Galaxies and Graphs

Learning Galaxy Physics with GNNs

Christian Kragh Jespersen, Princeton University

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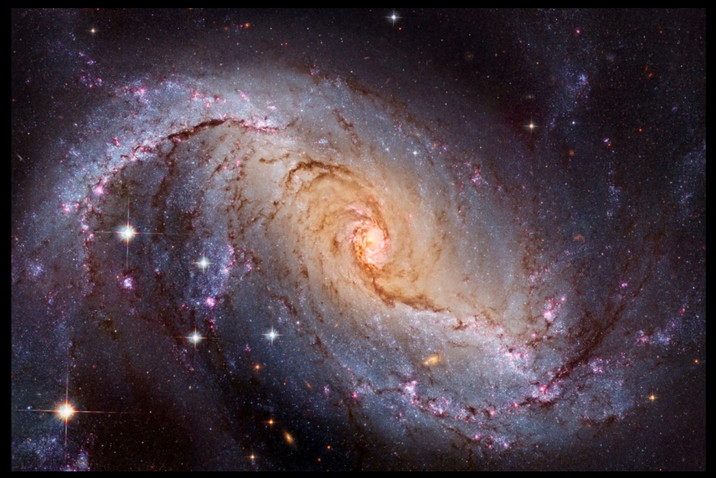
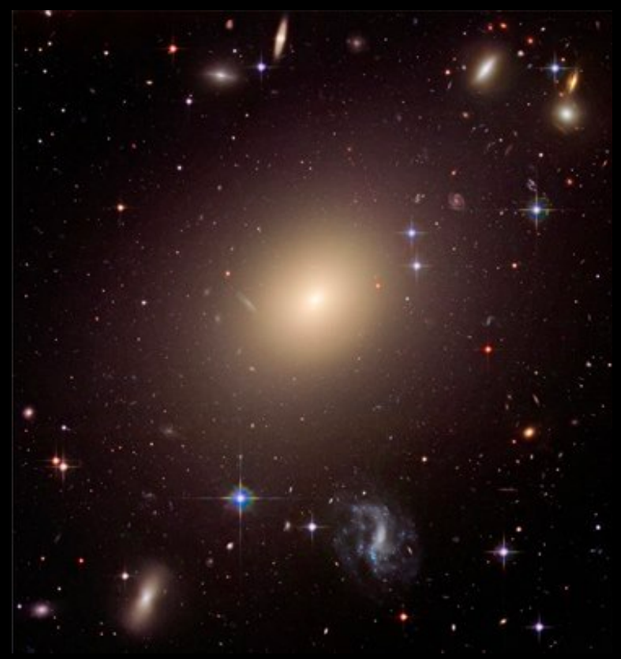
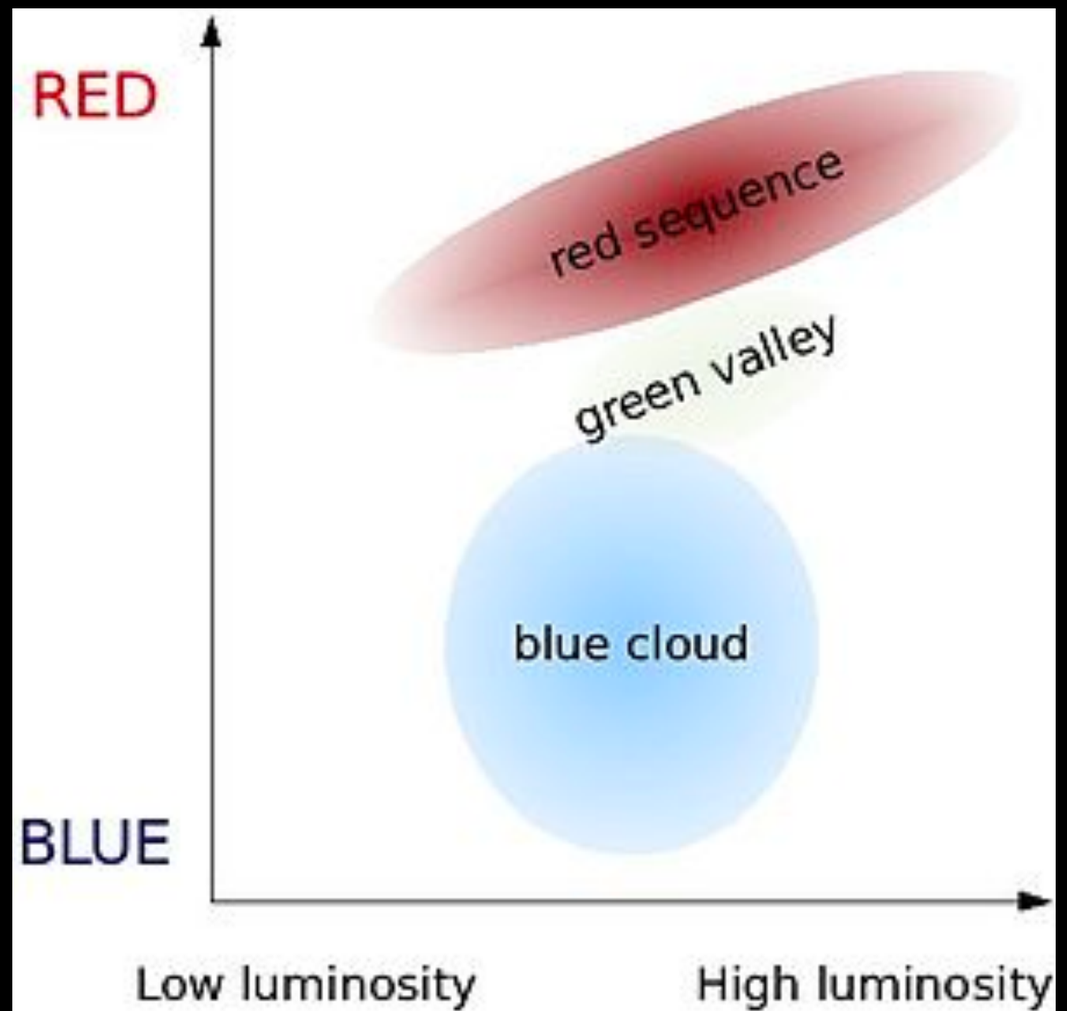
with Chen-Yu Chuang, John F. Wu, Miles Cranmer, Peter Melchior, Shirley Ho, Rachel Somerville and Austen Gabrielpillai

