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ENERGY SCIENCES NETWORK

# Debugging Bad Performance in Huge Infrastructure: Using ML and AI


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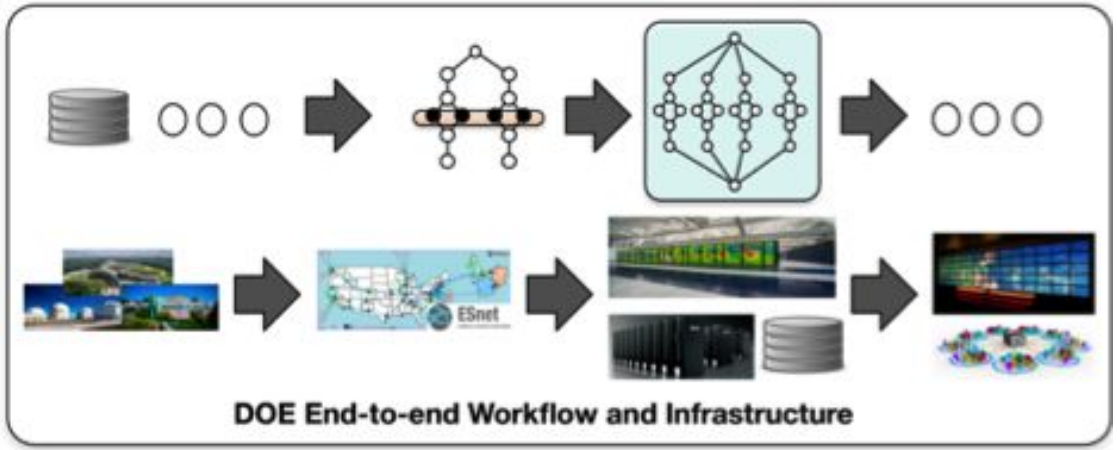
U.S. DEPARTMENT OF ENERGY
Office of Science

BERKELEY LAB

# Complex Workflows using Distributed Facilities




Workflow Performance analysis

Infrastructure Troubleshooting

- Distributed workflows massive computations and large data movements
- Workflow performance:
  - debug performance
  - performance optimization
- Infrastructure Troubleshooting:
  - Anomaly finding
  - root cause analysis

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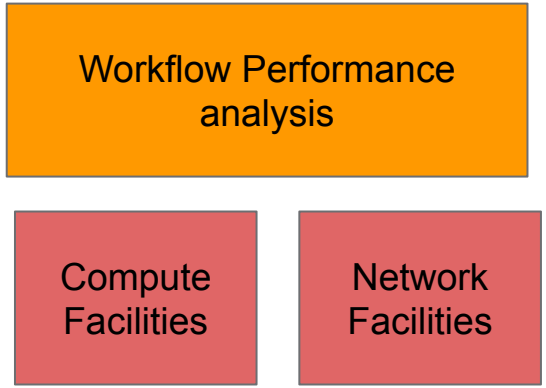
# Challenge: Working with Distributed Facilities




- Current infrastructures are not designed to diagnose bad performance in distributed settings
- Distributed performance data repositories

- RQ: Can we use ML/AI to build “normal” profiles to debug problems

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# Focusing on Network Behaviors

Science Workflows use TCP to guarantee data delivery, but what if something goes wrong

- Less Throughput
- Packet loss
- Packets reordered

Costing the credibility of experiments

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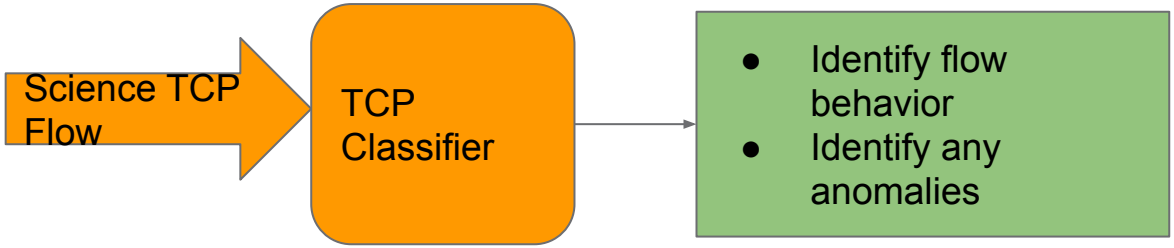
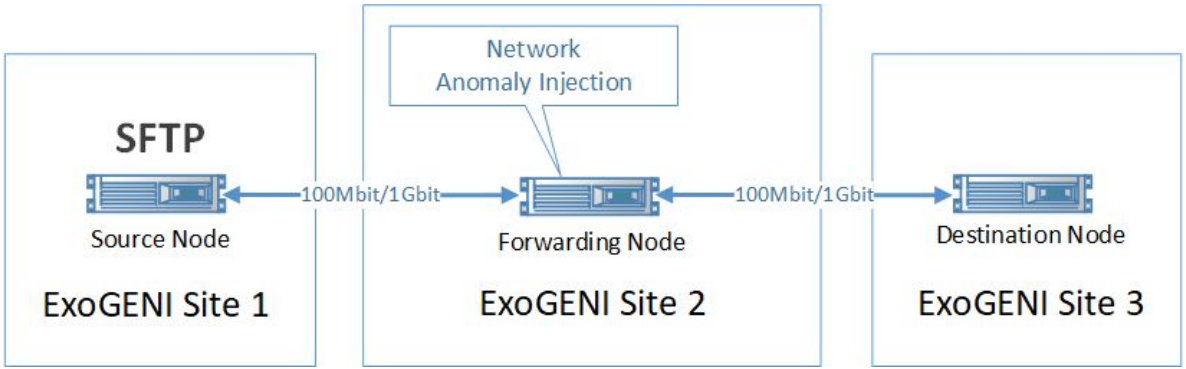
# Building Classifiers for ML/AI

