Strategic Tradeoffs in Goal Reactivation

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Introduction

Bruno Mars

- *Tell the devil I said "Hey" when you get back to where you're from* (Grenade, 2nd verse)

Bruno Mars

- *Tell the devil I said "Hey" when you get back to where you're from* (Grenade, 2nd verse)
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This talk: how do you remember to "tell the devil *hey*" when you see him?

Goal Reactivation in Everyday Life

- Passing on a message
- Buying milk after work
- Taking medication before bed

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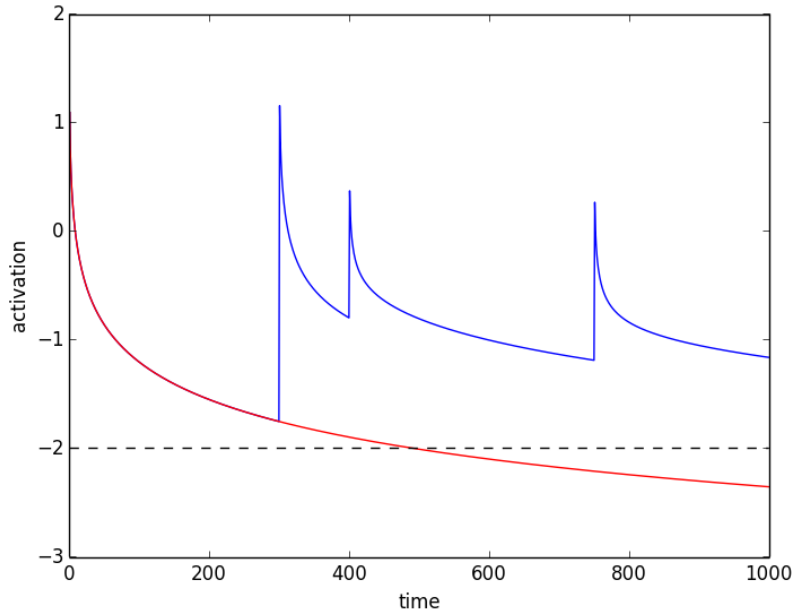
Why is this a difficult?

Forgetting

- Forgetting keeps working memory to a manageable size
- Memory elements are forgotten if their *activation* falls below a threshold
- Activation increases with recency and frequency of access
- Forgotten items can be recovered from long-term memory



Research Question

Research question: How should an agent reactivate goals in different environments?

Formalizing Goals

A goal is made of:

- a *target*: when you see the devil
- an *action*: tell him I said “hey”

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Stages of completing a goal:

1. *Encoding*: Mr. Mars makes his request
2. *Retention*: I do other things
3. *Initiation*: I see the devil
4. *Execution*: I tell him Mr. Mars says “hey”
5. *Completion*: I forget about this goal

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Strategies

- Procedural Strategy
- Preemptive Strategy
- Spontaneous Retrieval Strategy
- Noticing-Plus-Search Strategy

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Strategies

- **Procedural Strategy**
- **Preemptive Strategy**
- Spontaneous Retrieval Strategy
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Procedural Strategy

Learn a chunk that proposes the action if the target is present

Example: practice until the goal becomes a habit

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Encoding	Learn a chunk
Retention	N/A
Initiation	chunk fires, proposing do-goal
Execution	do-goal is selected and applied
Completion	N/A

Preemptive Strategies

Periodically retrieve forgotten goals to see if they should be reactivated

Example: “Today I have to buy milk, talk to John, and if I see the devil, ...”

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Encoding	store goal in SMem
Retention	periodically retrieve and boost goal
Initiation	rule matches target to percepts, proposing do-goal
Execution	do-goal is selected and applied
Completion	remove goal from SMem

Research Question

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Research question: How should an agent reactivate goals in different environments?

- with different number of goals?
- with goals that never apply?
- different amounts of interference?

Experimental Domain

An abstract domain with fixed-length stages:

- Encoding: 2,000 cycles
- Retention: 13,000 cycles
- Initiation/Execution: 2,500 cycles
- Completion: 2,500 cycles

