Fixation rates of mutation types can be used to infer those mutations' **impacts on fitness.**

MICHIGAN STATE UNIVERSITY

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The Cascade Effect: Mutation fixation rates over evolutionary time

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Background

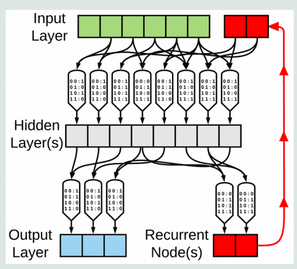
Different mutation types (e.g. insertions, deletions, point mutations, etc.) have different effects on organisms' **fitness** and on organisms' **underlying genome structure.**

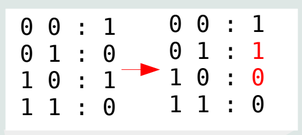
Previous work in digital organisms has focused on the effects of **particular** mutations, e.g. changing one instruction to another.

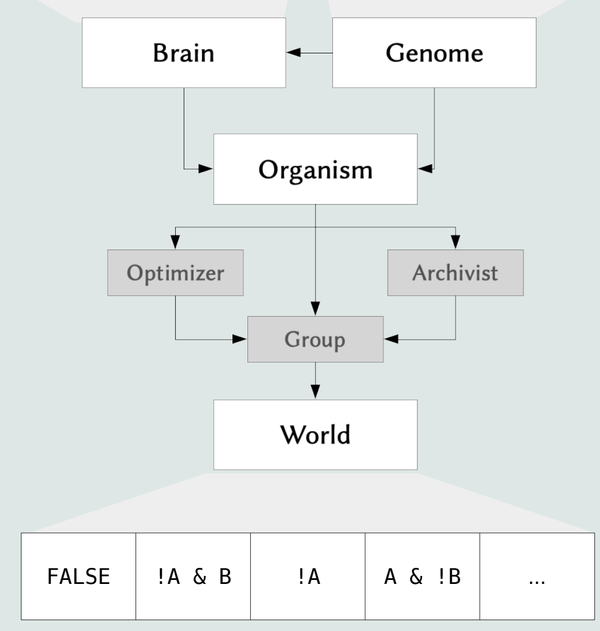
We **expand upon this work** by investigating mutations classified by their **structural impact.**

