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# Efficient Resilience Benchmarking of Microservice Architectures

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*et al.*

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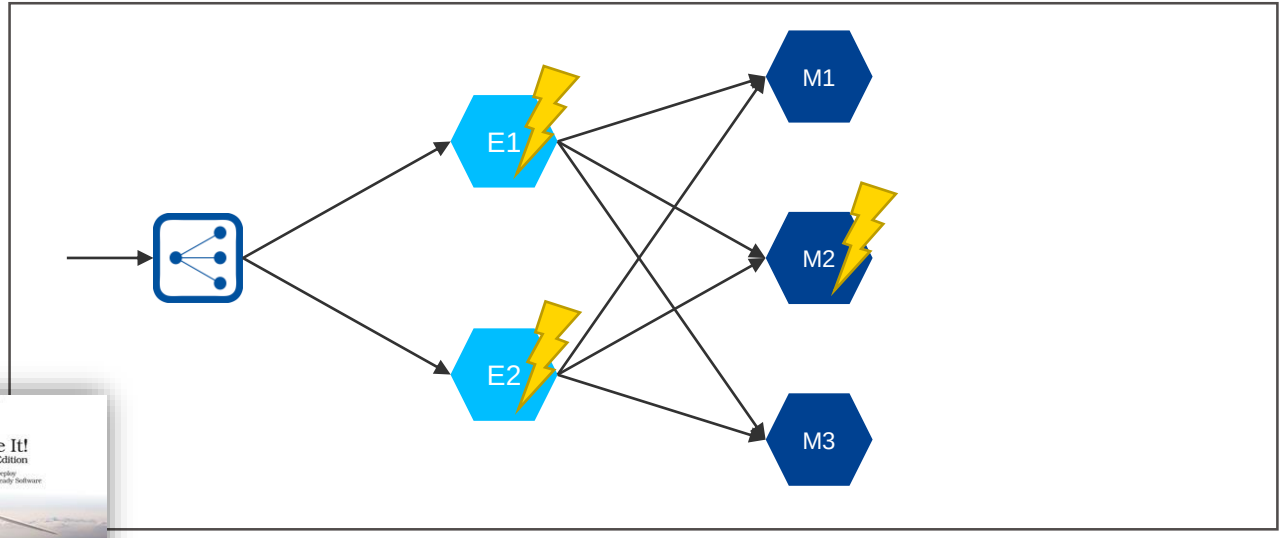
# Resilience Antipattern

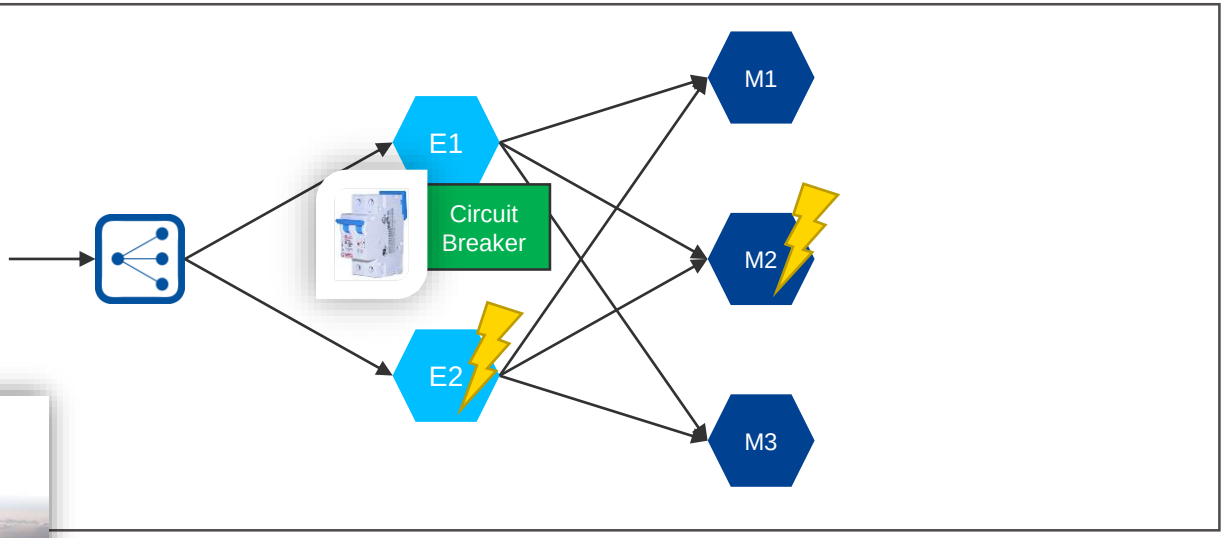
> “Recurring solution to common problem with negative consequences for the system”
>
> (Brown et al. Antipatterns: Refactoring Software, Architectures, and Projects in Crisis. John Wiley & Sons, Inc., 1998)





