Social Foraging for Crime

A Simulation Study on Co-Offenders' Specialization

Ruslan Klymentiev, Paul Jeffrey Brantingham, Rafael Prieto-Curiel, Luis Enrique Correa Rocha & Christophe Vandeviver

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Offending behavior can be seen as foraging

Johnson, 2014; Vandeviver *et al.*, 2021

Offenders are believed to be generalists with occasional specialization

Eker & Mus, 2016

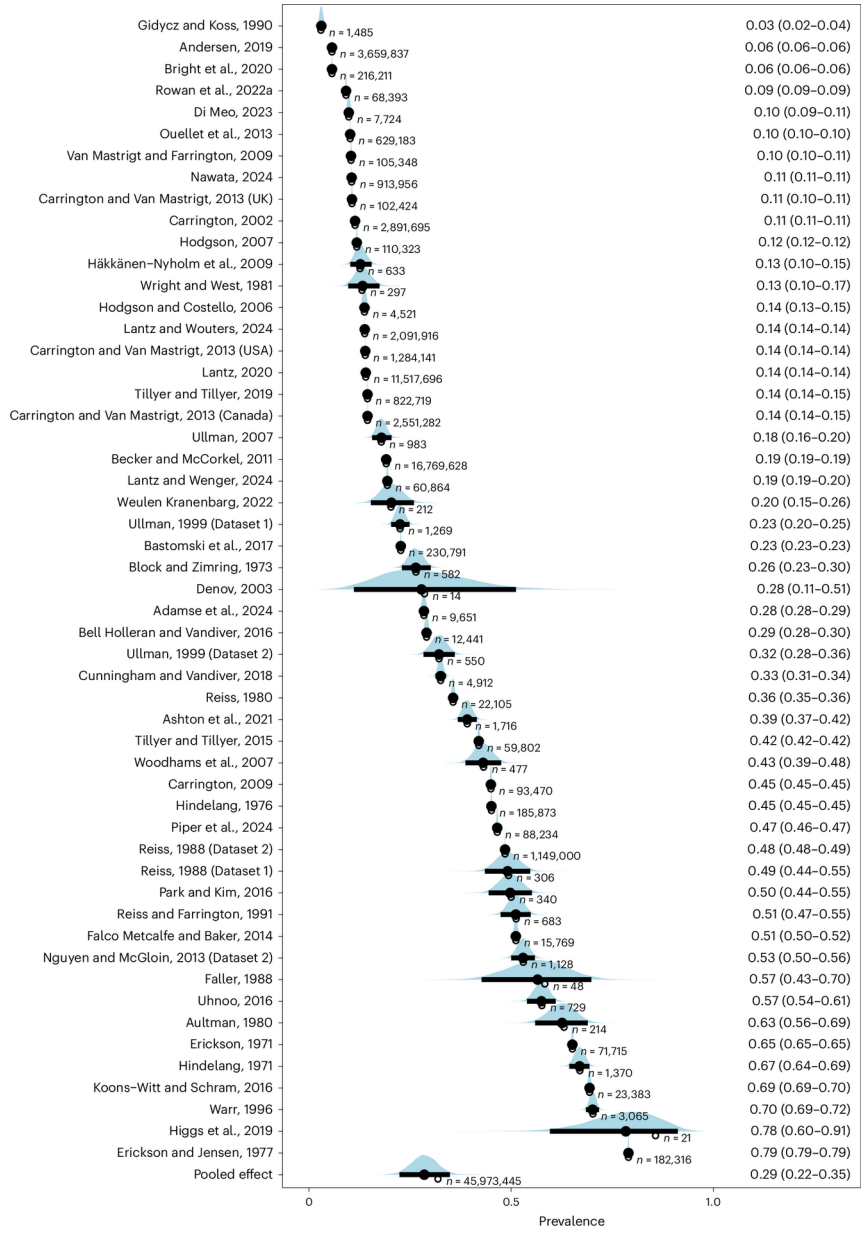
However, what about co-offending?

Co-offending as a means of social exchange

Weerman, 2003

- Access to diverse parts of criminal network leads to a greater generalization (McGloin and Piquero, 2010; Klymentiev *et al.*, 2025)
- Co-offending allows the commitment of more sophisticated crime types (Felson, 2003; Tremblay, 2017)
- Co-offending groups involve offenders with different skills (Bright *et al.*, 2024)

Prevalence of co-offenses



Klymentiev *et al.* (2025)

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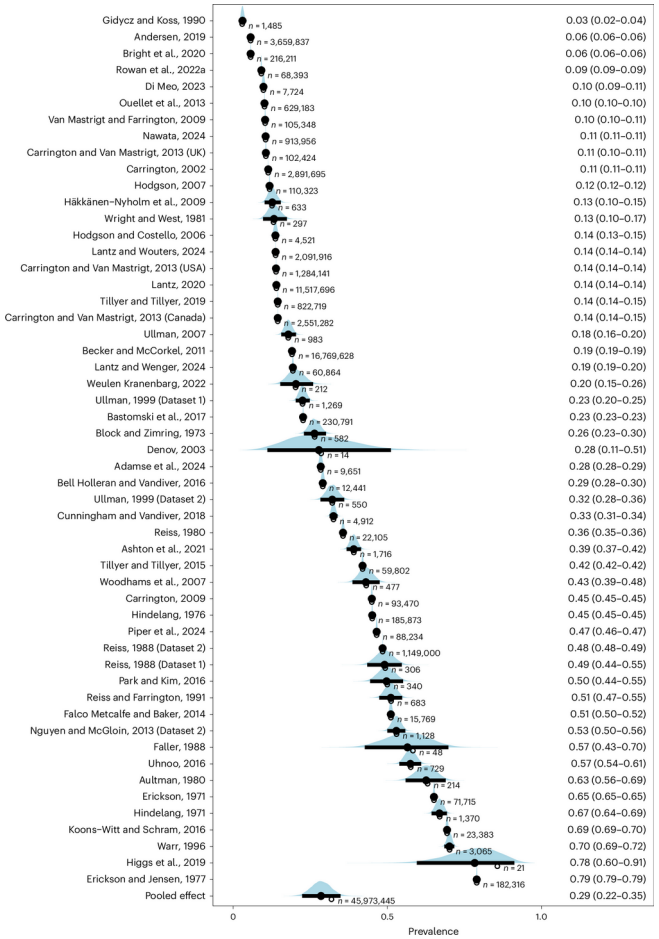
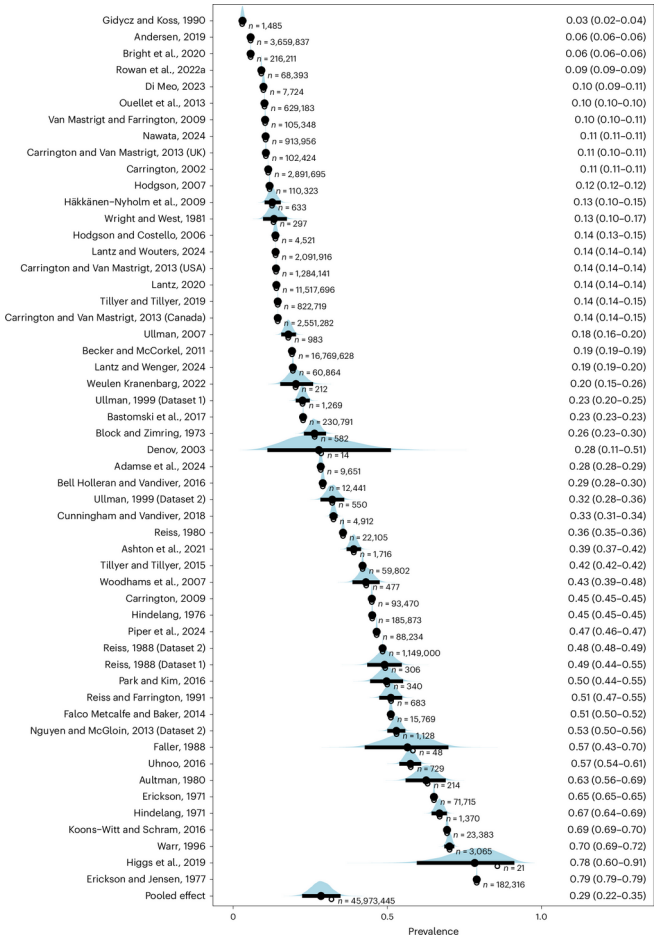


Why is co-offense prevalence less than 5% in some environments, while in others it's greater than 50%?

Prevalence of co-offenses



Why is co-offense prevalence less than 5% in some environments, while in others it's greater than 50%?