Methods

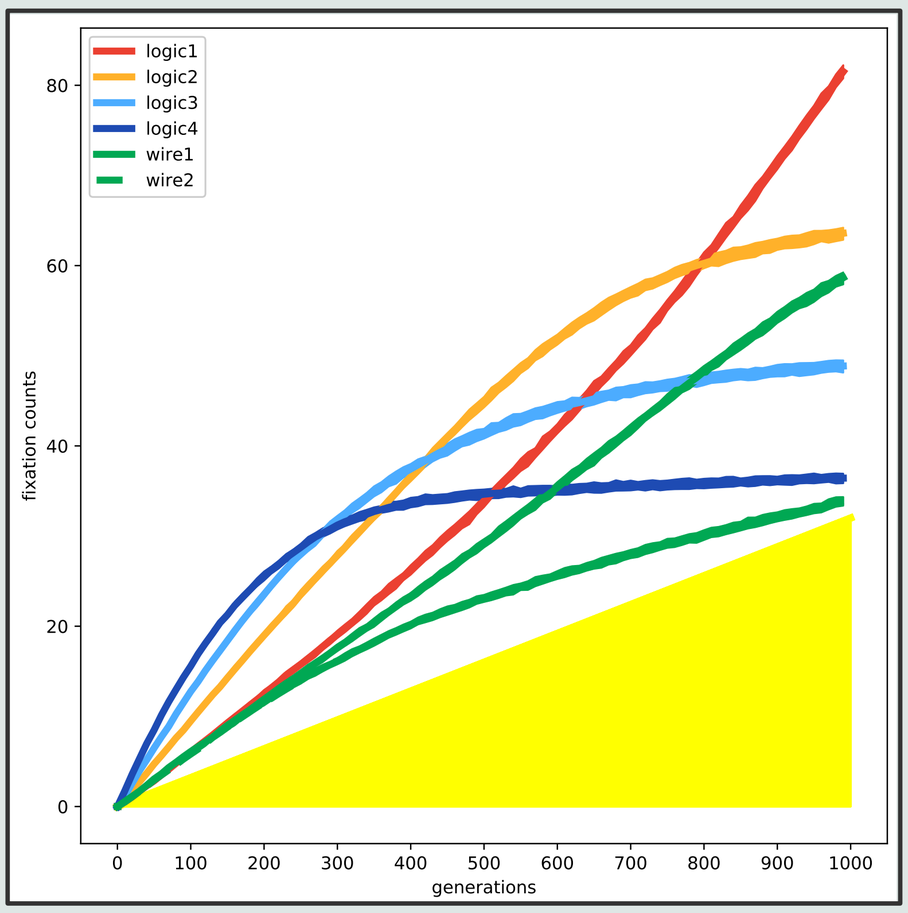
MABE: Modular Agent Based Evolver







Results



- The yellow line indicates the expected mutation rate of 0.001 if mutations were under drift.

Discussion

Mutations which are **beneficial early** in evolution are **suppressed later**, at a rate **inversely proportional** to their early benefit. We call this the **cascade effect**.

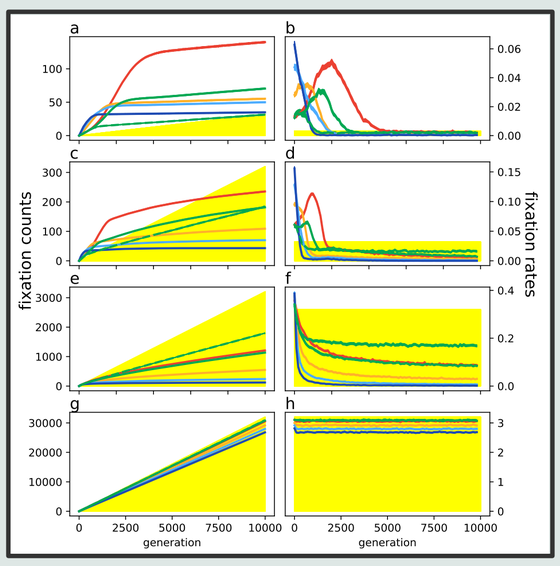
Future Directions

Do these results hold under **rapidly changing environments**?

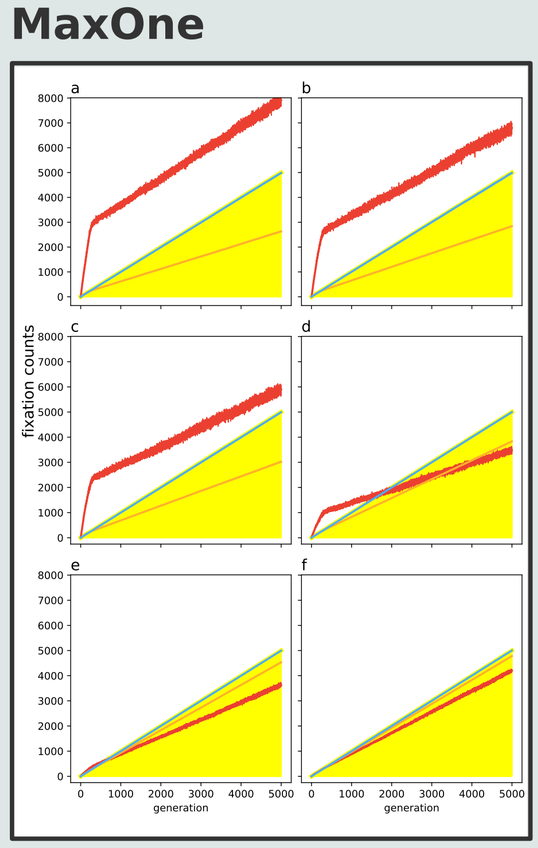
What effect do **epistatic interactions** have on fixation rates and on the cascade effect?

Additional Information

BiLog Brains



MaxOne



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