

# EFFECTS OF NOISE ON COOPERATION IN HARSH ENVIRONMENTS

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## 01 BACKGROUND

- **Prisoner's Dilemma** used to study how cooperation can emerge in nature
- **Harsh environments** are known to lead to increased cooperation
- **Noise** is the probability that an agent makes a mistake

## PROBLEM

How does noise affect cooperation in harsh environments?

## 02

## 03 METHOD

**Model** using a spatial Prisoner's Dilemma in a harsh environment with noise

Model Parameters

S

Sucker's Payoff

K

Cost of Life

E

Noise

Harshness parameters

## Experimental Settings



### Cooperators vs Defectors

How does noise affect cooperation directly in harsh environments

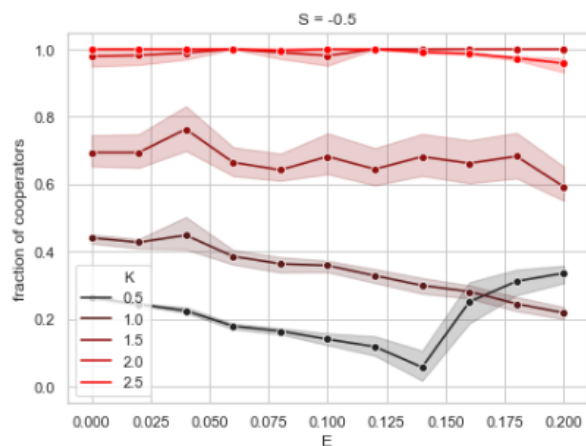


### Tournament

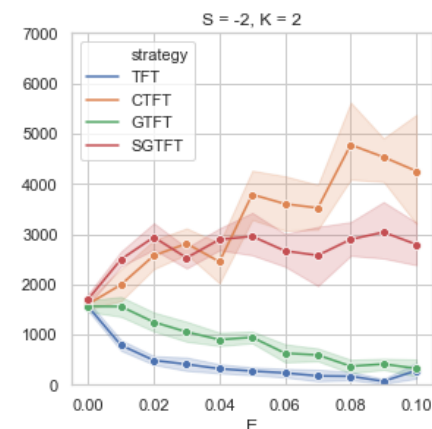
What strategies work best in harsh environments in the presence of noise

## 04 RESULTS

**Noise** decreases cooperation, but **harshness** can help



In harsh environments **Generous** and **Contrite** strategies perform best under noise



## 05 CONCLUSION

Harsh environments promote cooperation. Noise hinders cooperation. When combined,

- If harshness leads to a majority of cooperators, cooperation is more robust against noise
- The benefits of generosity under noise are emphasized in harsh environments
- In harsh environments and high noise, contrite behaviours perform best