Perhaps in some environments it is:

- Hard to find a partner for co-offending (due to availability, not enough trustworthy or skillful partners)
- Crimes are relatively easy to execute alone
- Offenders do not even want to co-offend

Weerman (2003)

Research question

OUTCOME

- Co-offending leads to generalization
- Co-offending allows the commitment of more sophisticated crime types (Felson, 2003; Tremblay, 2017)
- Varying prevalence of co-offending (mean = 30%) (Klymentiev *et al.*, 2025)

Research question

MECHANISM

?

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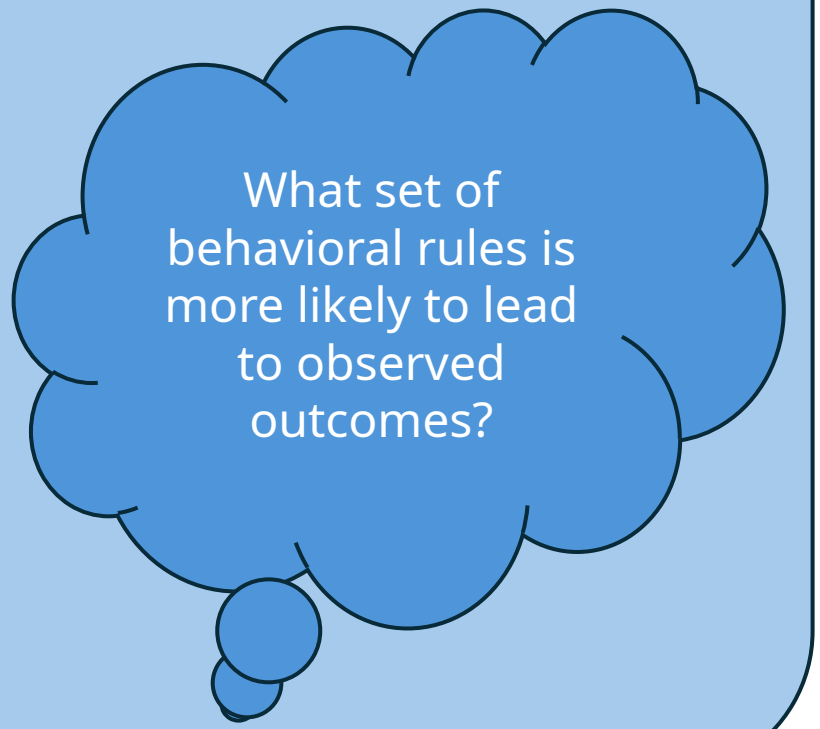

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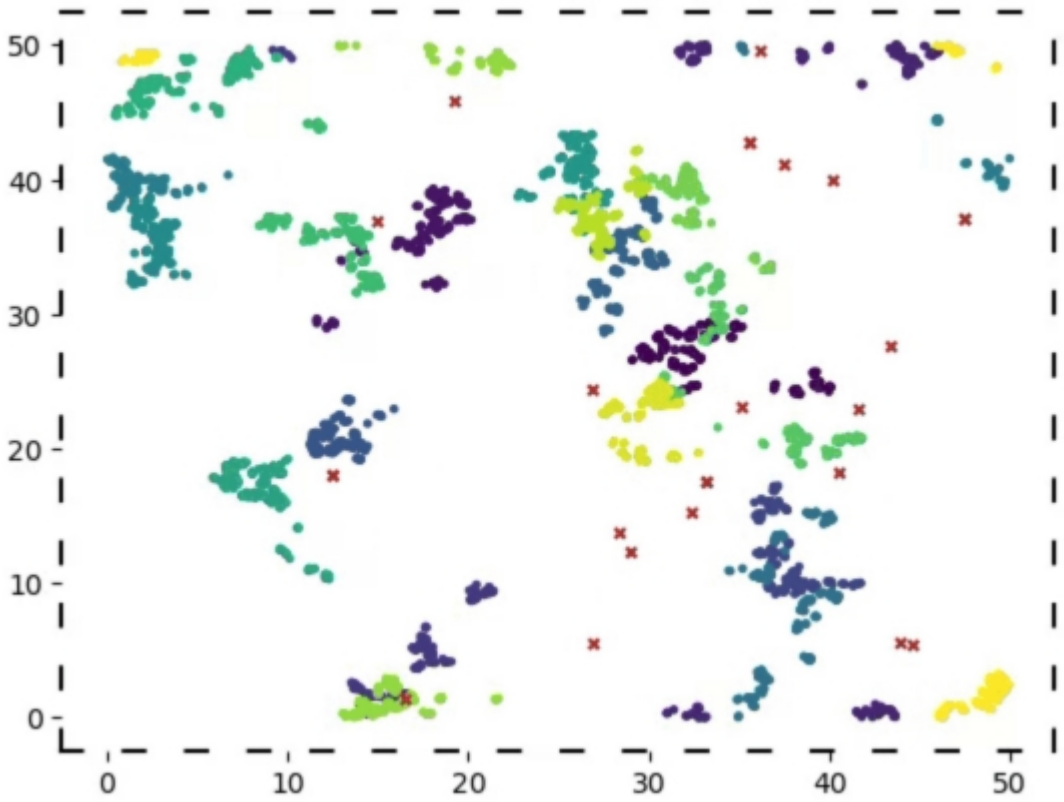
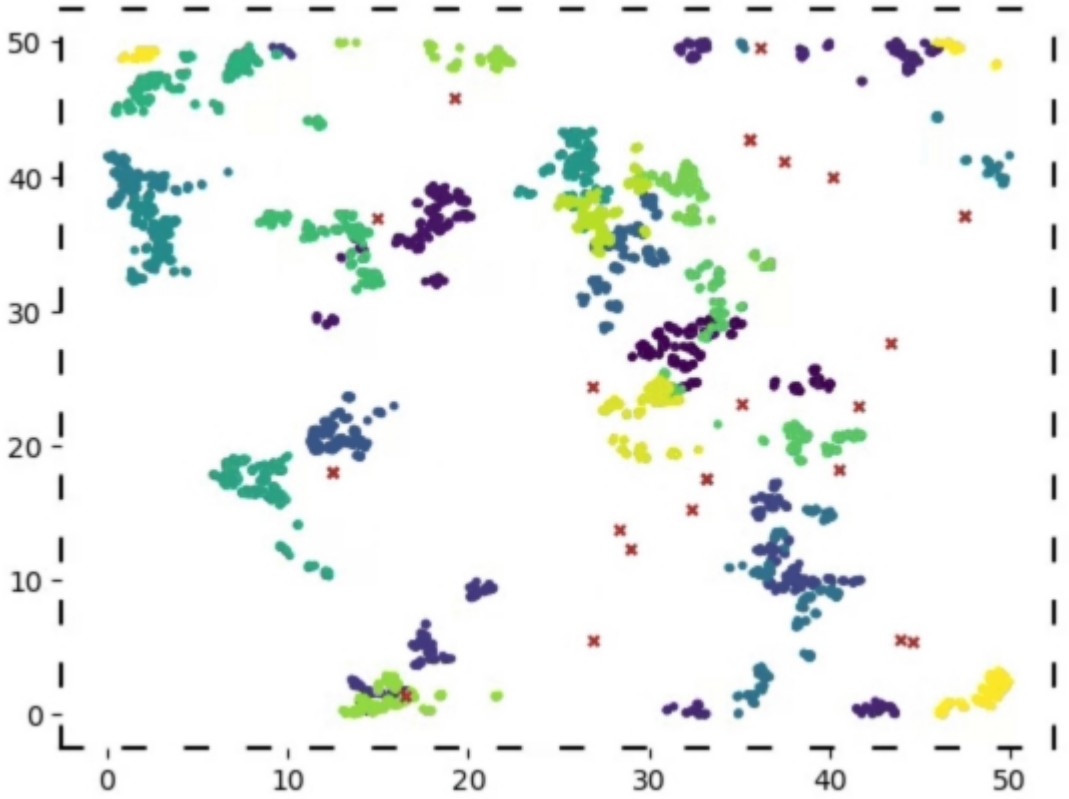
The agent-based model

- Move around (Levy walk)
- Crime opportunity within a search radius?
  - Potential partner(s) within a partner search radius?
  - Make a decision based on trust and skill preference
    - Solo offense
    - Co-offense
- Repeat until no crime opportunities left



The agent-based model

- Parameters to explore:
  - Partner search radius
  - Skill preference
  - Trust preference
  - Crime complexity



Preliminary results

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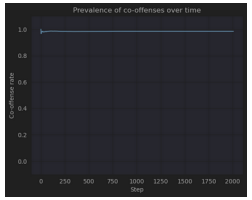