Randomly generate goal properties and interference events

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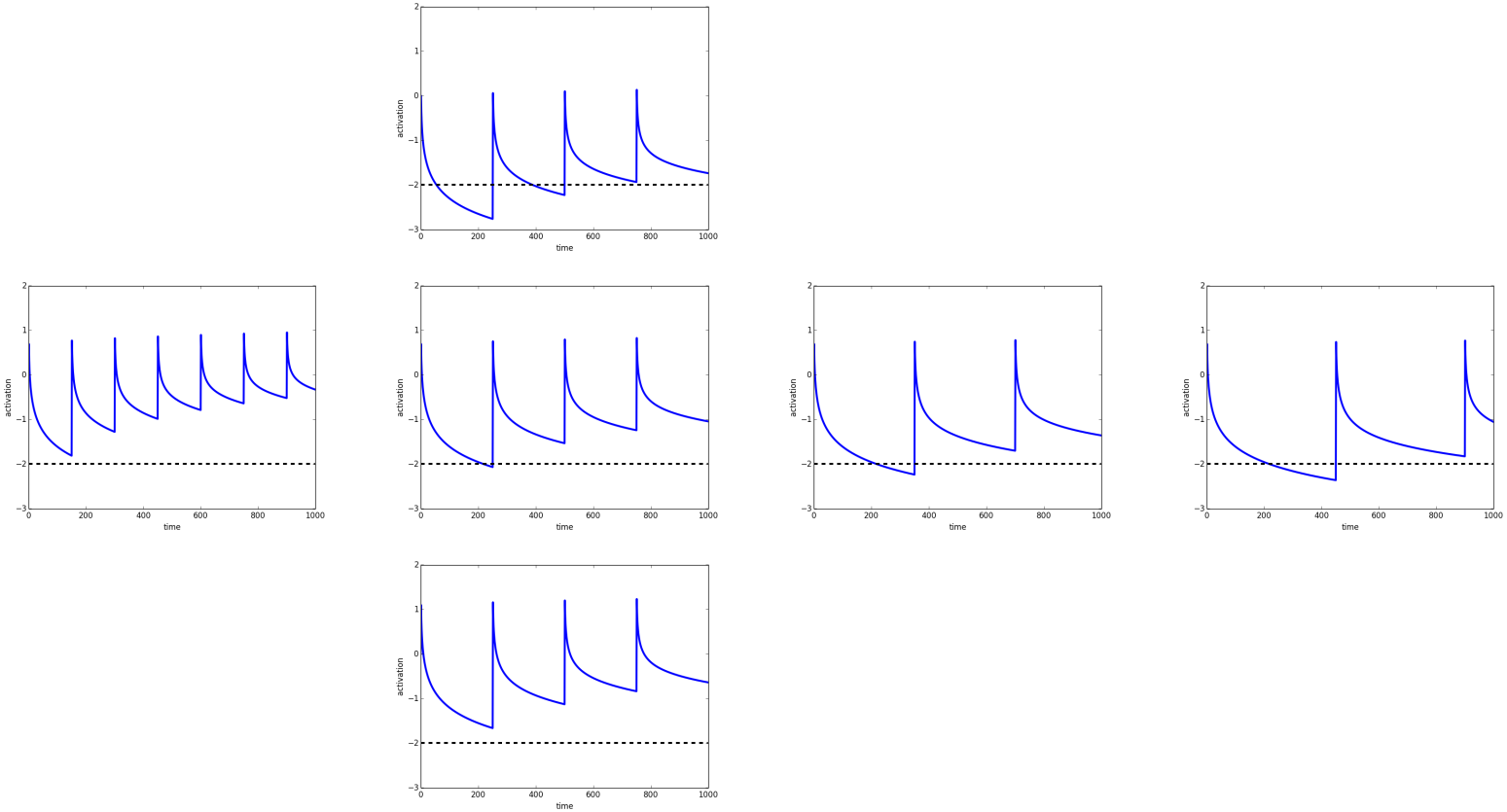
Randomly generate goal properties and interference events

Metrics:

- goal completion percentage
- computation required after completion

Results: Preemptive Strategy Parameters



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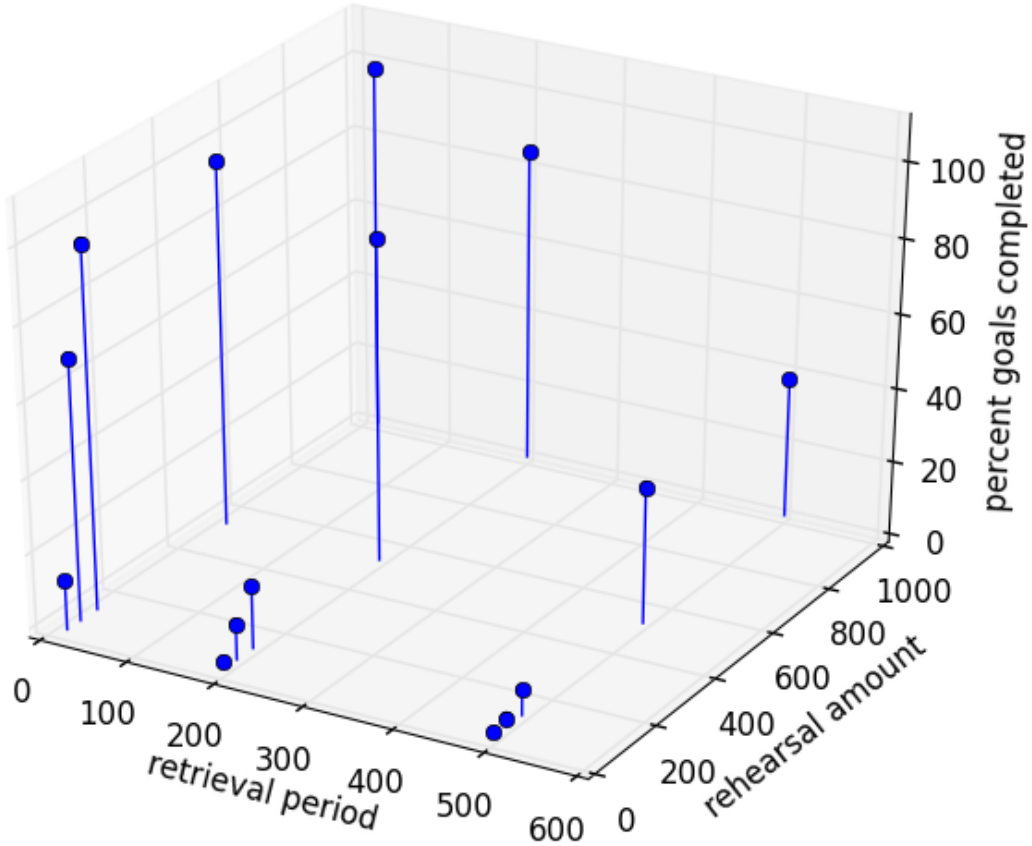

