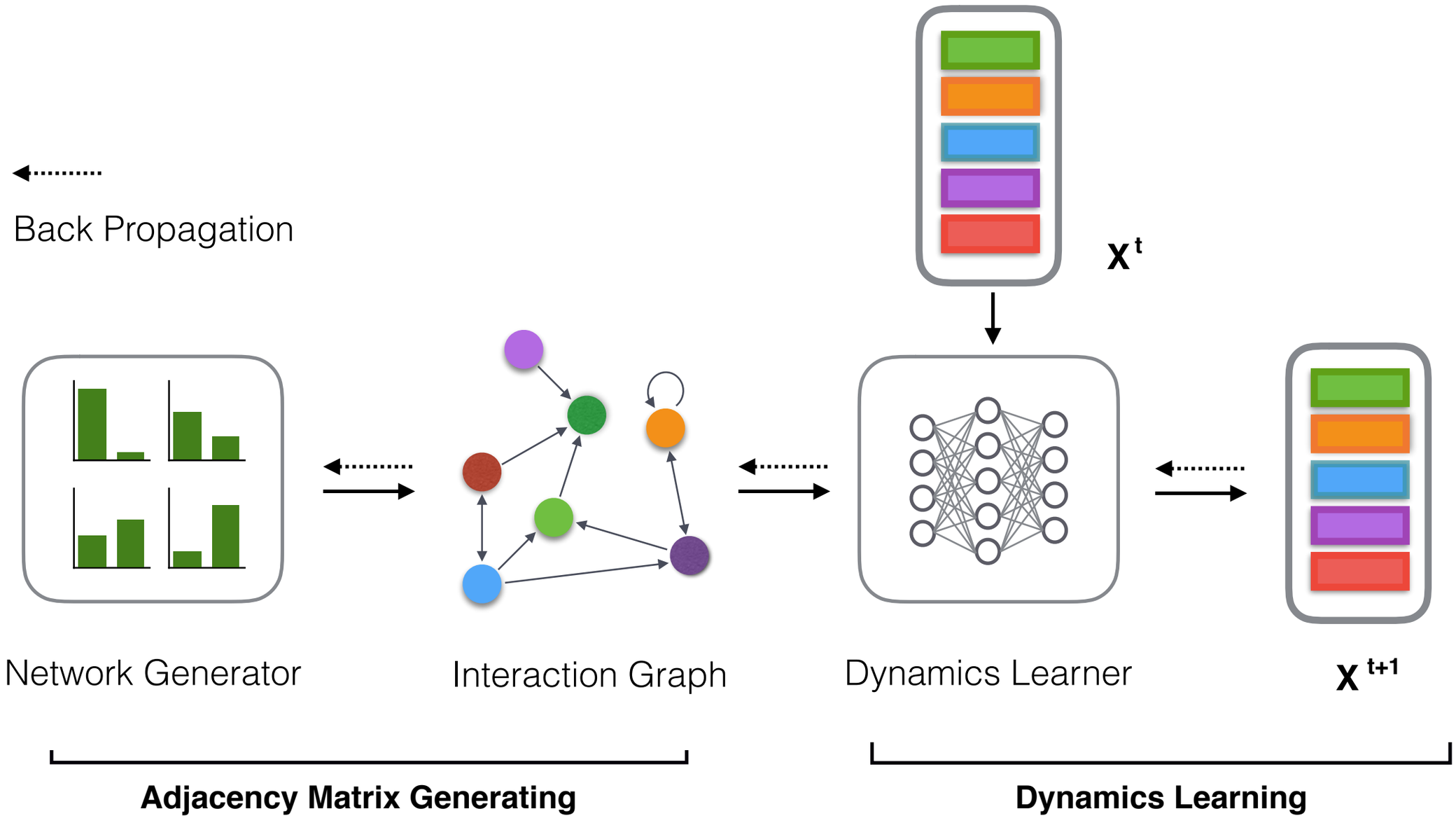
- 用网络生成器采样网络结构
- 用动力学预测器预测未来时序信息
- 共同优化网络生成器和动力学预测器