So what's the issue?



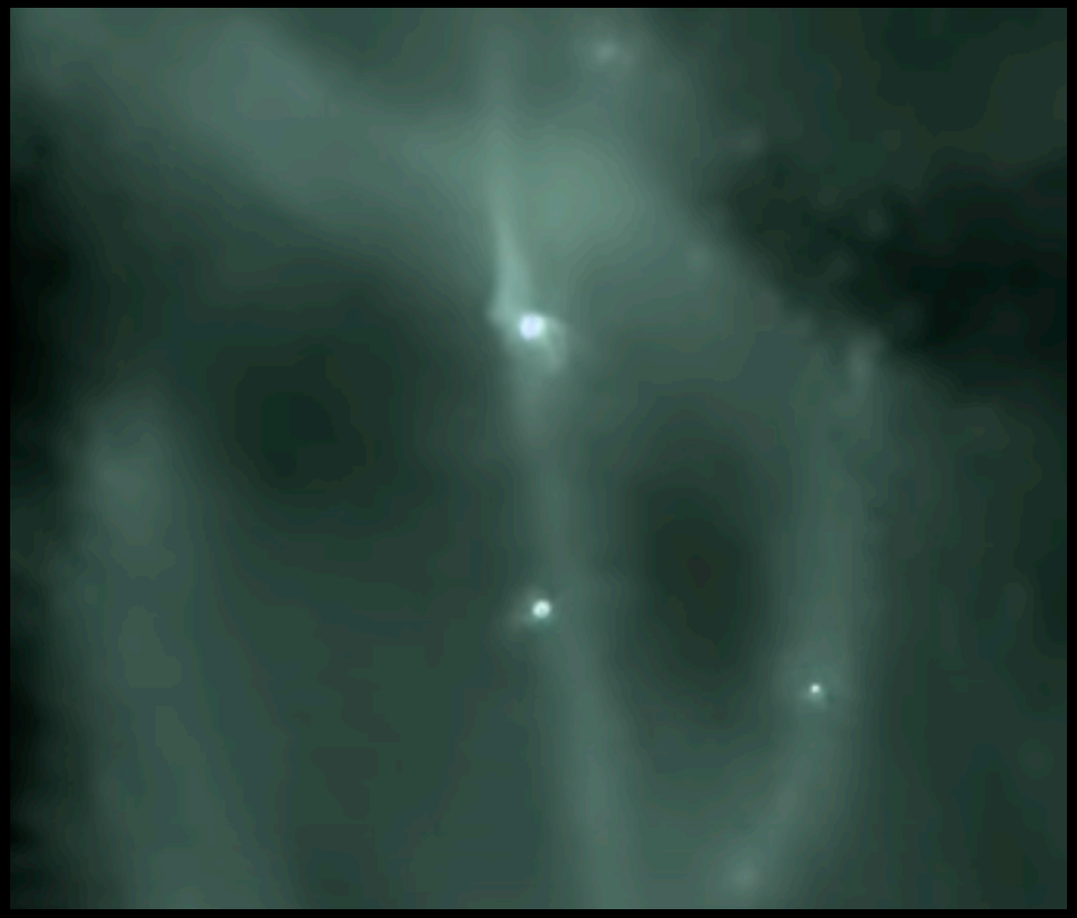


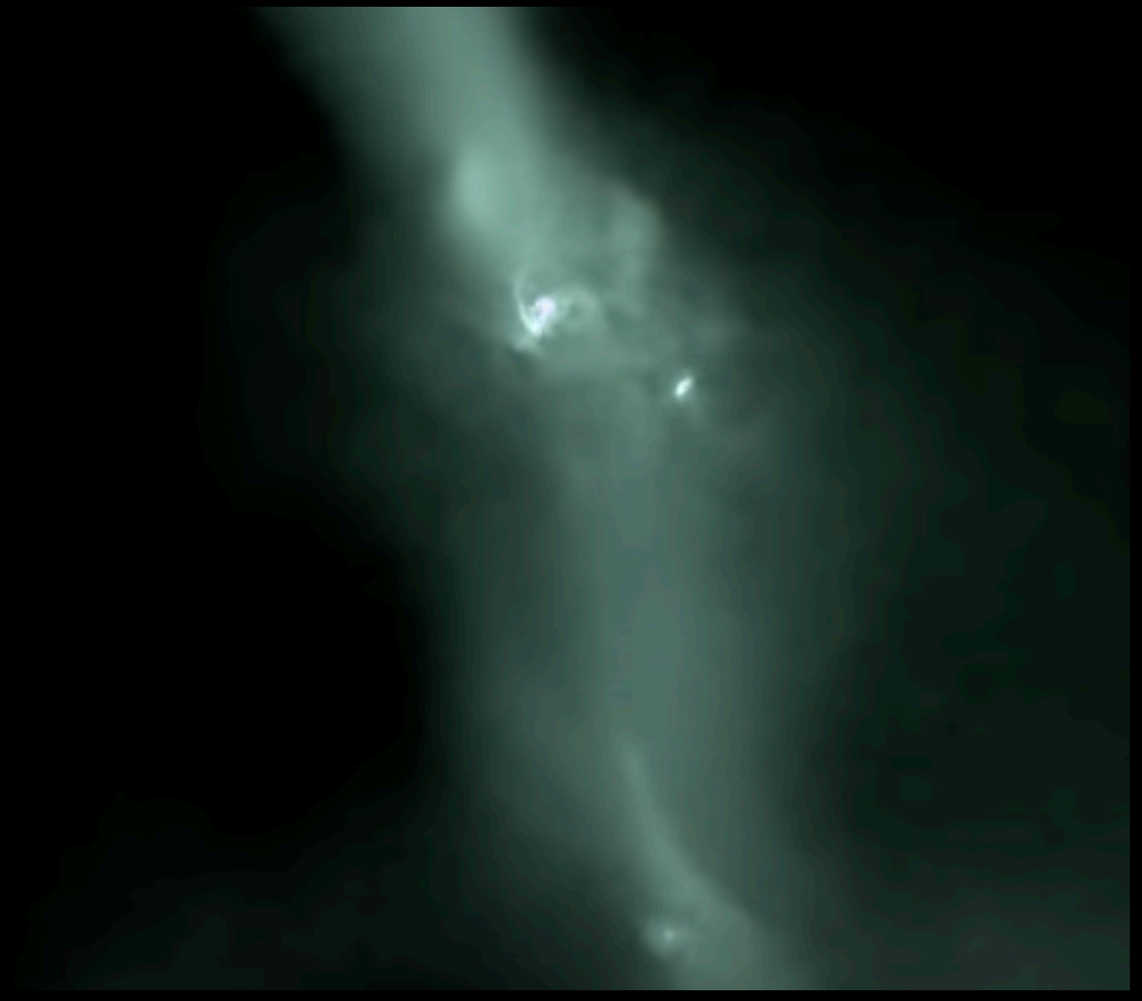
Condense into two parameters