Cascading Failures

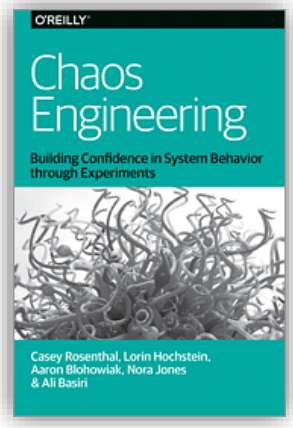
# Resilience Pattern Example: Circuit Breaker




# Resilience Benchmarking – aka Chaos Engineering

- How to accept failures? – Learning by doing:
  Intentionally inject failures into the production system

> "Chaos Engineering is the discipline of experimenting on a distributed system in order to build confidence in the system's capability to withstand turbulent conditions in production." — *Principles of Chaos*

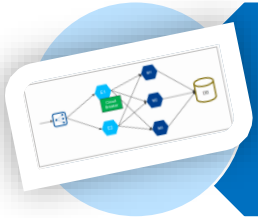


**“Current resilience benchmarking practice is inefficient.”**

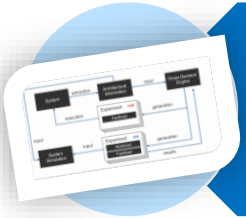
**André et al.**

Goal: **Make it more efficient!**

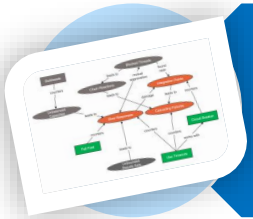
# Idea of the rcas Project



Consider software architectural knowledge to generate experiments



Combine model-based (simulations) and measurement-based („real“) resilience experiments



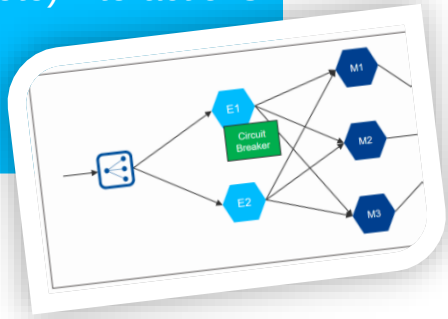
Leverage relationship between resilience patterns, antipatterns, and fault injections

# Envisioned Framework

Static and dynamic analysis + manual enrichment

System → extraction → Architectural Information

- Services, deployment, (remote) interactions
- Patterns and anti-patterns
- Criticality of services
- Steady-state metrics

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Static and dynamic analysis + manual enrichment

System → extraction → Architectural Information → input → Orcas Decision Engine

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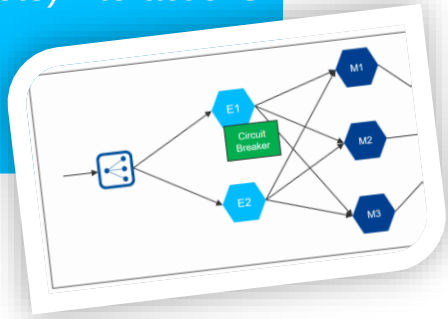
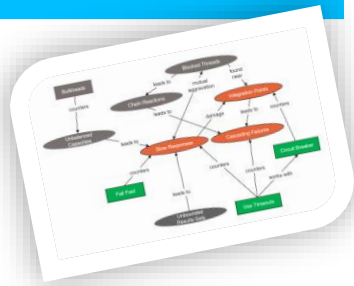