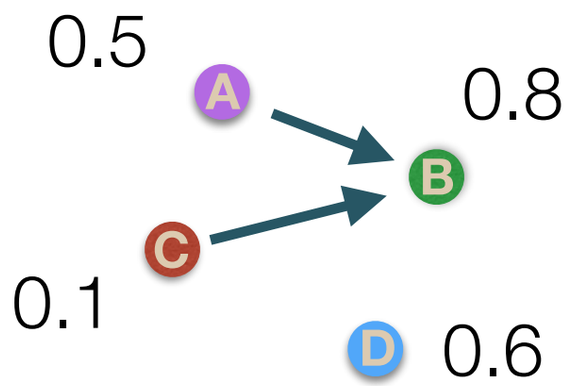

Network Generator

Dynamics Learner

# Algorithms Framework



# Algorithms Framework: Dyn Learner




A [0.5,
B 0.8,
C 0.1,
D 0.6]

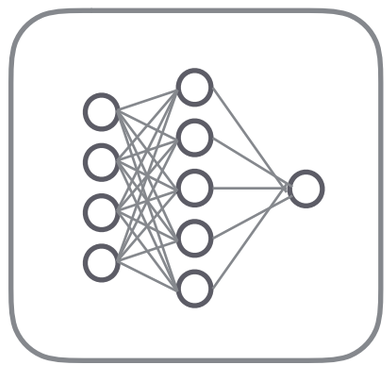
*

[1,
0,
1,
0]

→

[0.5,
0,
0.8,
0]