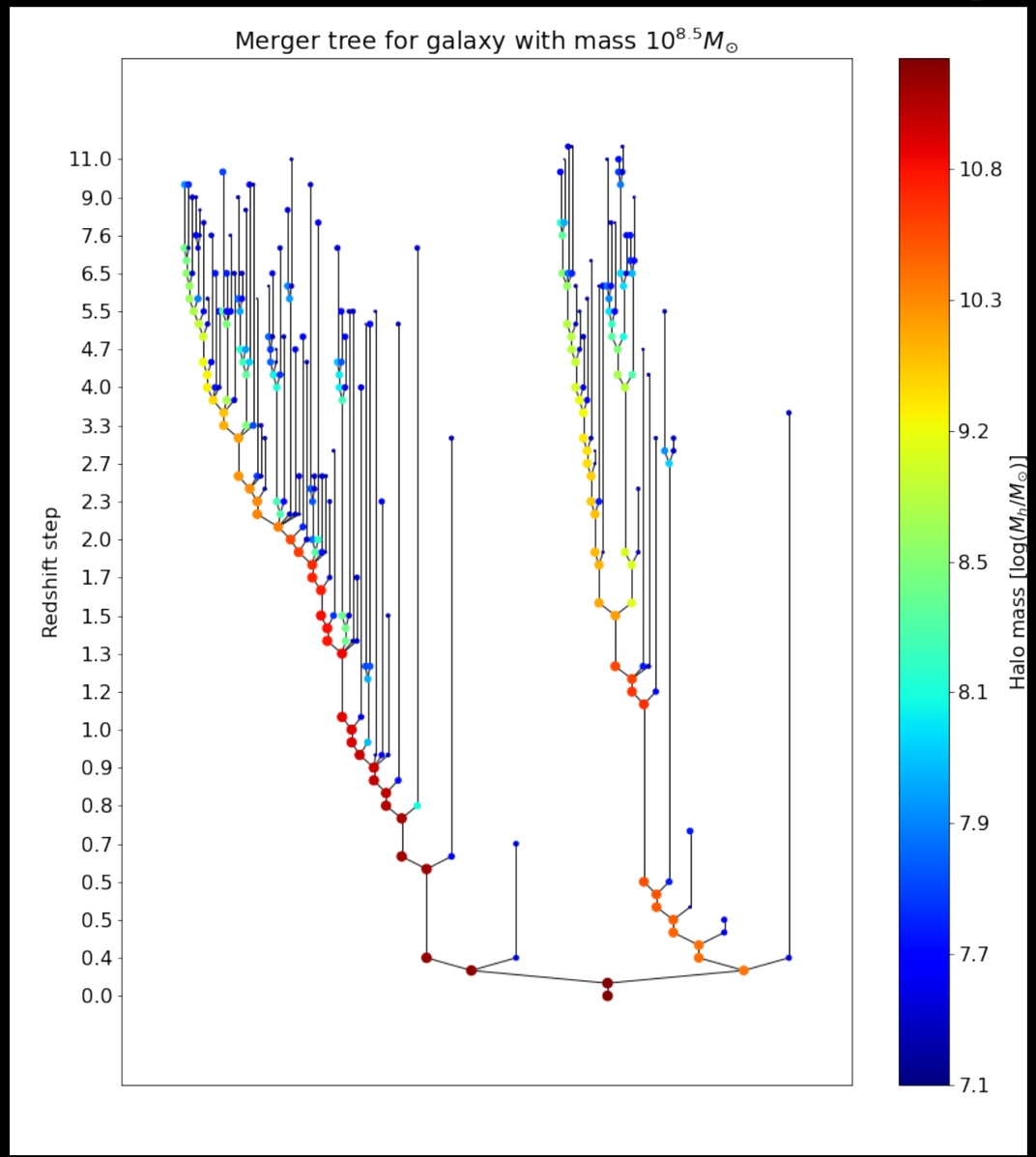
What other things matter?

Formation history?





Formation history?