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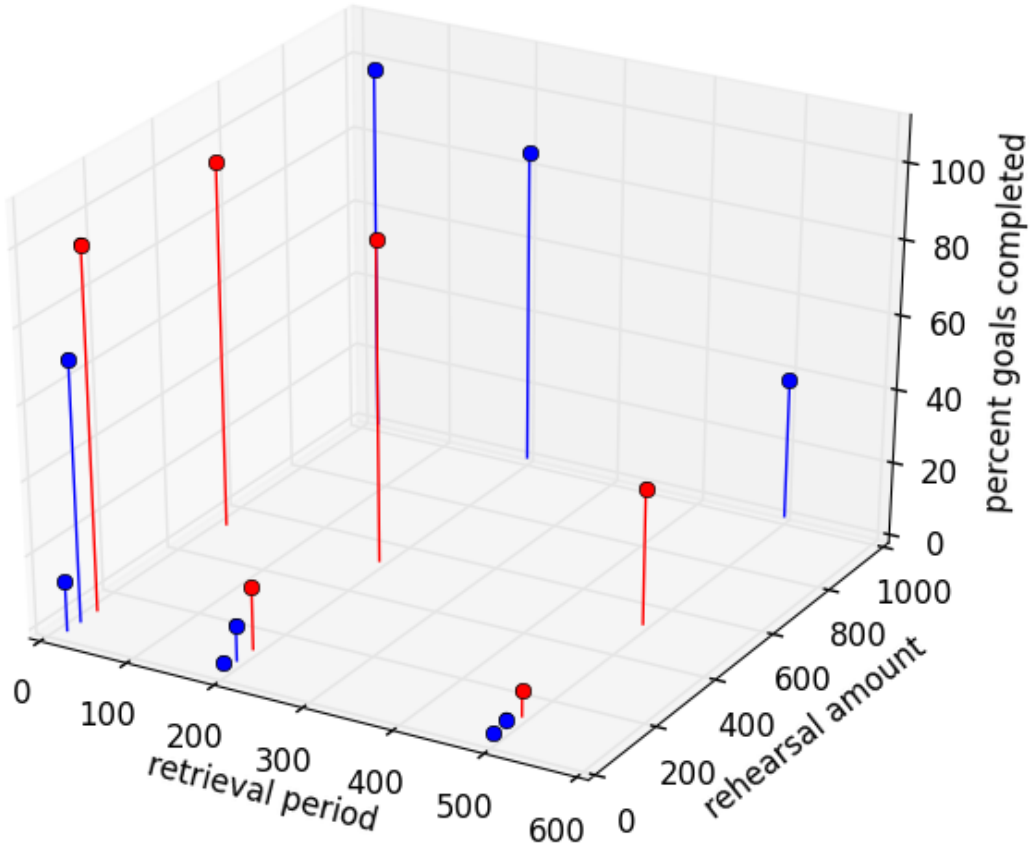

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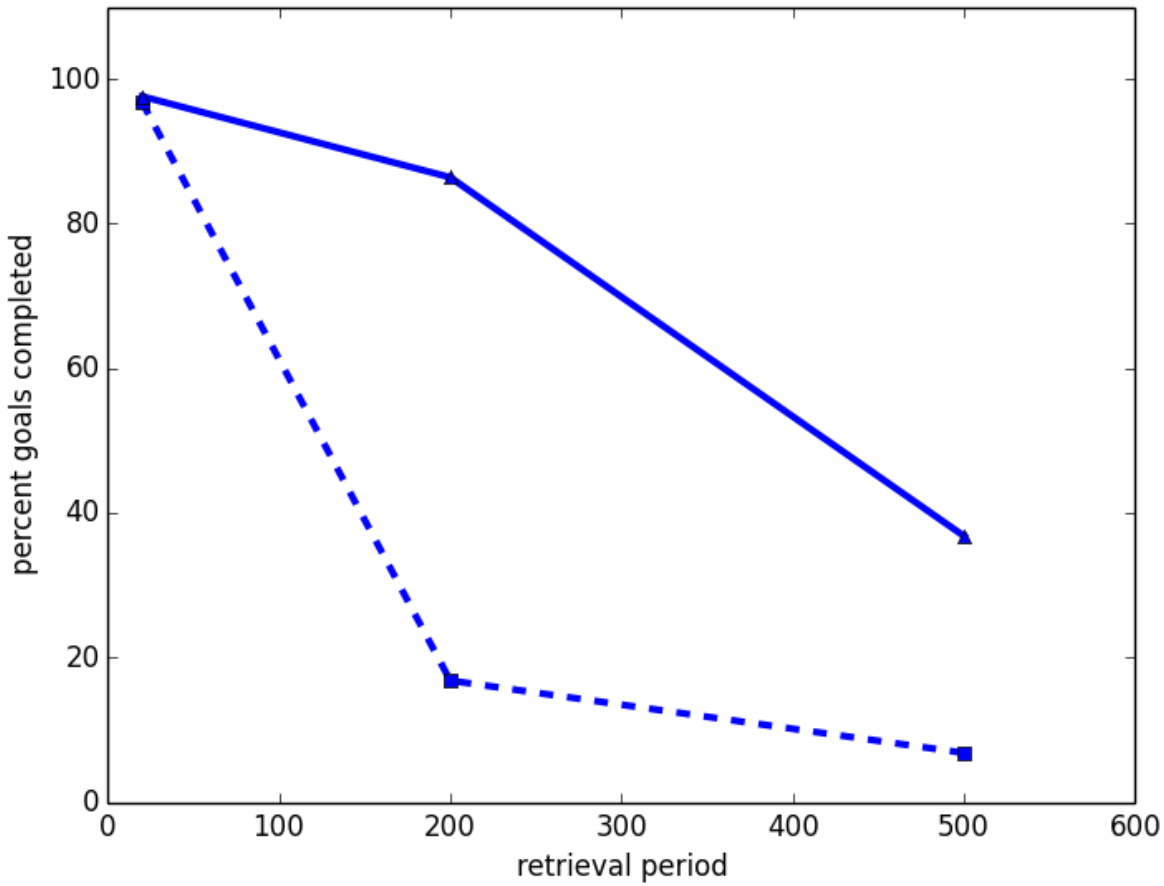