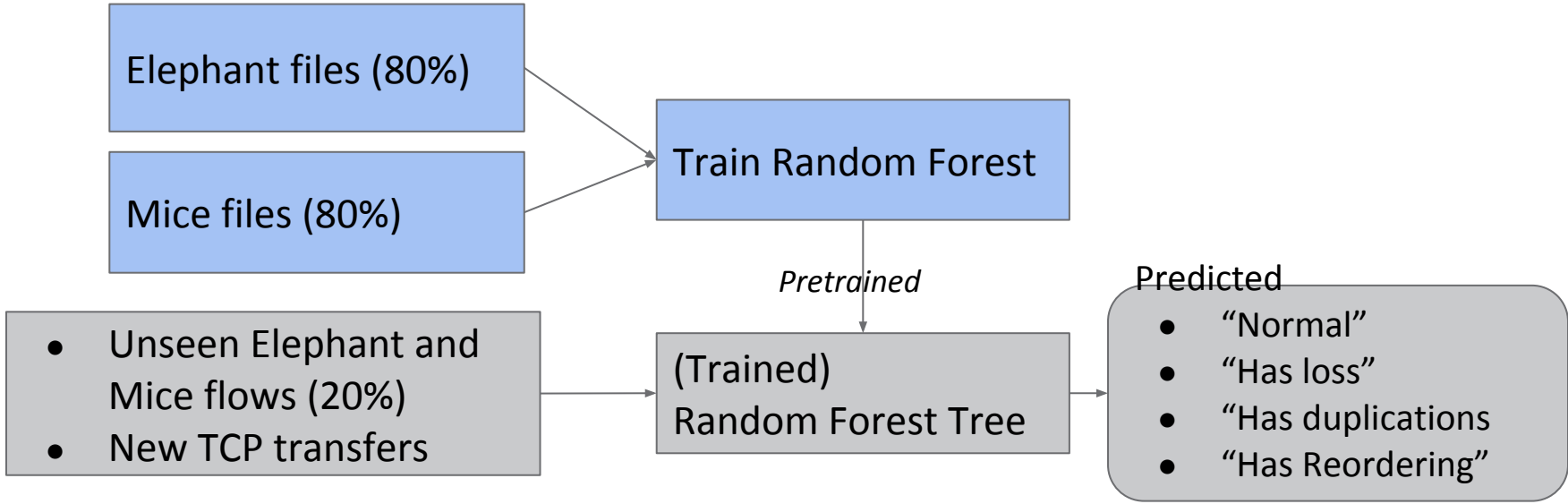



Build “normal” and “abnormal” TCP profiles

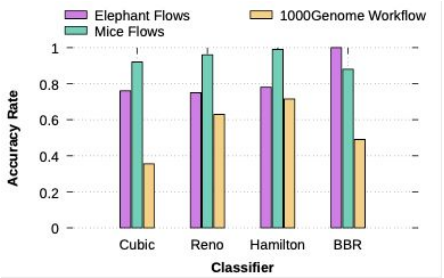
Train ML Classifiers to identify behavior patterns



# Deploying Classifiers at Network Edge




Challenge: Need labelled data sets for training classifiers

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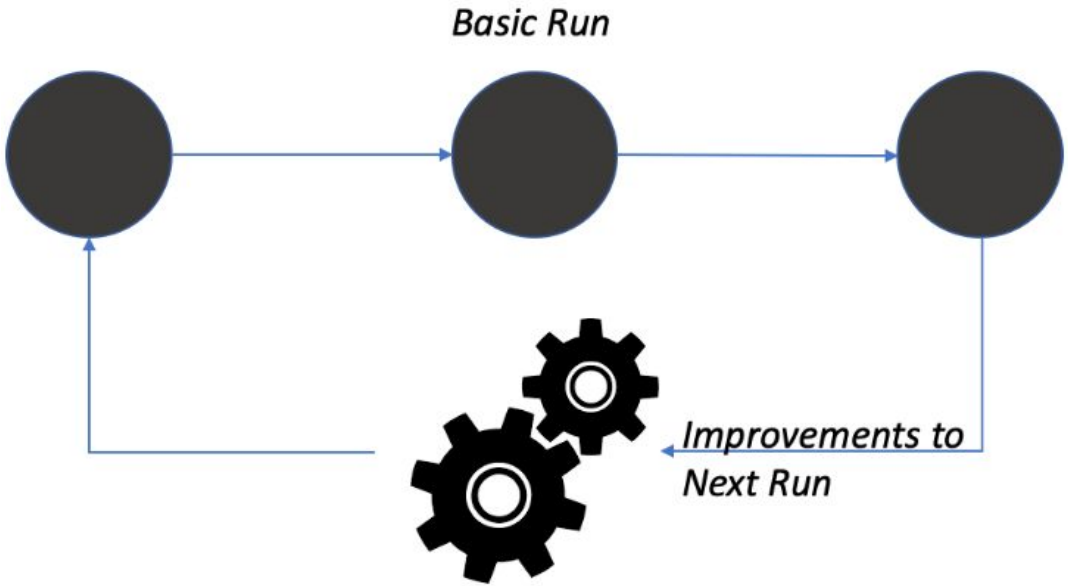
# Next Phase: Self-Learning Classifiers

Adapting Deep Reinforcement Learning to Optimize Classifiers for accuracy




- Try new performance via trial-and-error
- Learn optimum profiles for workflows over time
- Can perform in unlabelled data settings
- Build recommender profiles!

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# Thankyou!

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Multiple projects on ML/AI for Network Operations

Tying it back to Workflows can help scientists debug where problems are occuring

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