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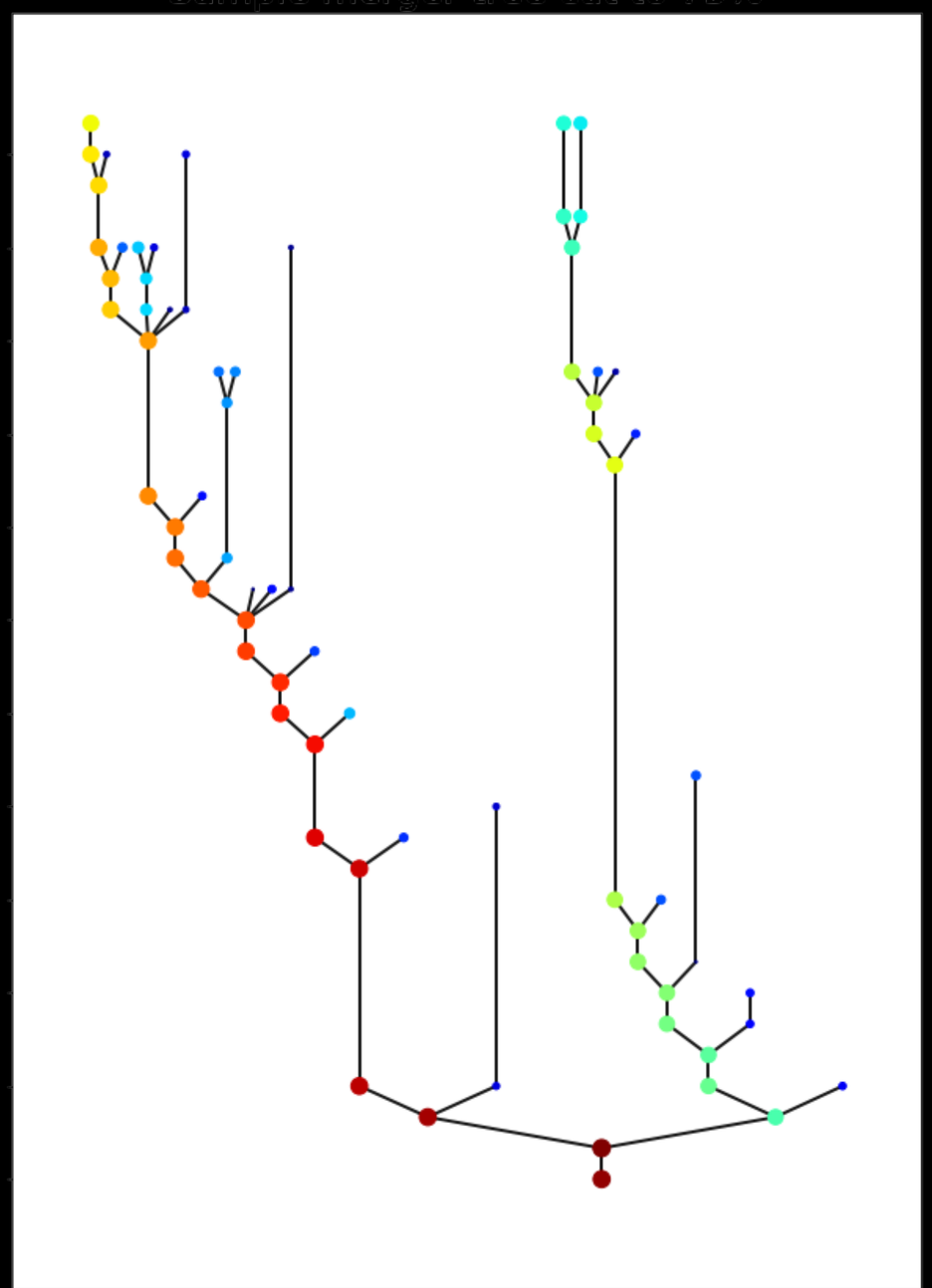