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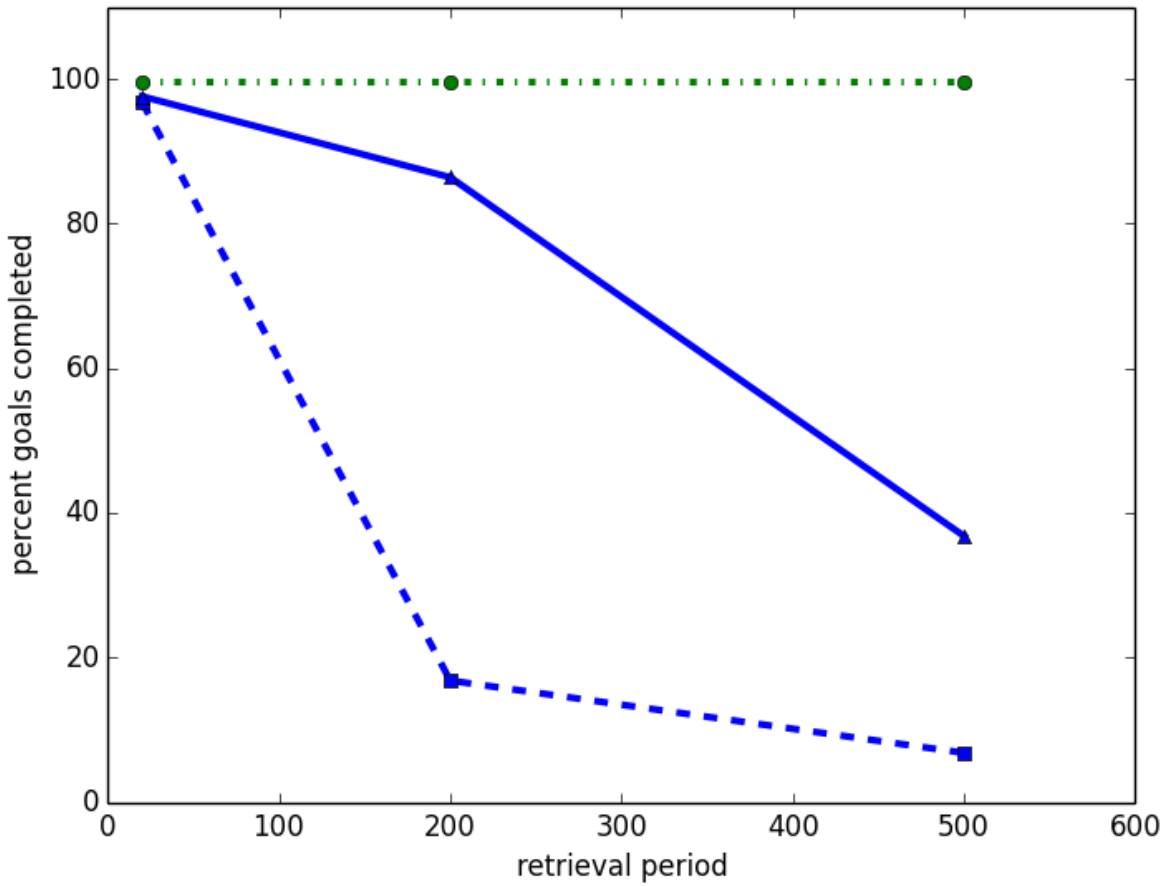
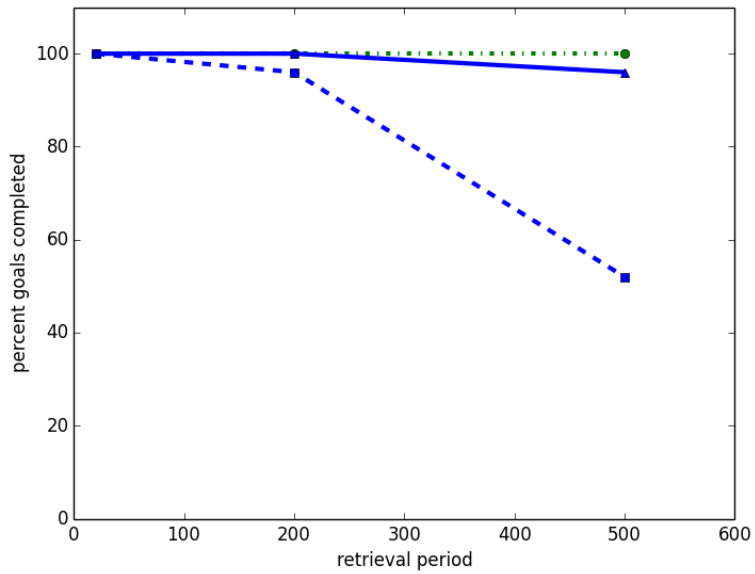