Knowledge and algorithms – „the magic“



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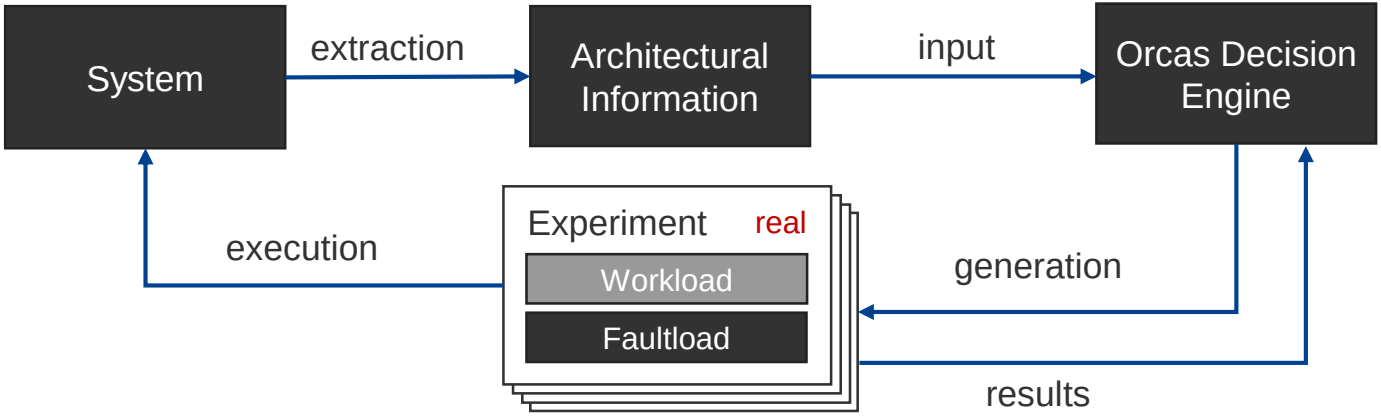


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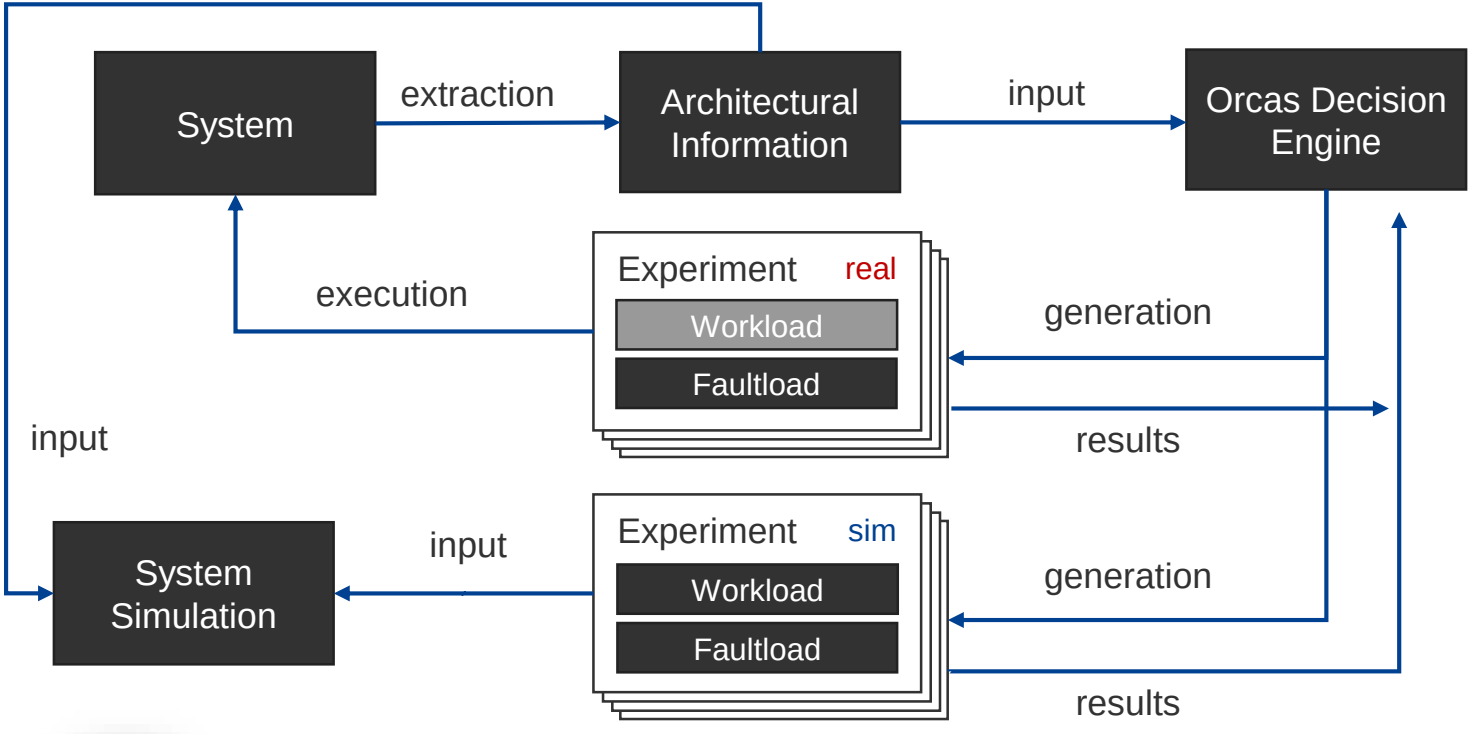