→

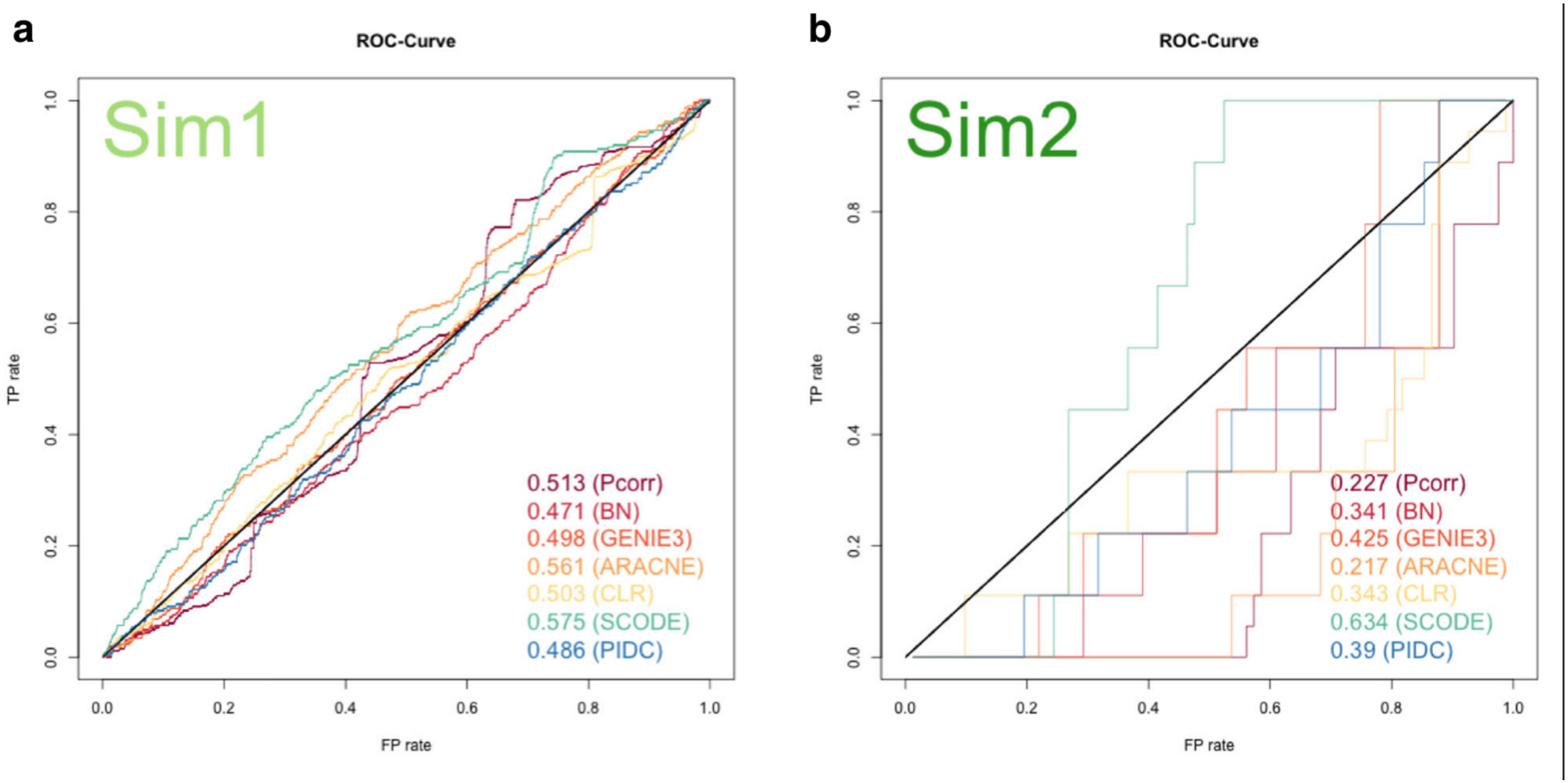


→

0.3

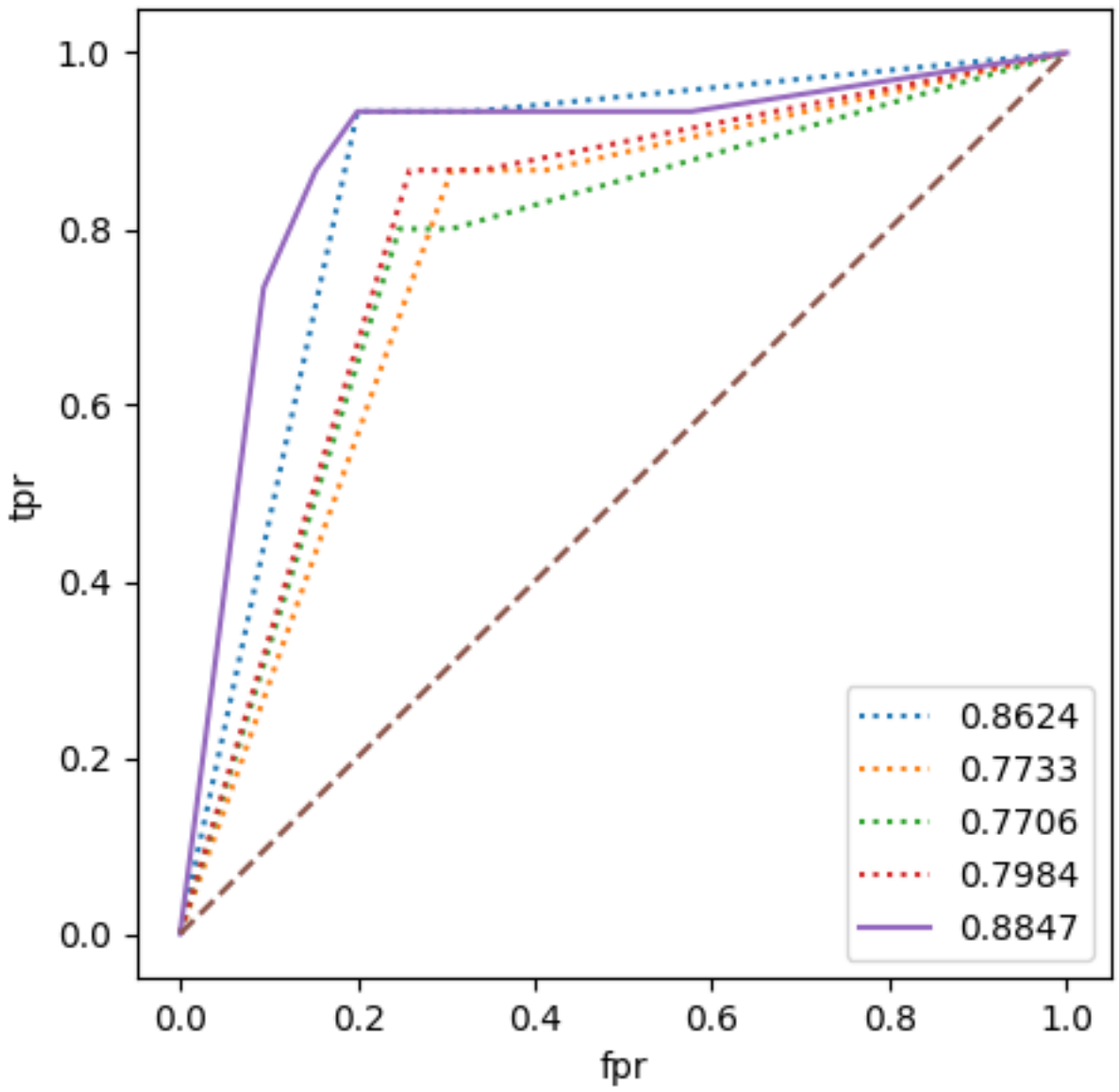
Dynamics Learner

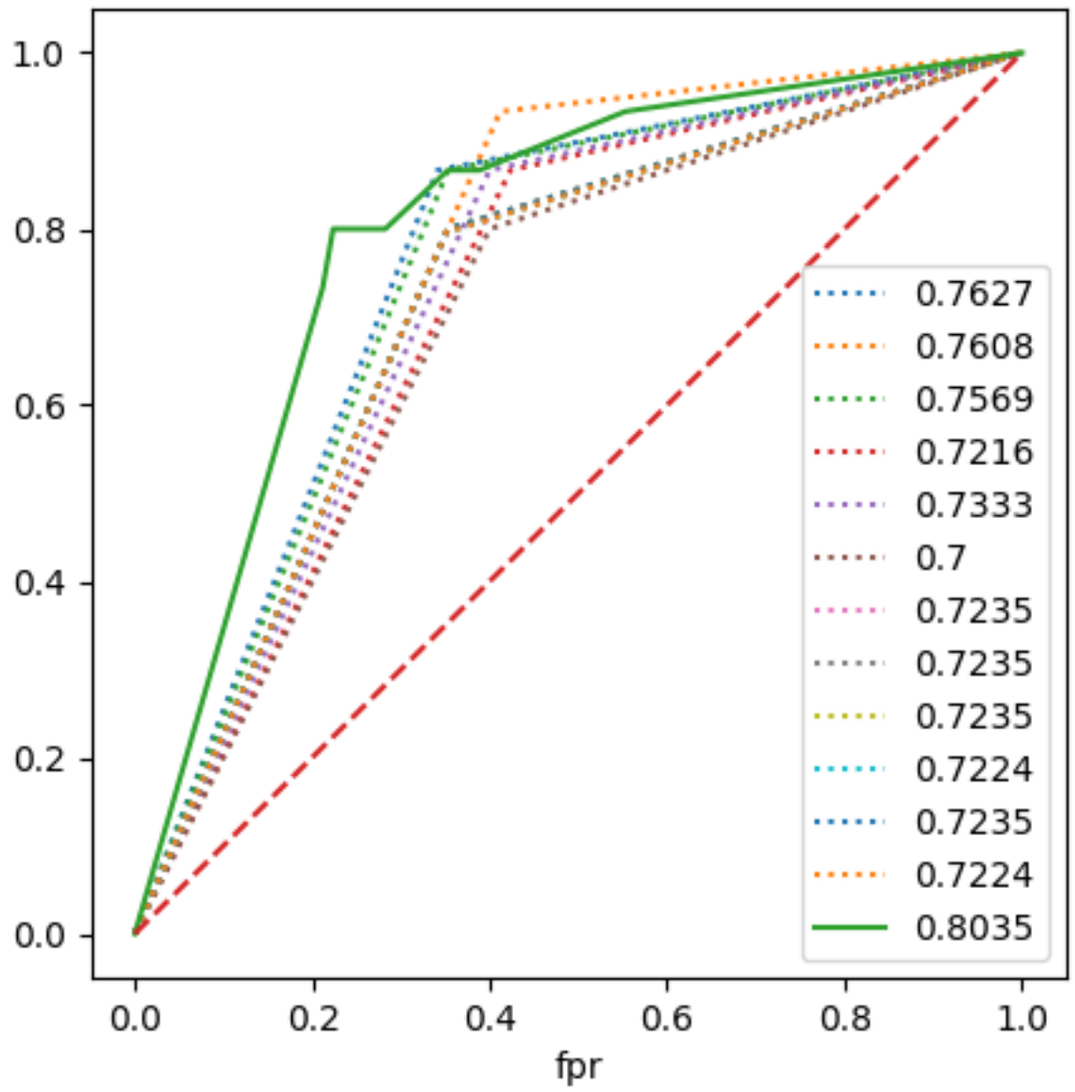
# Experiments



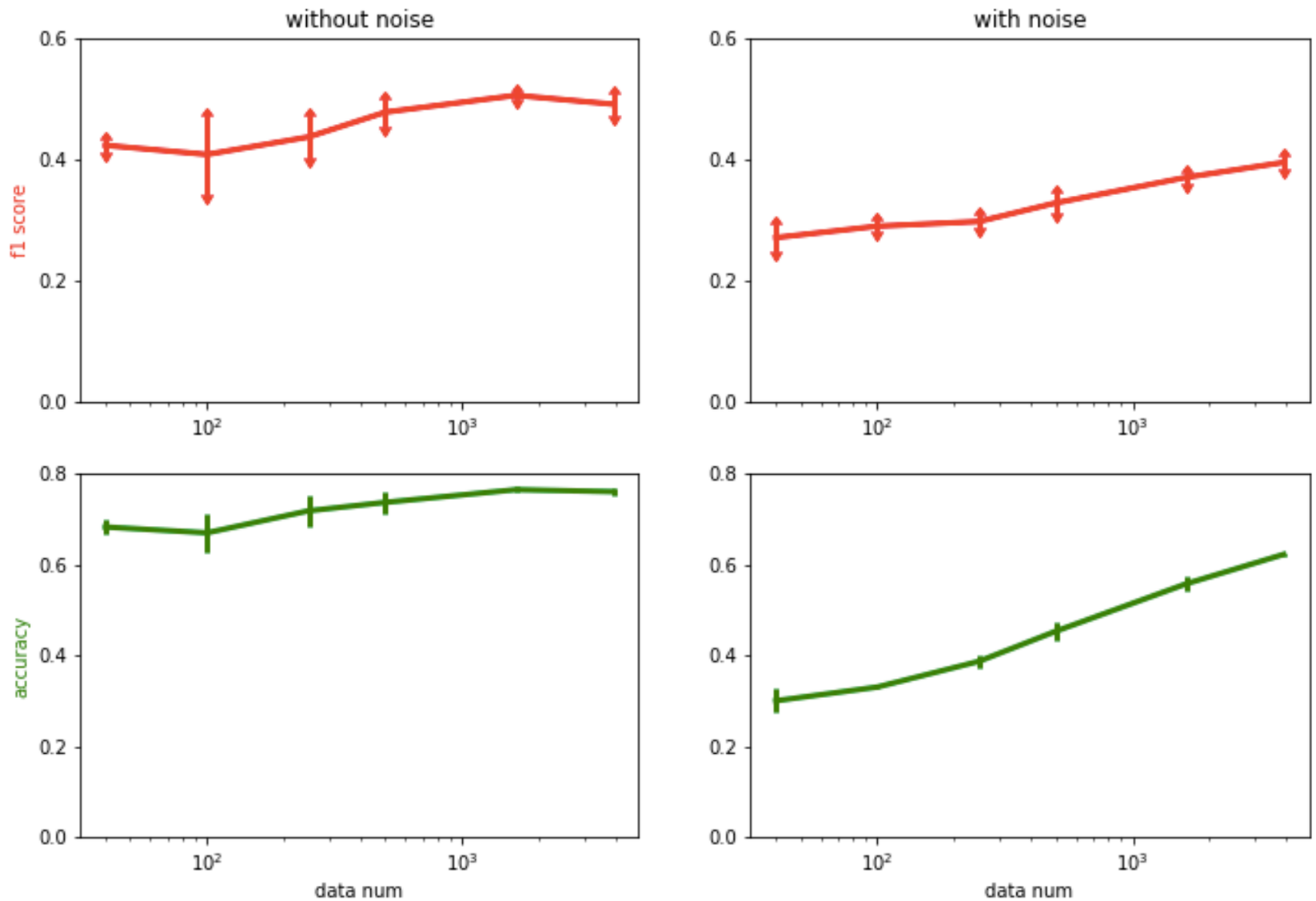

Chen S, Mar J C. Evaluating methods of inferring gene regulatory networks highlights their lack of performance for single cell gene expression data[J]. BMC Bioinformatics, 2018, 19(1).

# Experiments



# Experiments: data num vs. performance



# Future Work

- 复现竞争对手的方法
- 探究时滞效应的影响
- 探究动力学学习器复杂度对重构效果的影响

# Conclusion

- 新的，data-driven的重构基因调控网络的方法
- 可以同时完成网络的重构和动力学的预测
- SOTA的效果

Thank you for your listening

张章 北京师范大学 系统科学学院
3riccczz@gmail.com

集智学园
campus.swarma.org