Results: Number of Goals



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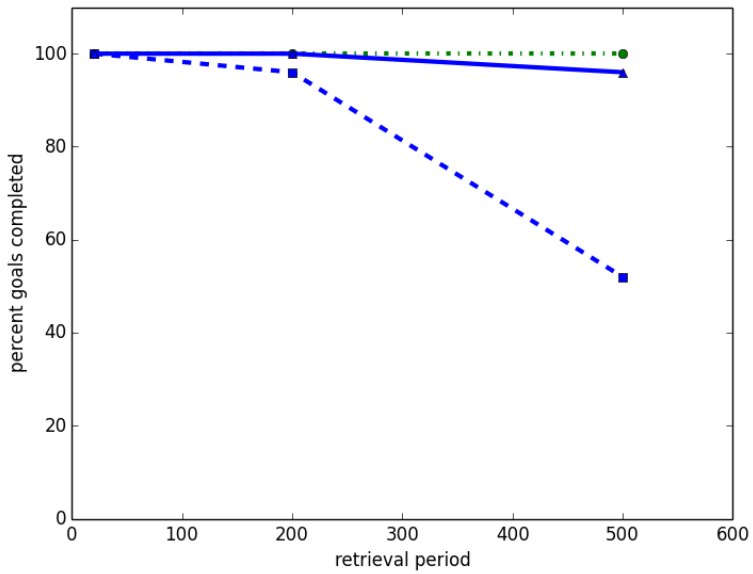

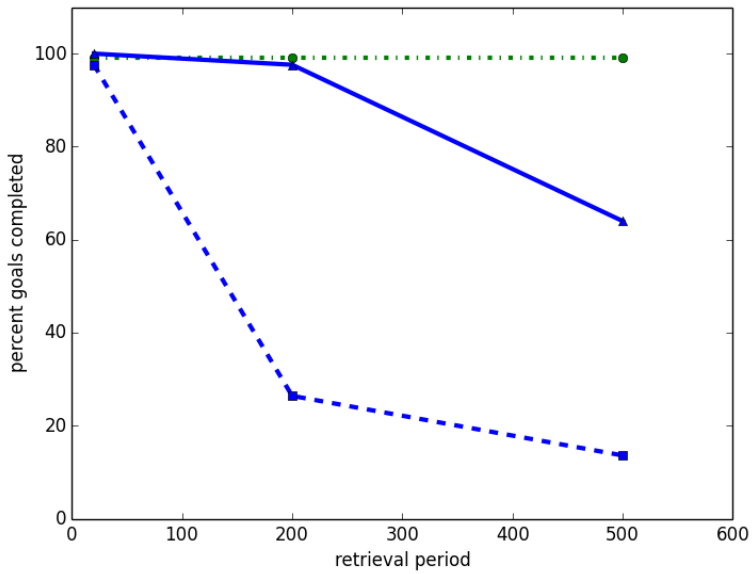

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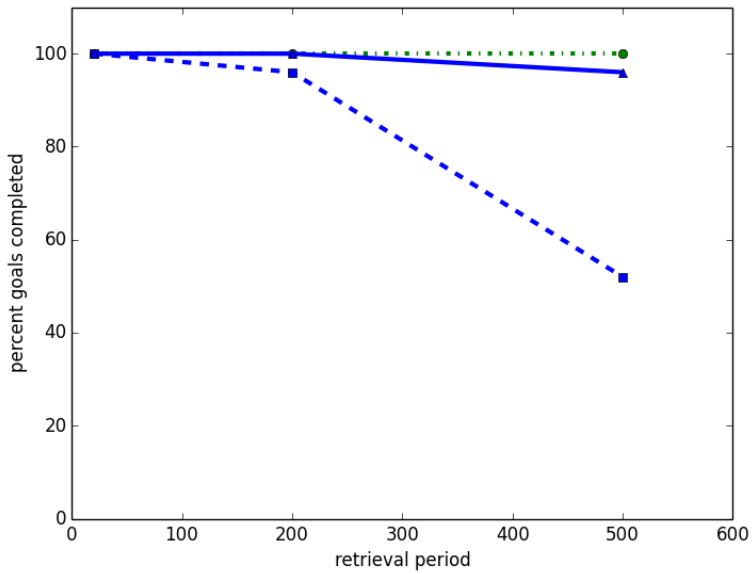