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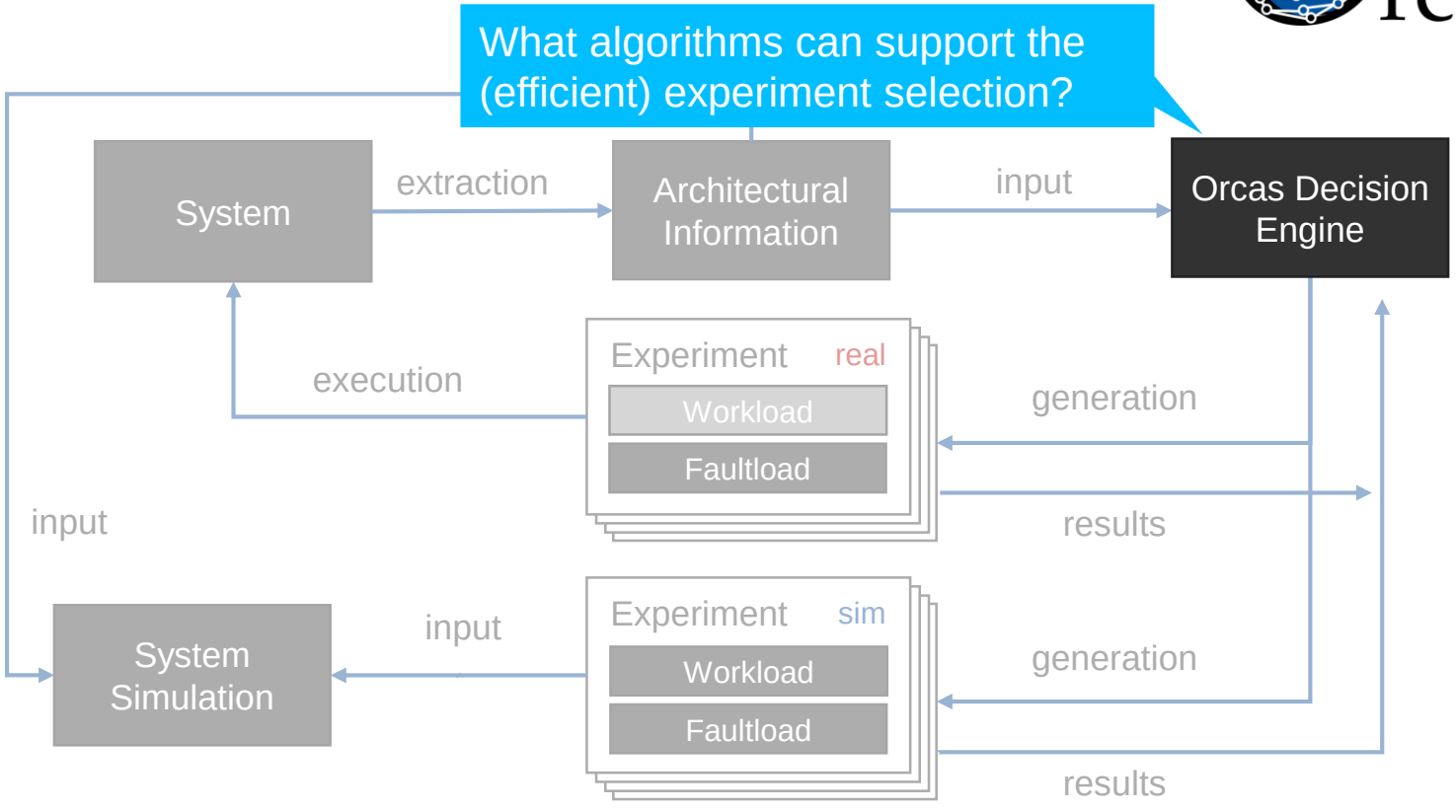
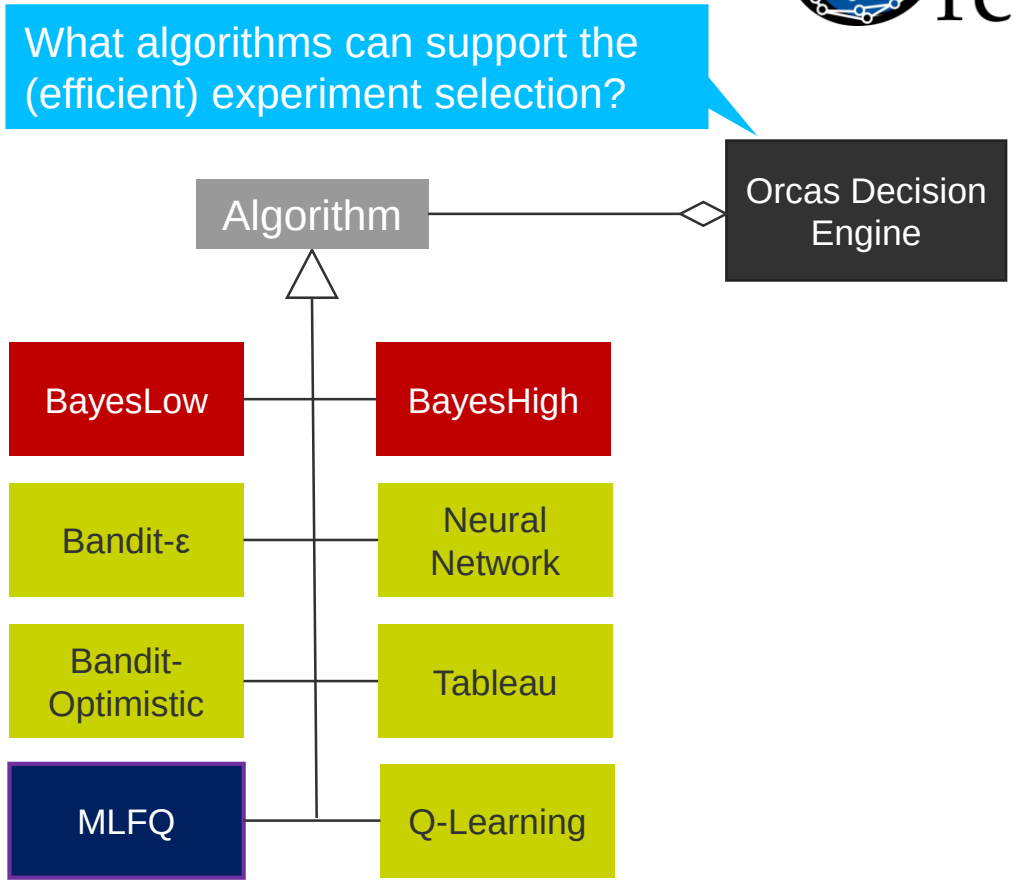
# Envisioned Framework – Decision Engine