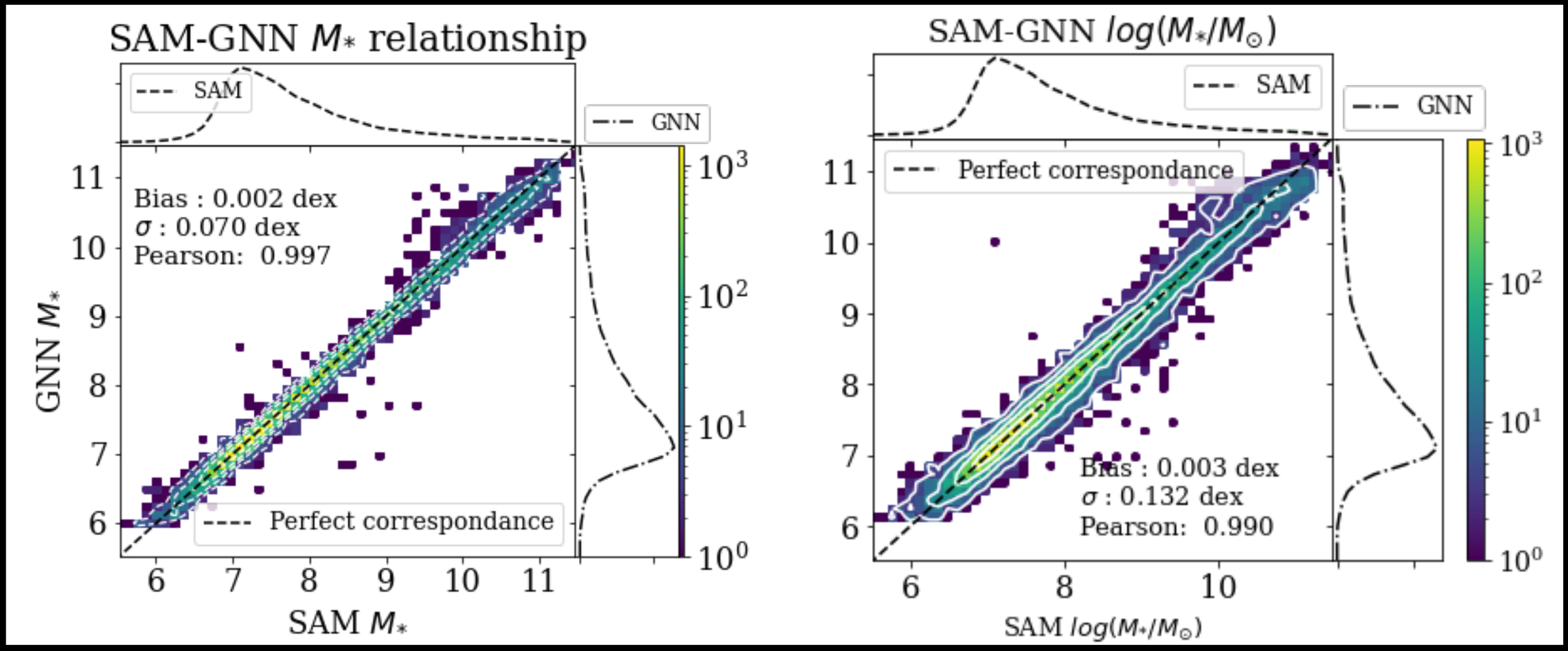
arxiv.org/abs/2210.13473