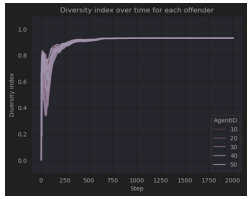

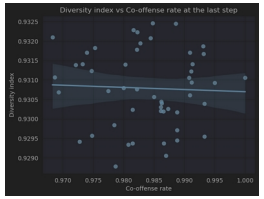

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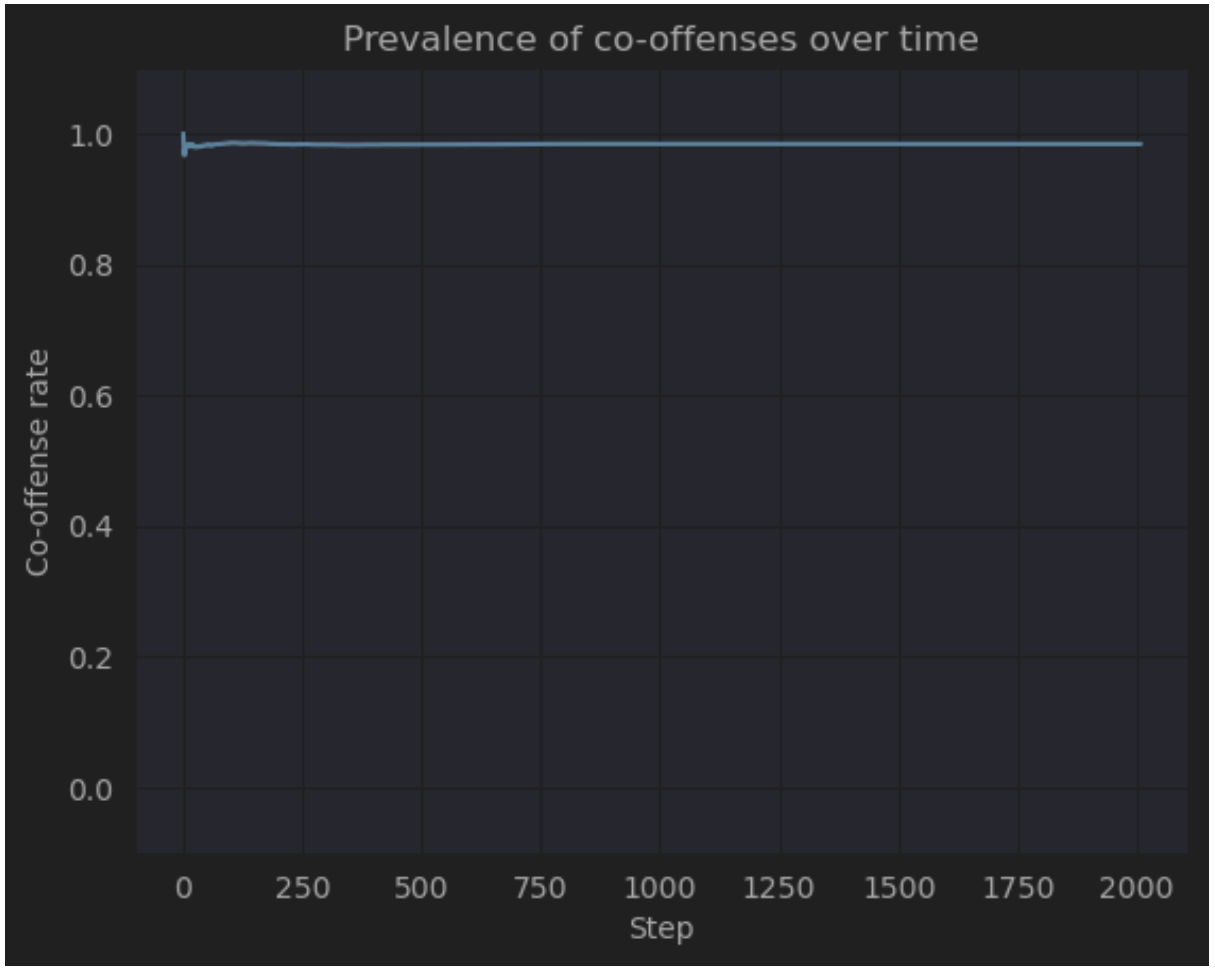

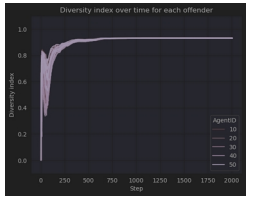

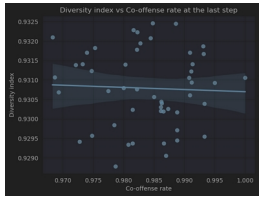

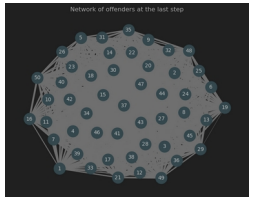

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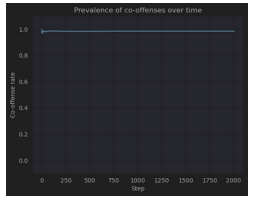

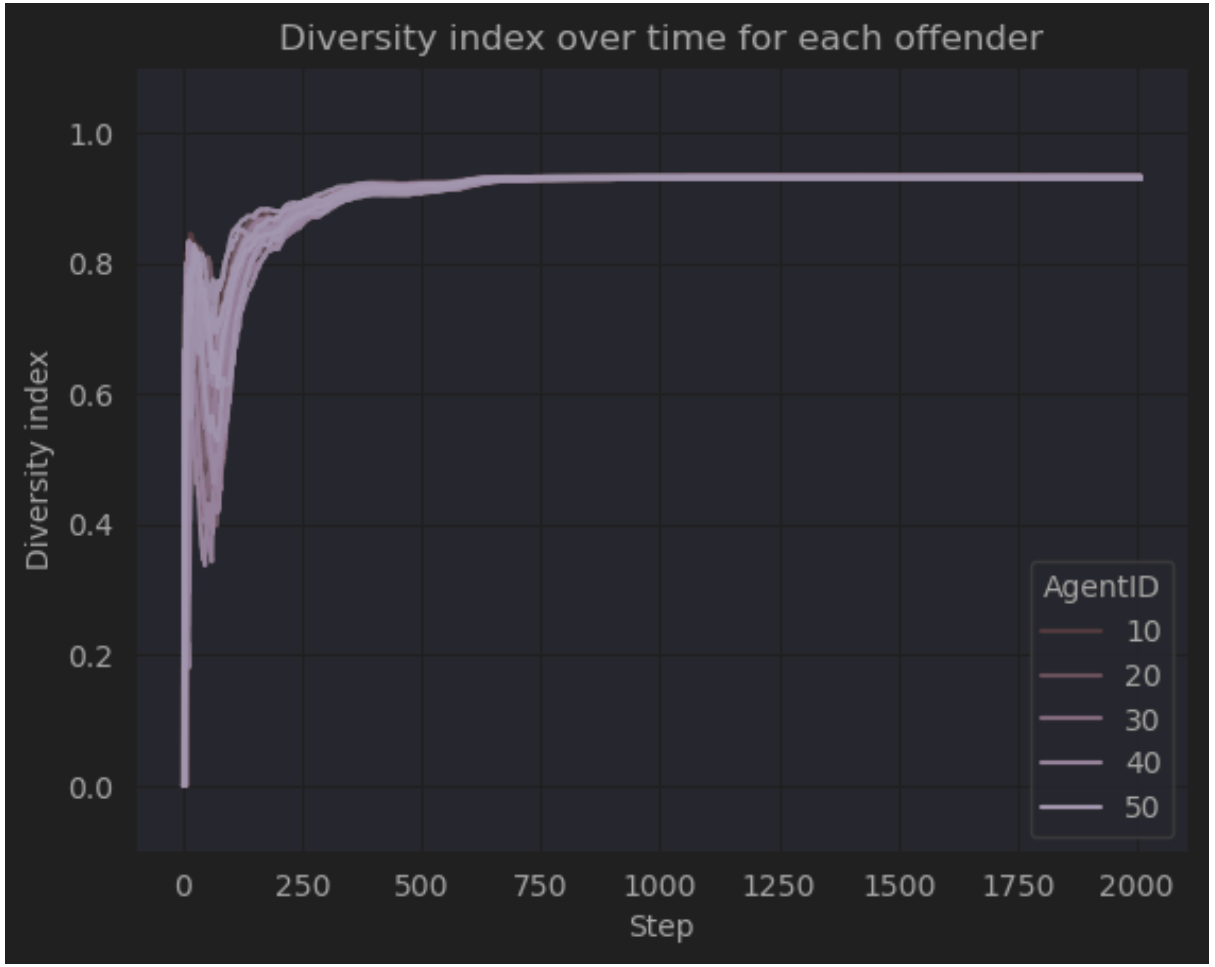

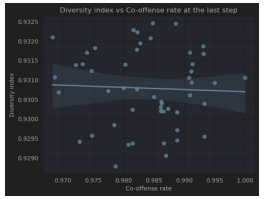

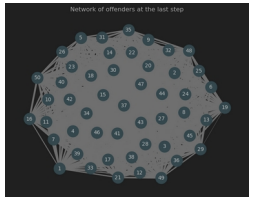

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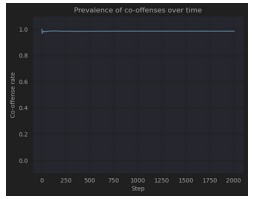