# Decision Engine

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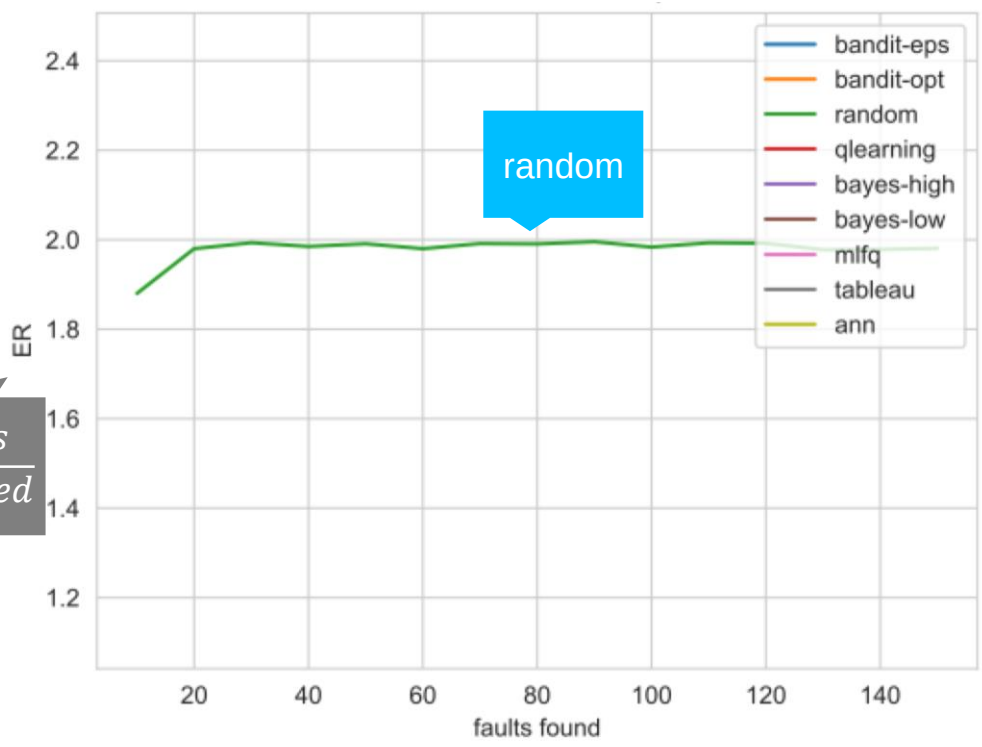
# Initial Results – Efficiency Rate (ER)