= Graph -> Graph Neural Network

“Tell me how you grew up and I will tell you who you are”



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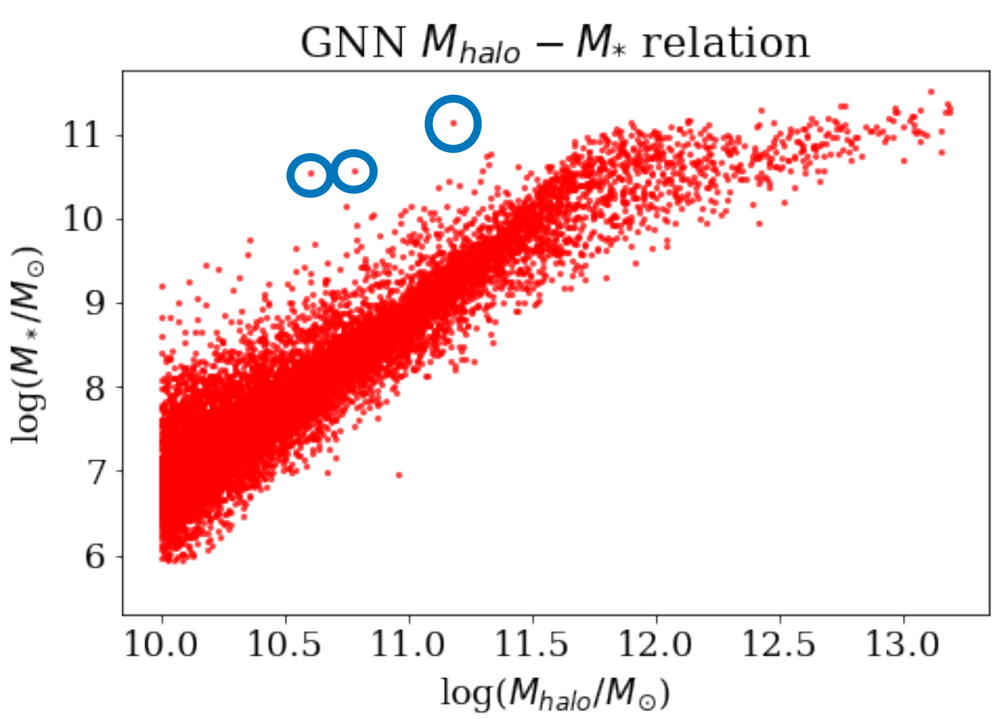
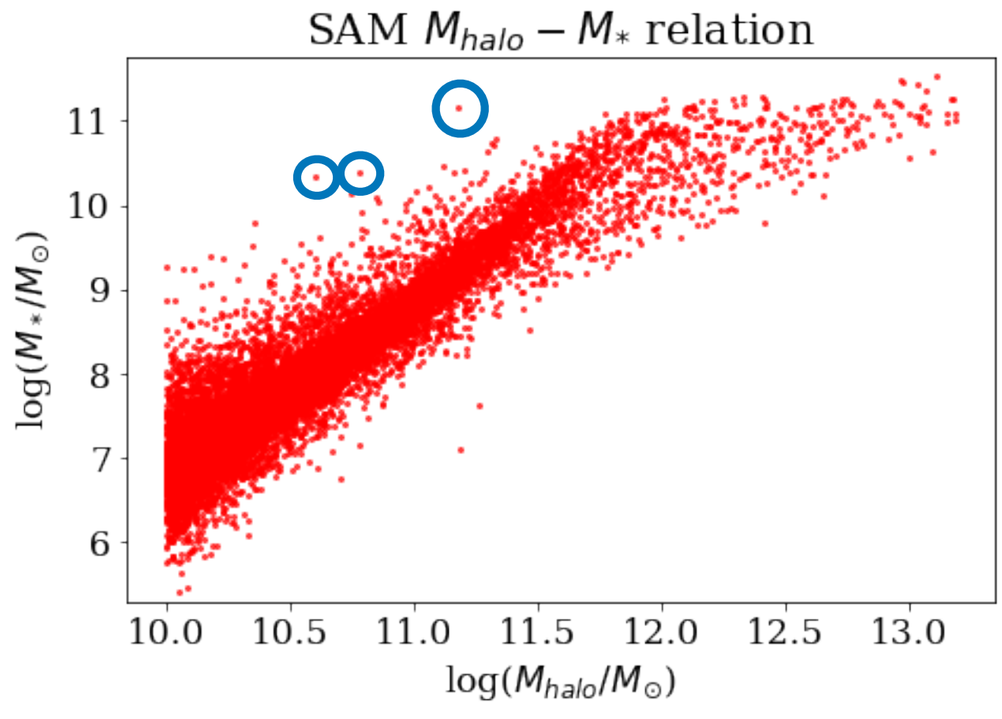
Outliers are dead on!