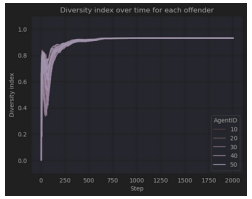

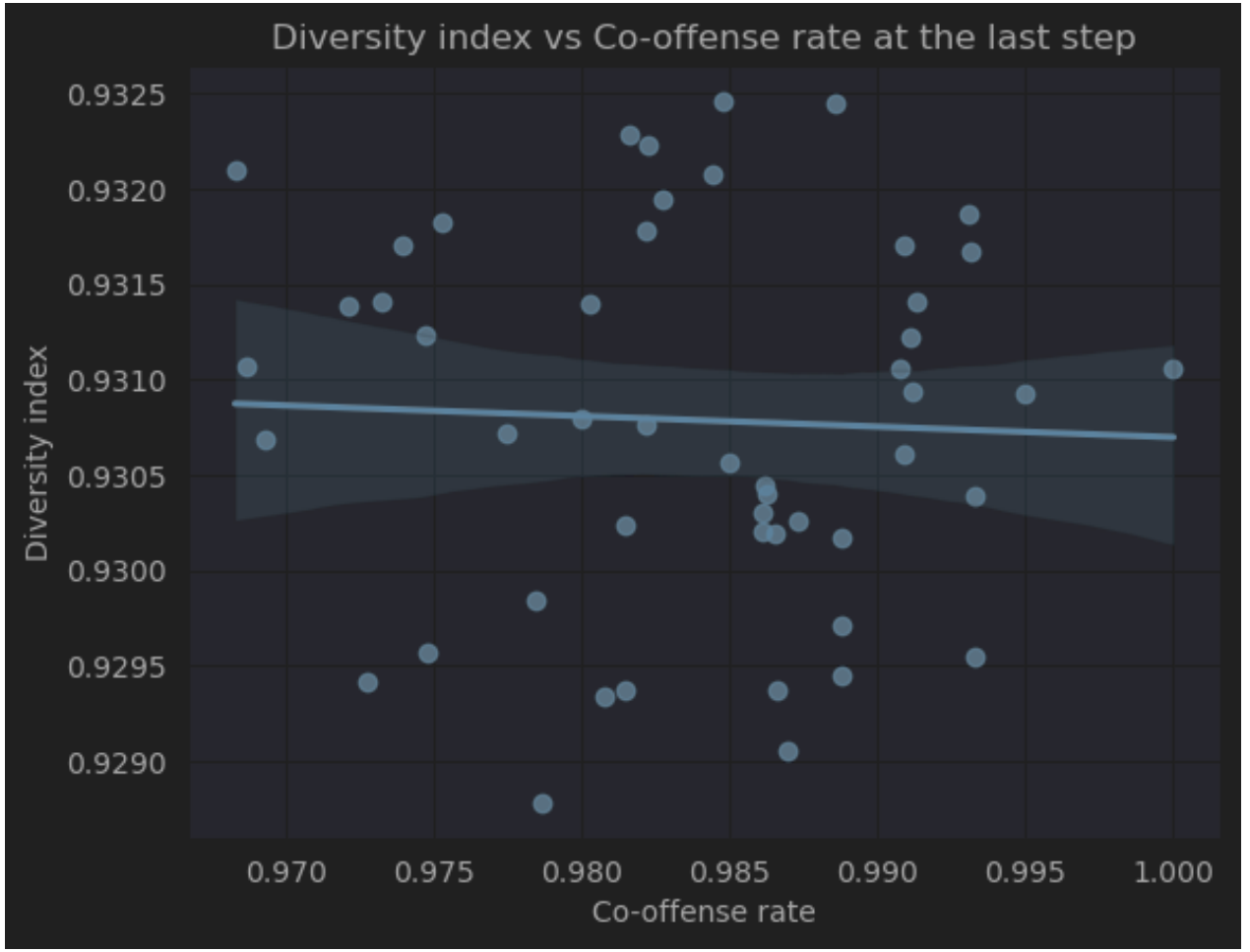

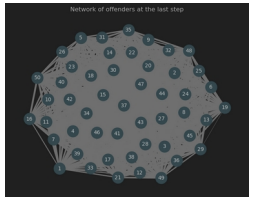

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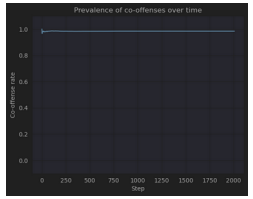

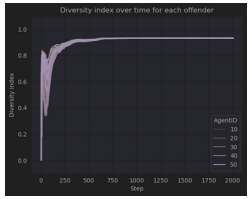

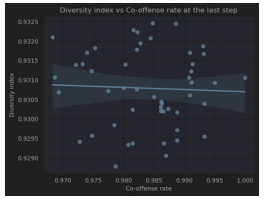

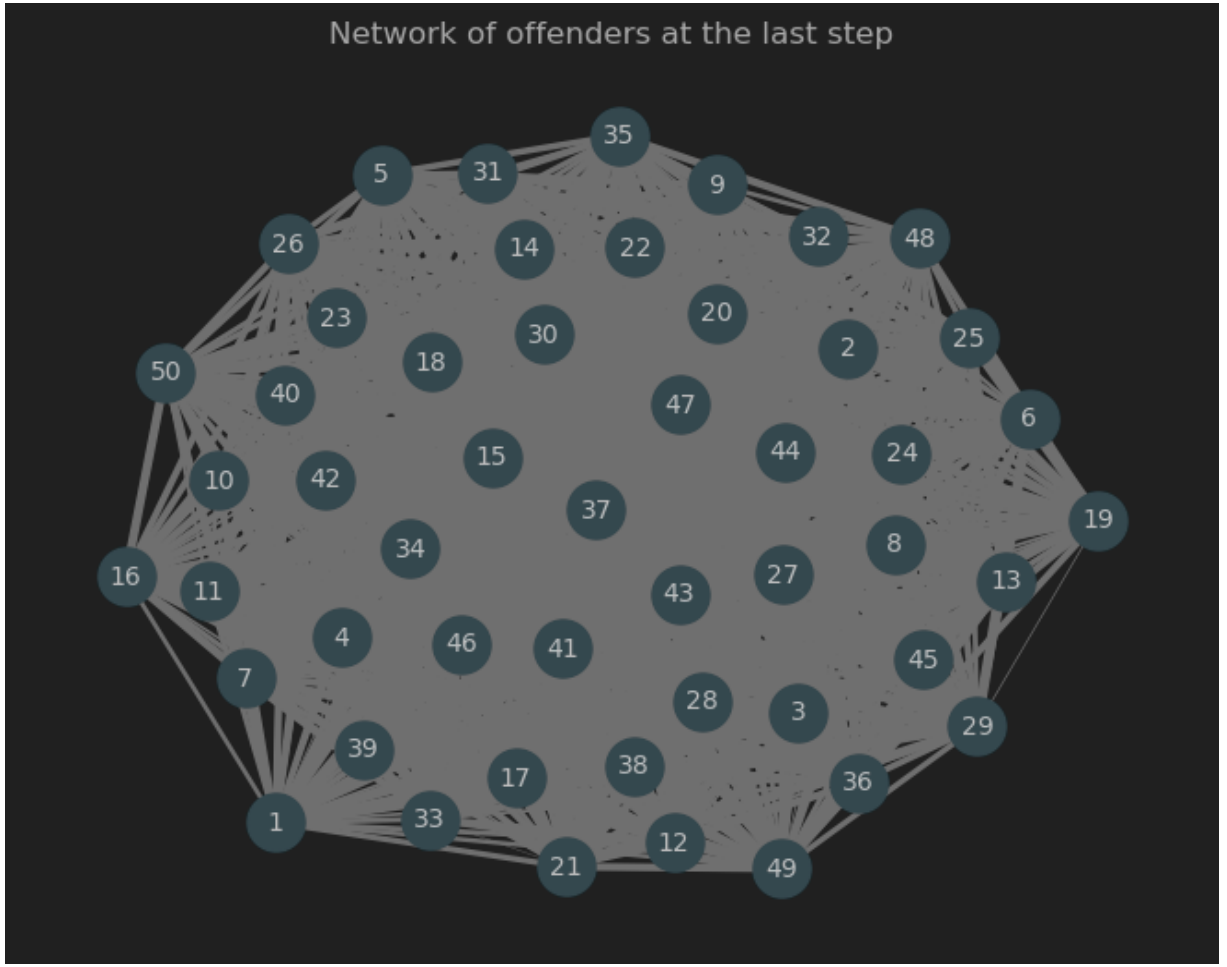

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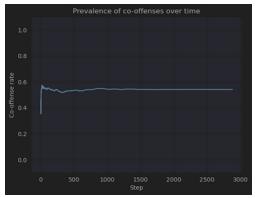