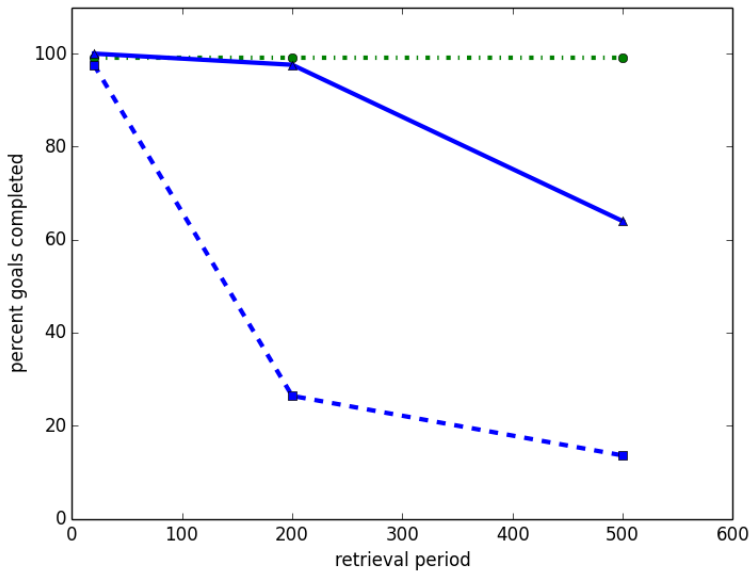

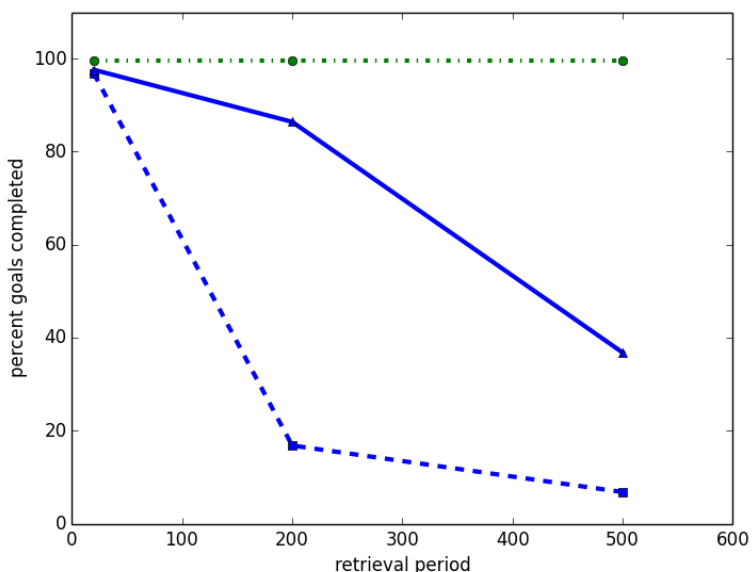

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