How do the algorithms compare with respect to the (fault detection) efficiency of the generated experiments?




$$\frac{\#experiments}{\#faultsRevealed}$$

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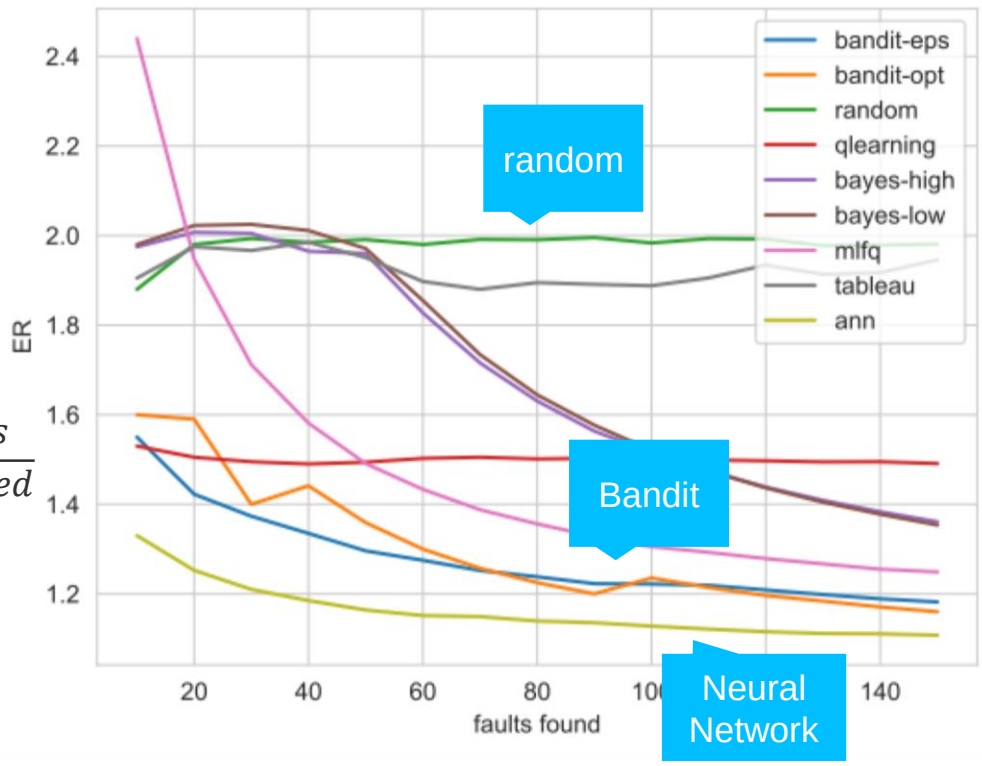


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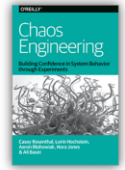
- Who is doing this?
  - Game Day exercises
  - Simian Army for AWS
  - Error Monkey for Node.js

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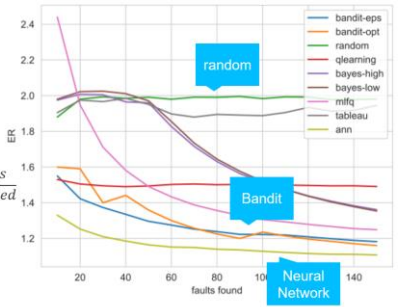


van Hoorn et al.: Efficient Resilience Benchmarking of Microservice Architectures

## Current and Next Steps

- Extended experimental evaluation
- Simulator extension and validation
- Combination with simulations
- + (anti-)pattern/injection knowledge
- Industry case study

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https://github.com/orcas-elite/