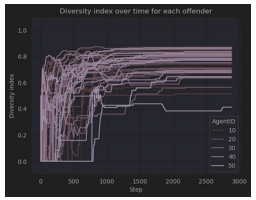

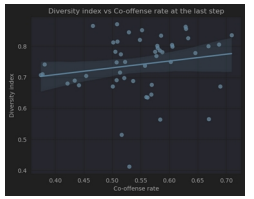

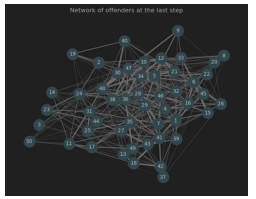

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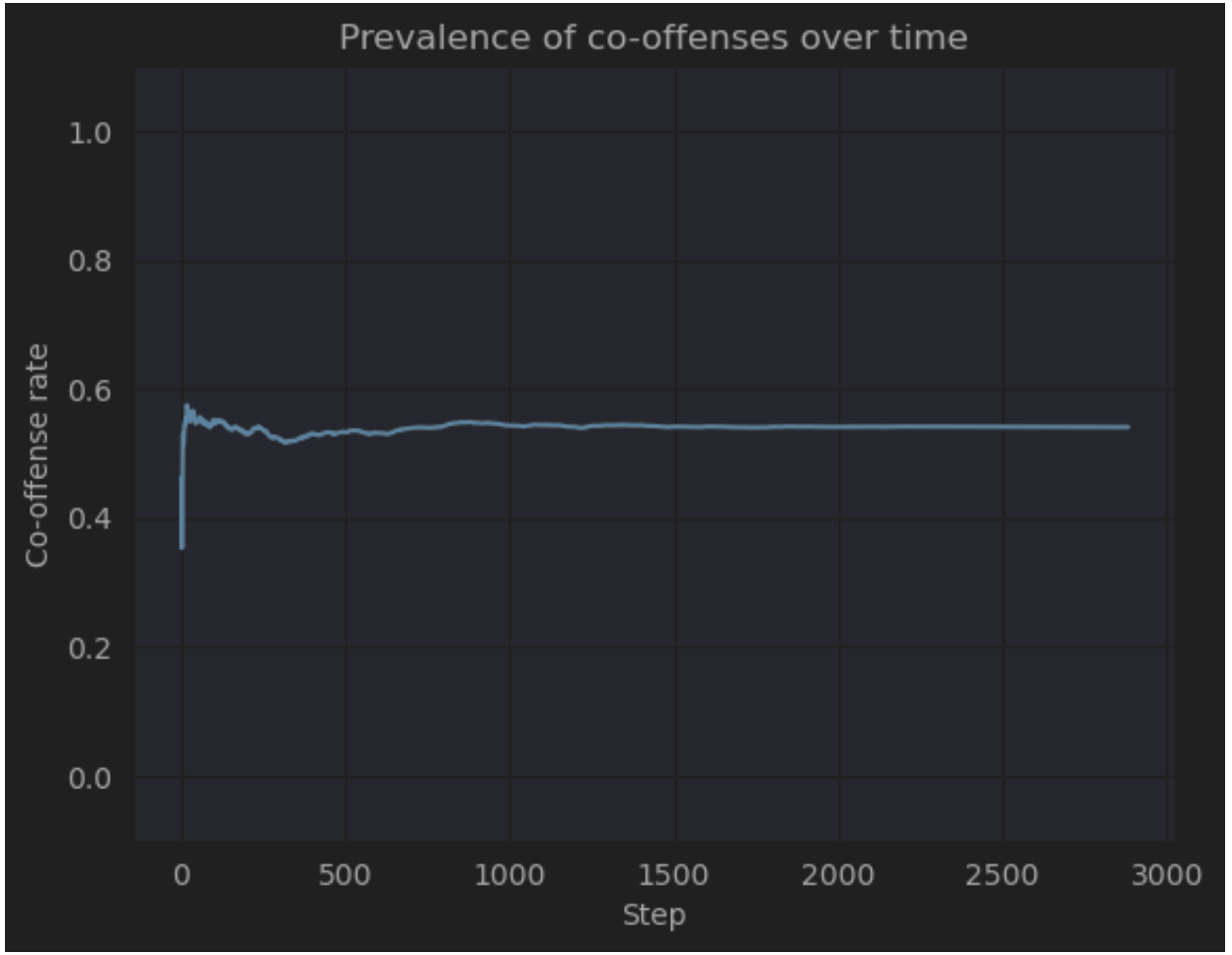

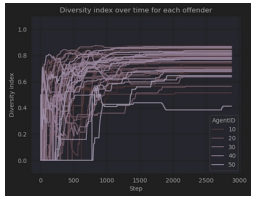

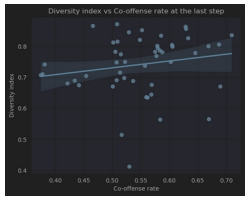

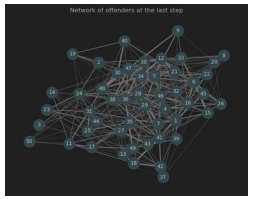

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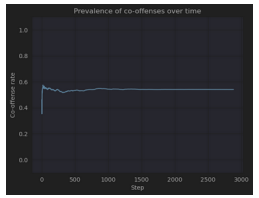