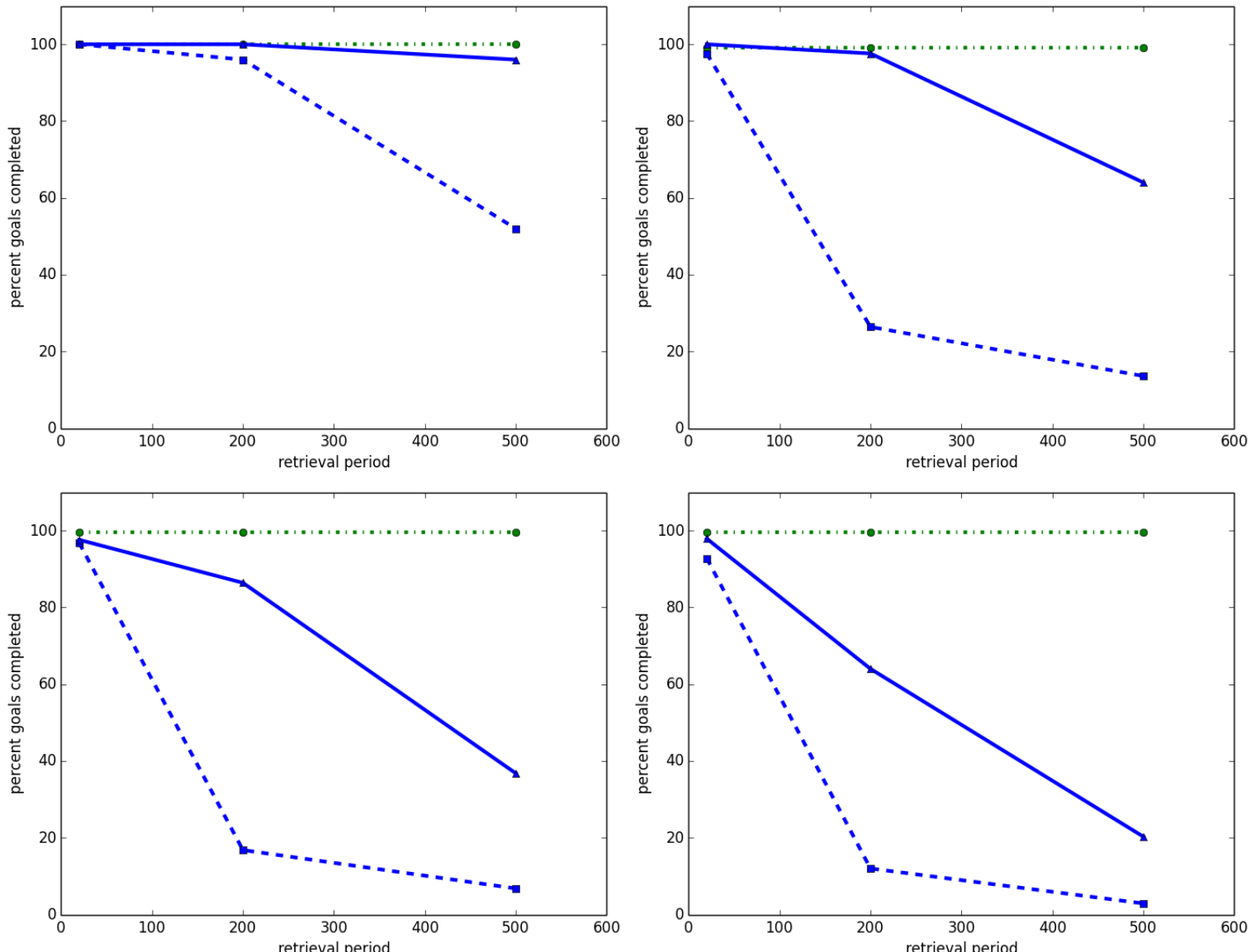
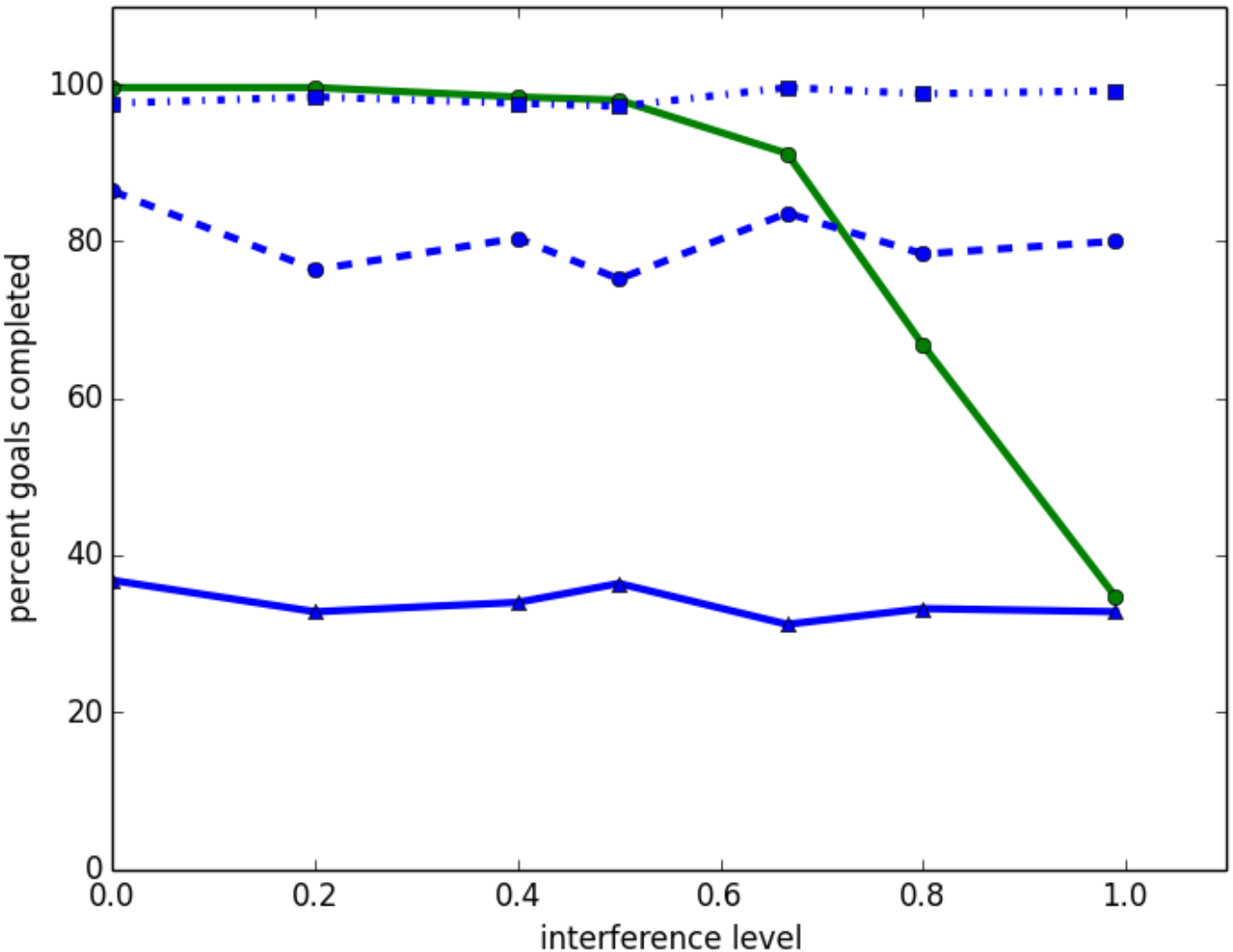
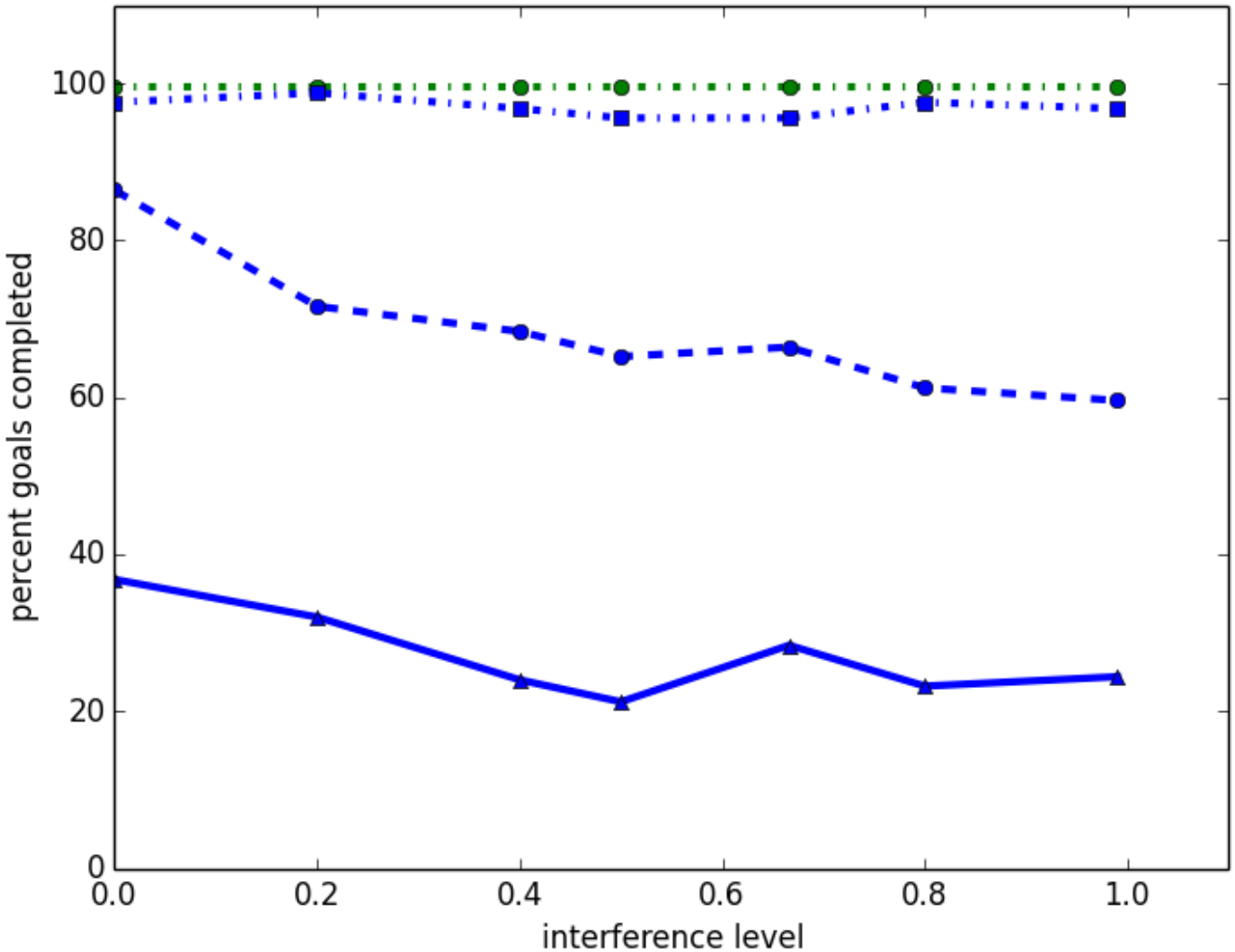