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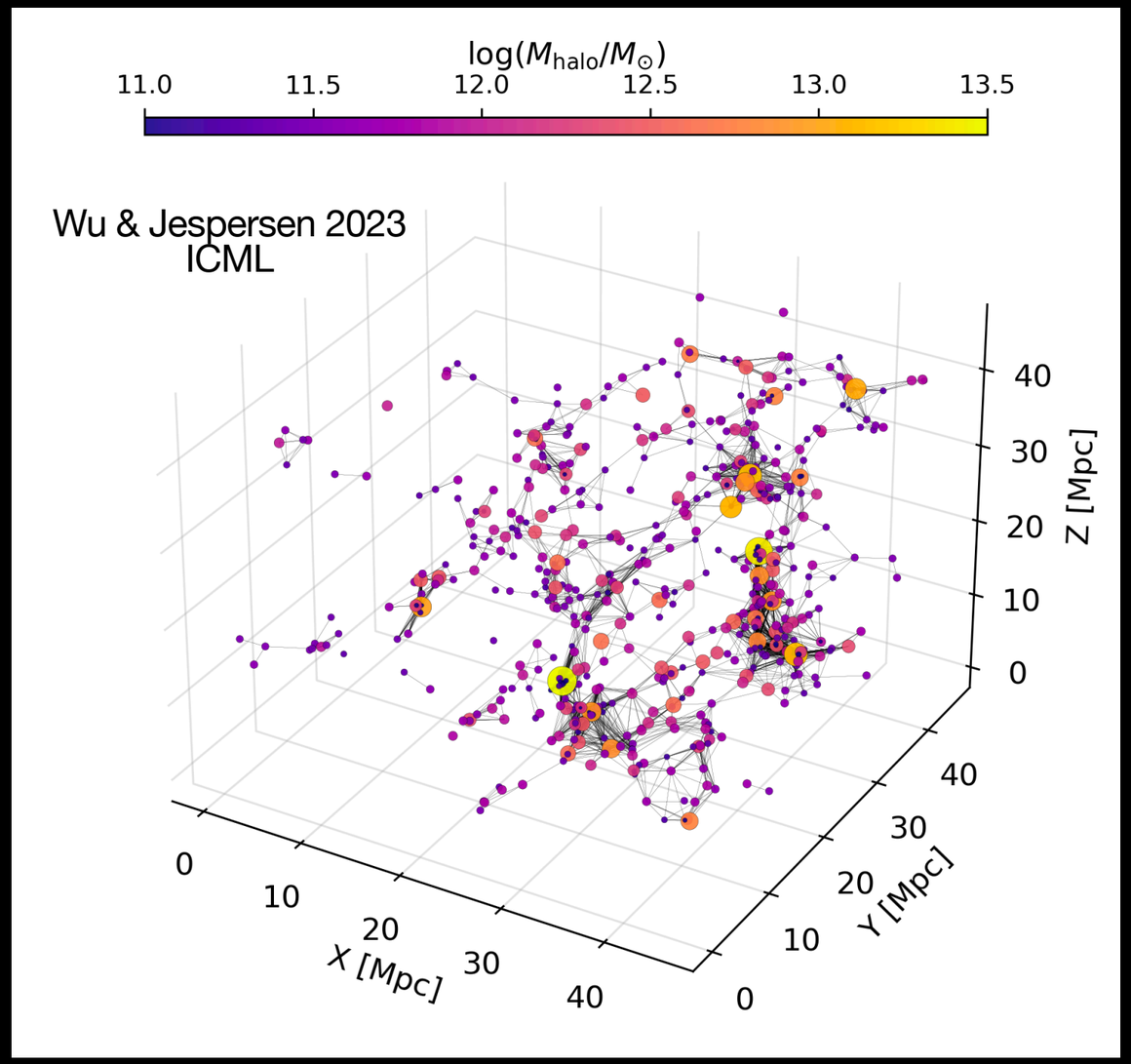
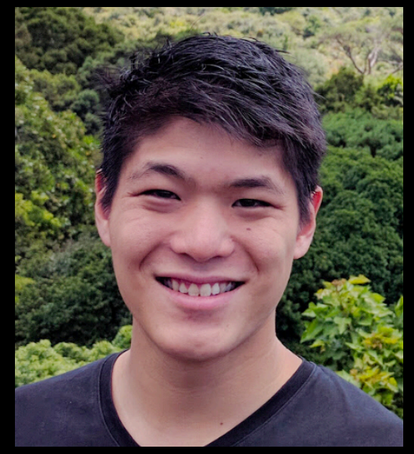
History matters!