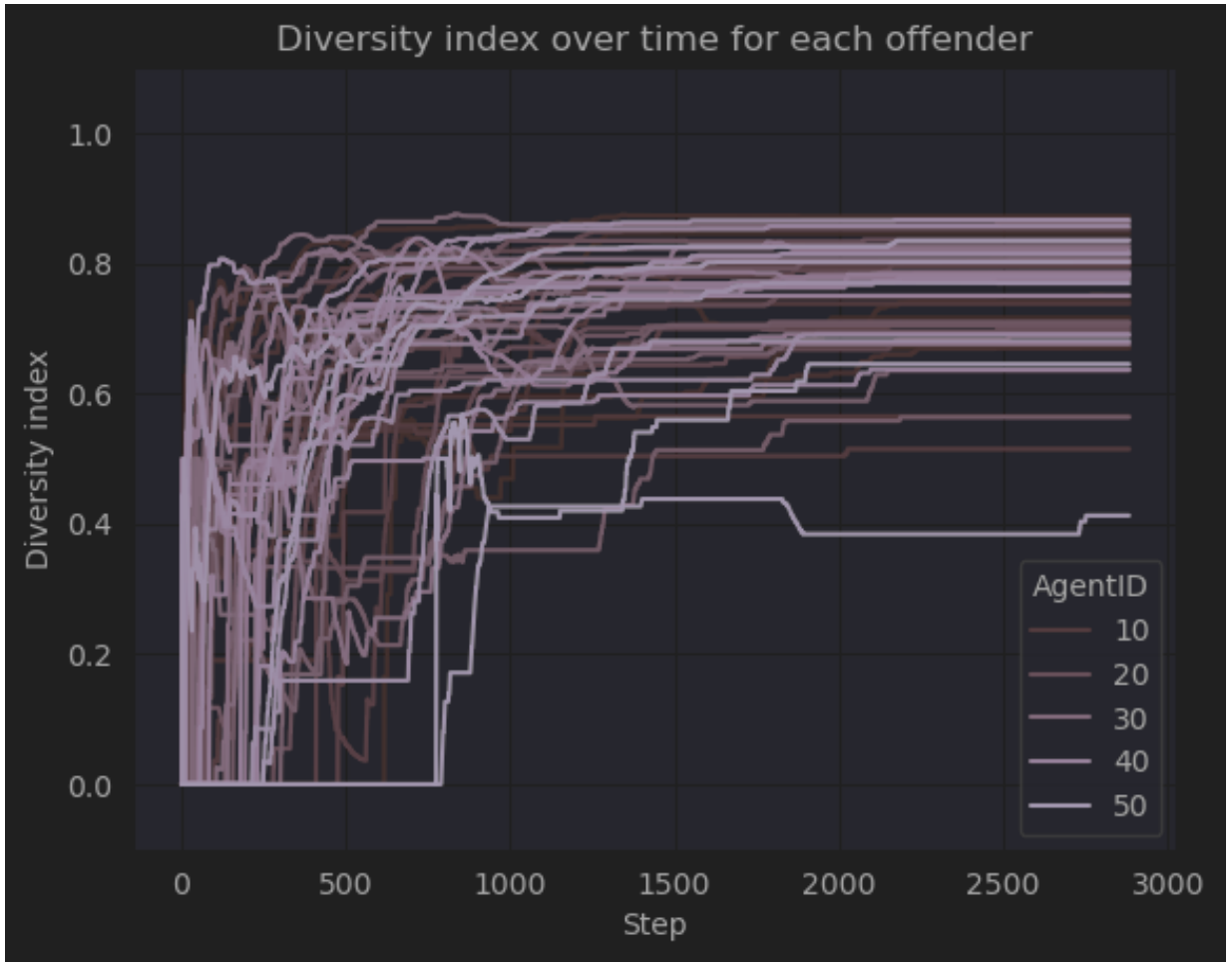

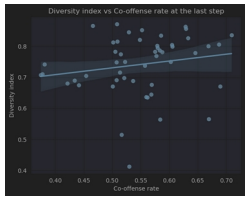

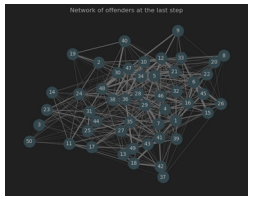

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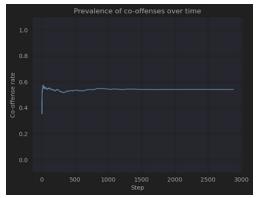

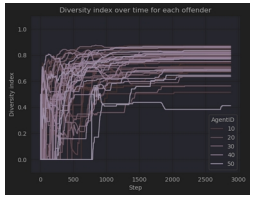

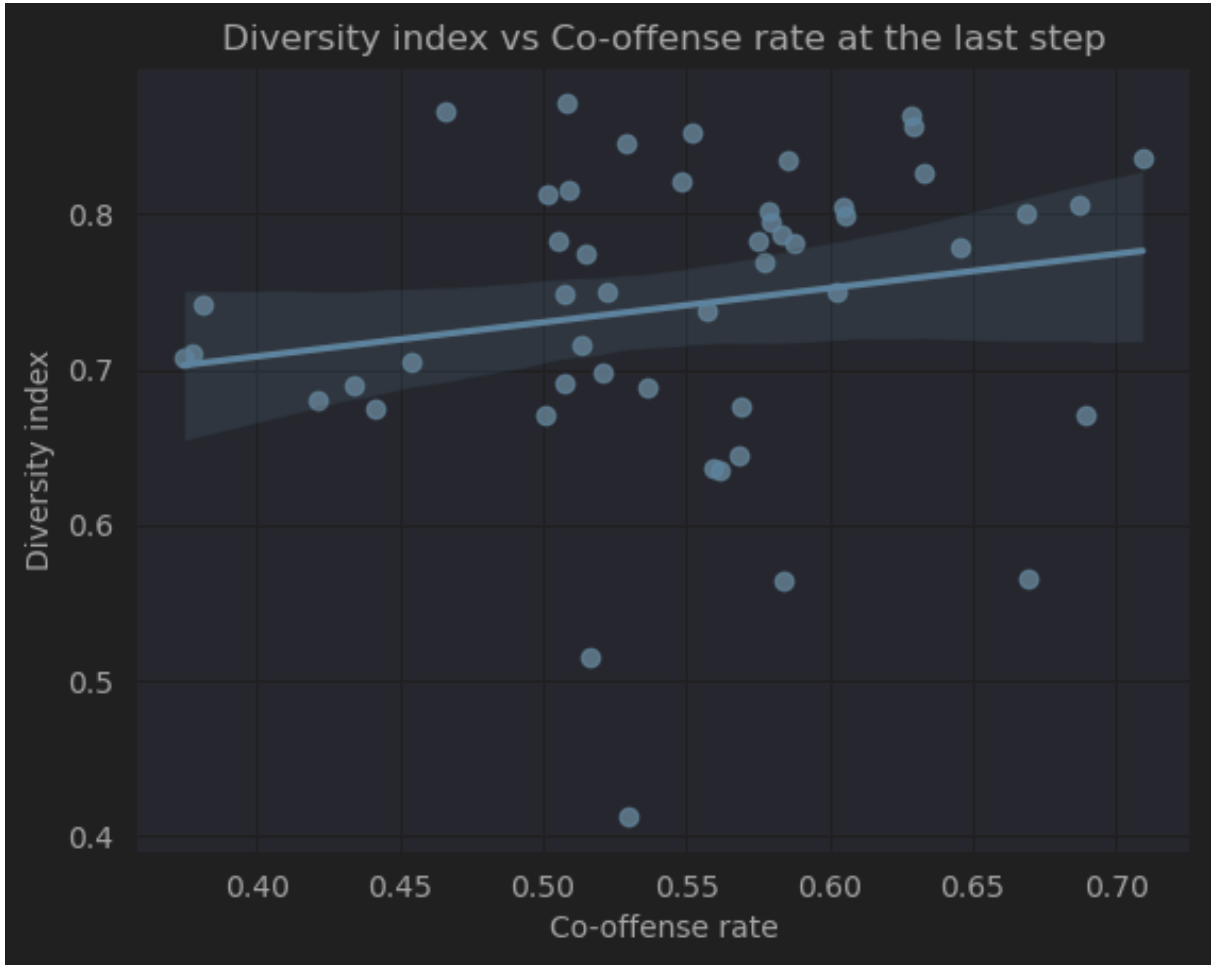

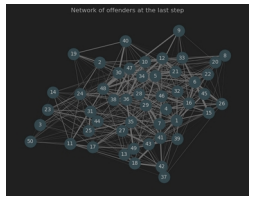

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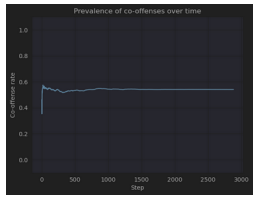

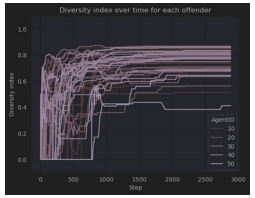

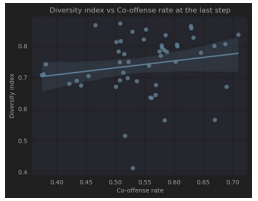

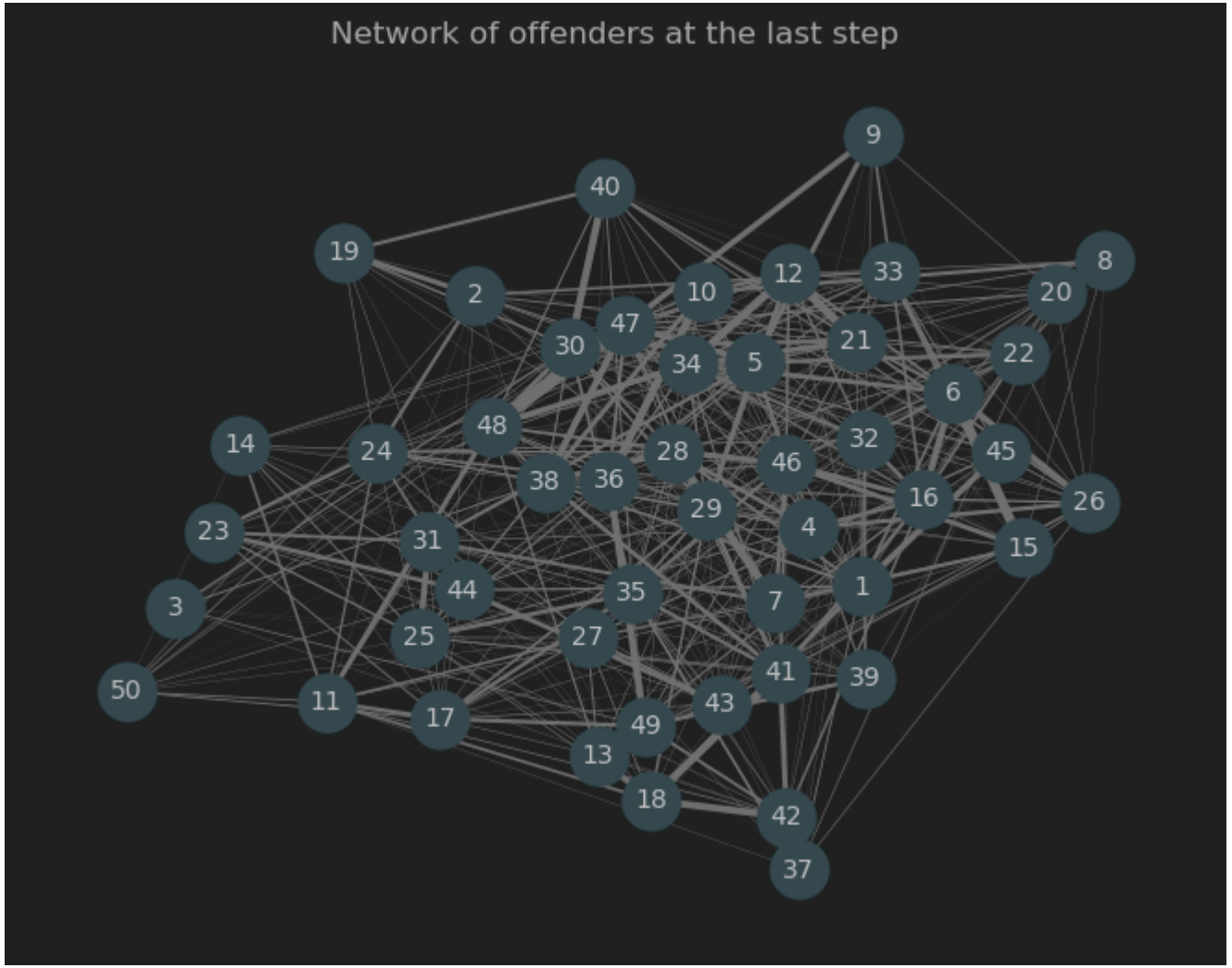

Future directions

- Assess the interaction between parameters
- Quantify the expected outcomes

Team:

- Ruslan Klymentiev
- Paul Jeffrey Brantingham
- Rafael Prieto-Curiel
- Luis Enrique Correa Rocha
- Christophe Vandeviver

Ruslan Klymentiev
PhD Candidate
Ruslan.Klymentiev@UGent.be

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Skill and trust preference

- Skill level = number of previous successful crime events
- Trust level = number of previous successful collaborations
- Assign probability for each potential partner and the agent itself (for solo offending)

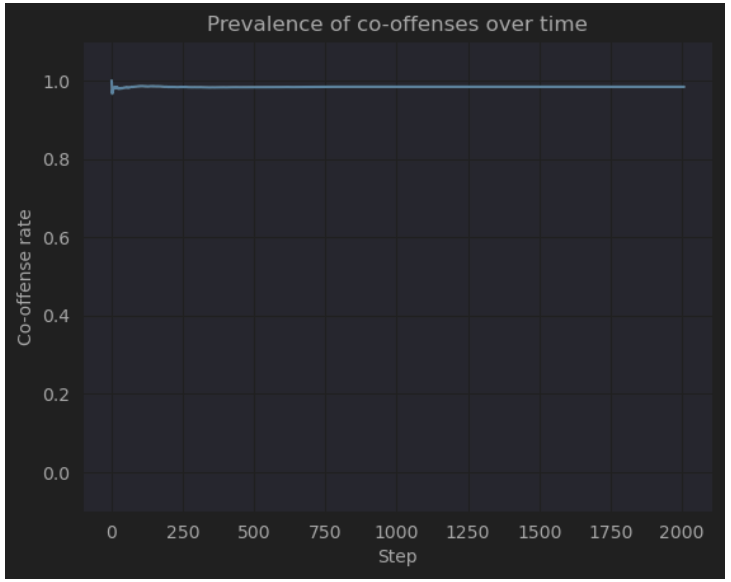
$$P(j) = \text{softmax}(\beta_{\text{trust}} \cdot T_{ij} + \beta_{\text{skill}} \cdot S_j)$$

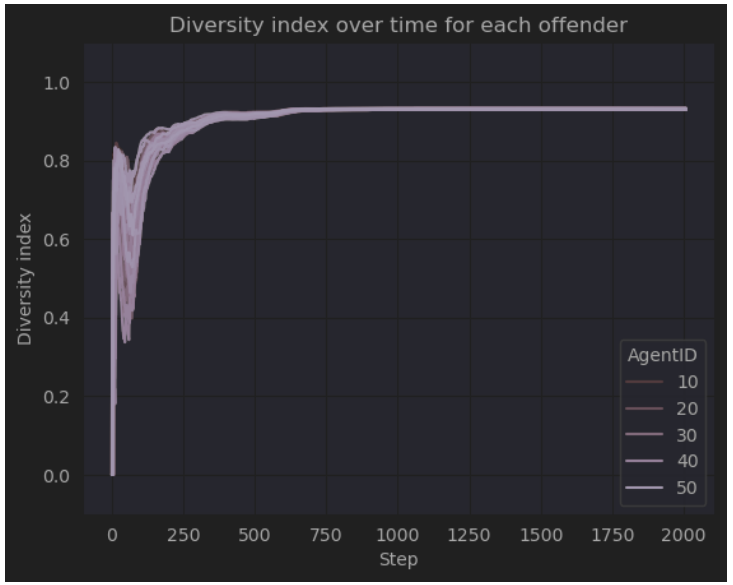
Co-offenders’ specialization

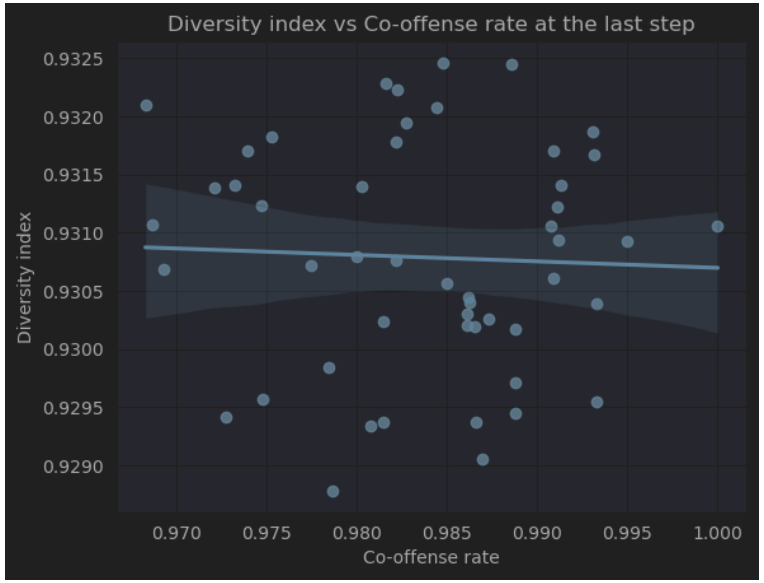
- McGloin and Piquero (2010): redundancy of ego-centric network = more versatility
- Nieto et al. (2024): 54% (of 1,796 co-offending groups) were specialists, 46% were generalists
- Grund and Morselli (2017): 47% were entirely specialists, around 30% were entirely generalists, and the remainder showed mixed behavior

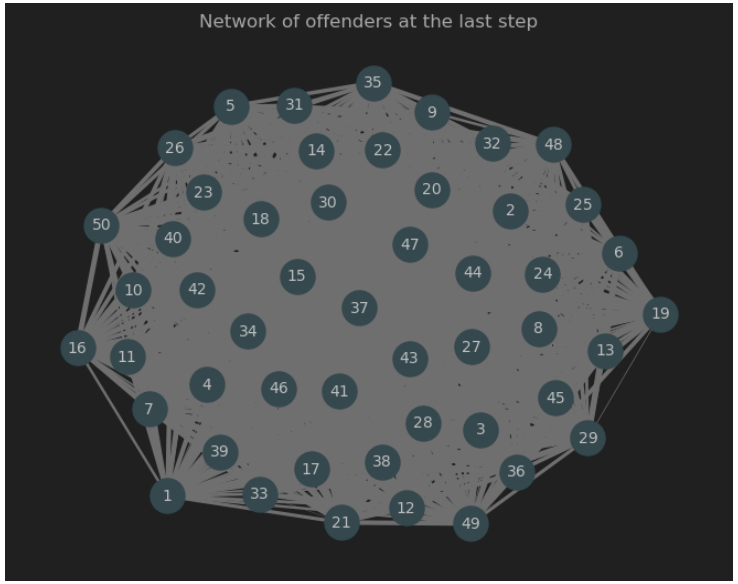
Preliminary results

Scenario 0: Random (everyone can access everyone without skill or trust preference)