What else?

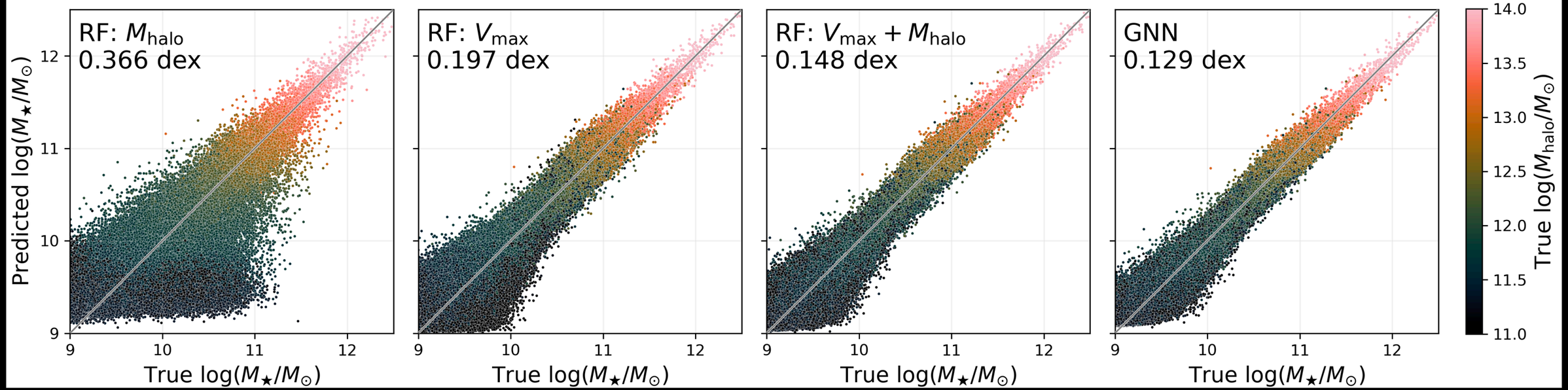
What about environment?

"Show me your friends and I will tell you who you are"





John F. Wu
(STSci/JHU)



Wu & Jespersen
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So what did we learn?

- GNNs are a natural, strong and versatile approach to learning about merger histories and environments

Primary outstanding questions - works in progress

- How degenerate are environment and history?
- Direct connections to observations

https://github.com/astrockragh/Mangrove