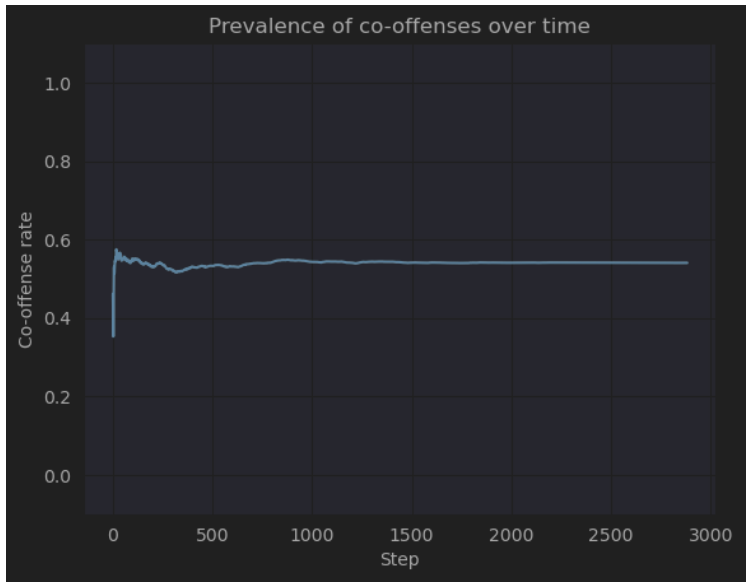


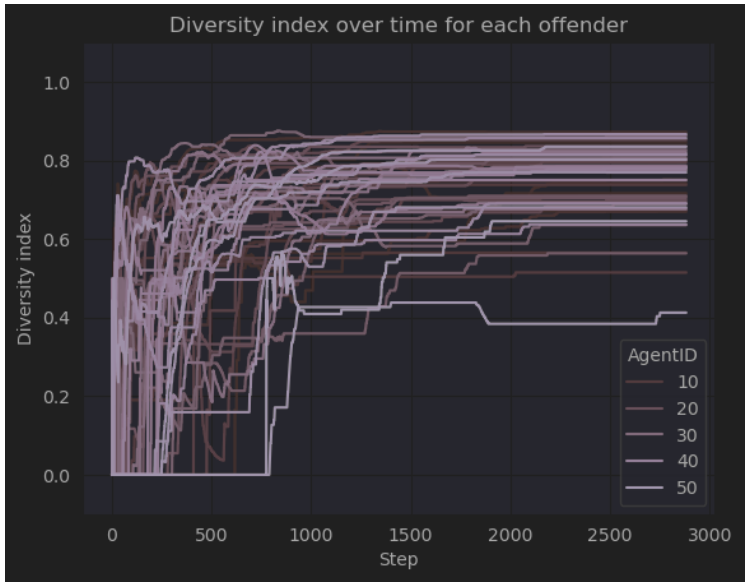


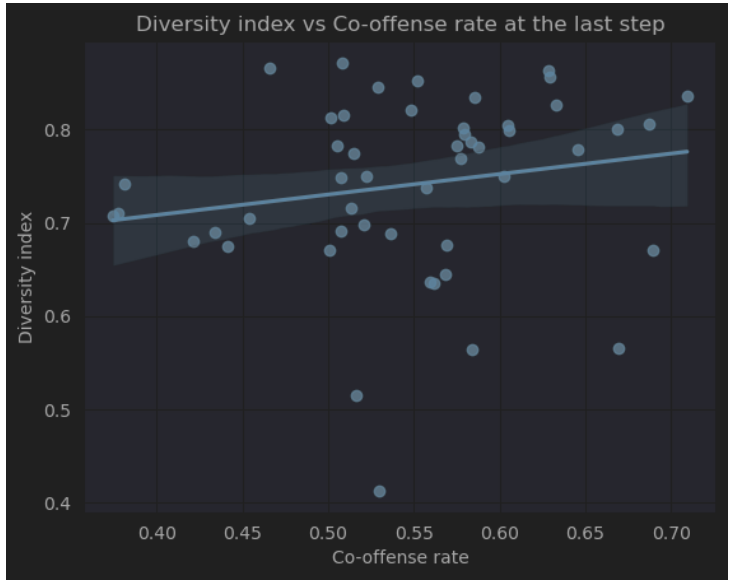


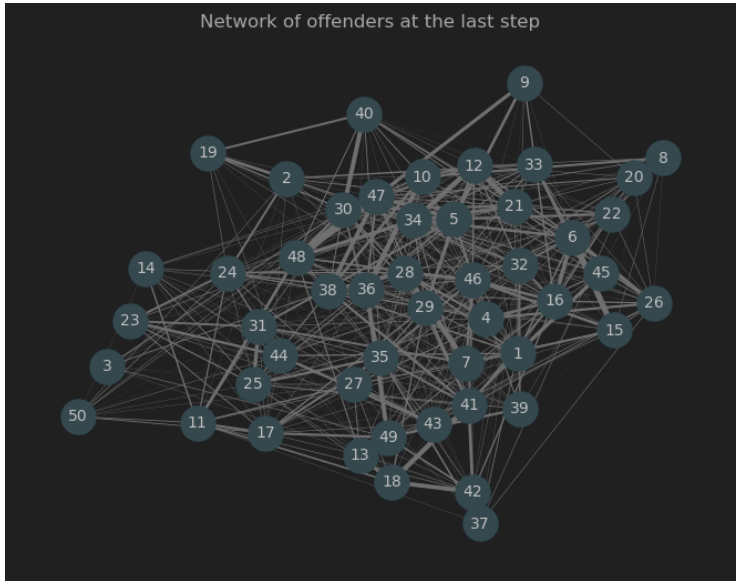
Preliminary results

Scenario 1: Limited access to partners, moderate skill and trust preference









Theoretical model proposed by Weerman (2003)

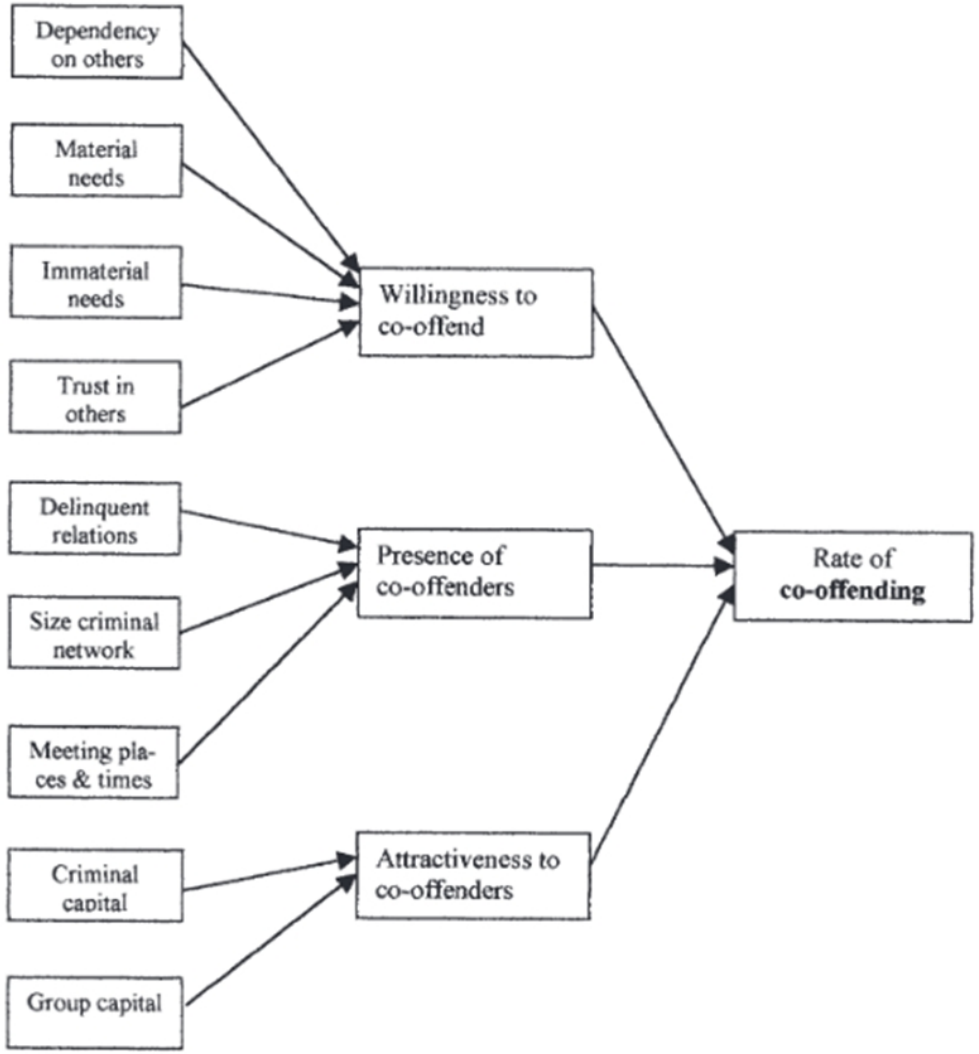


FIG. 2 Direct and indirect influences on individual co-offending rate