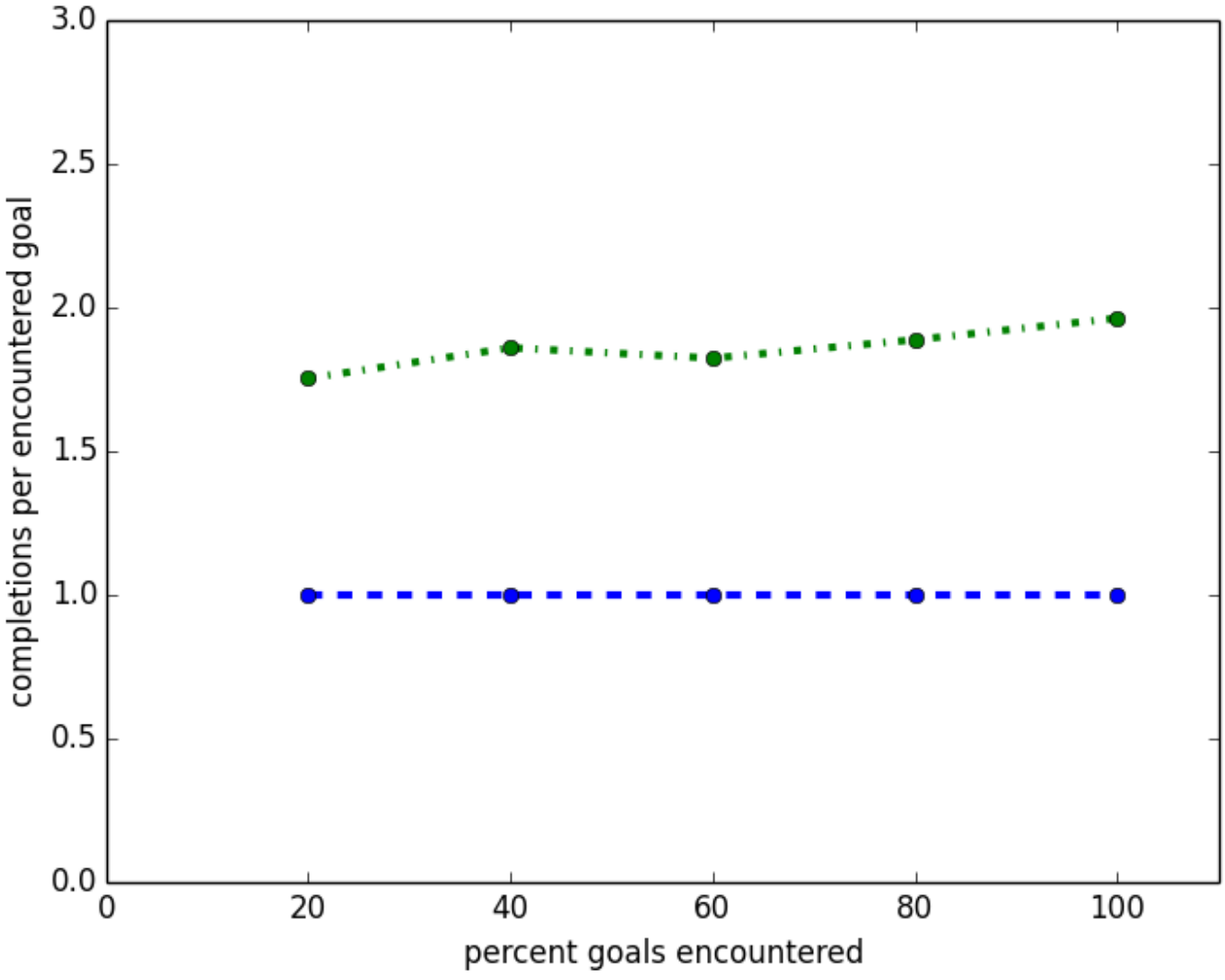
Results: Effects of Interference (at encoding)



Results: Effects of Interference (at retention)



Results: Post-Completion Costs



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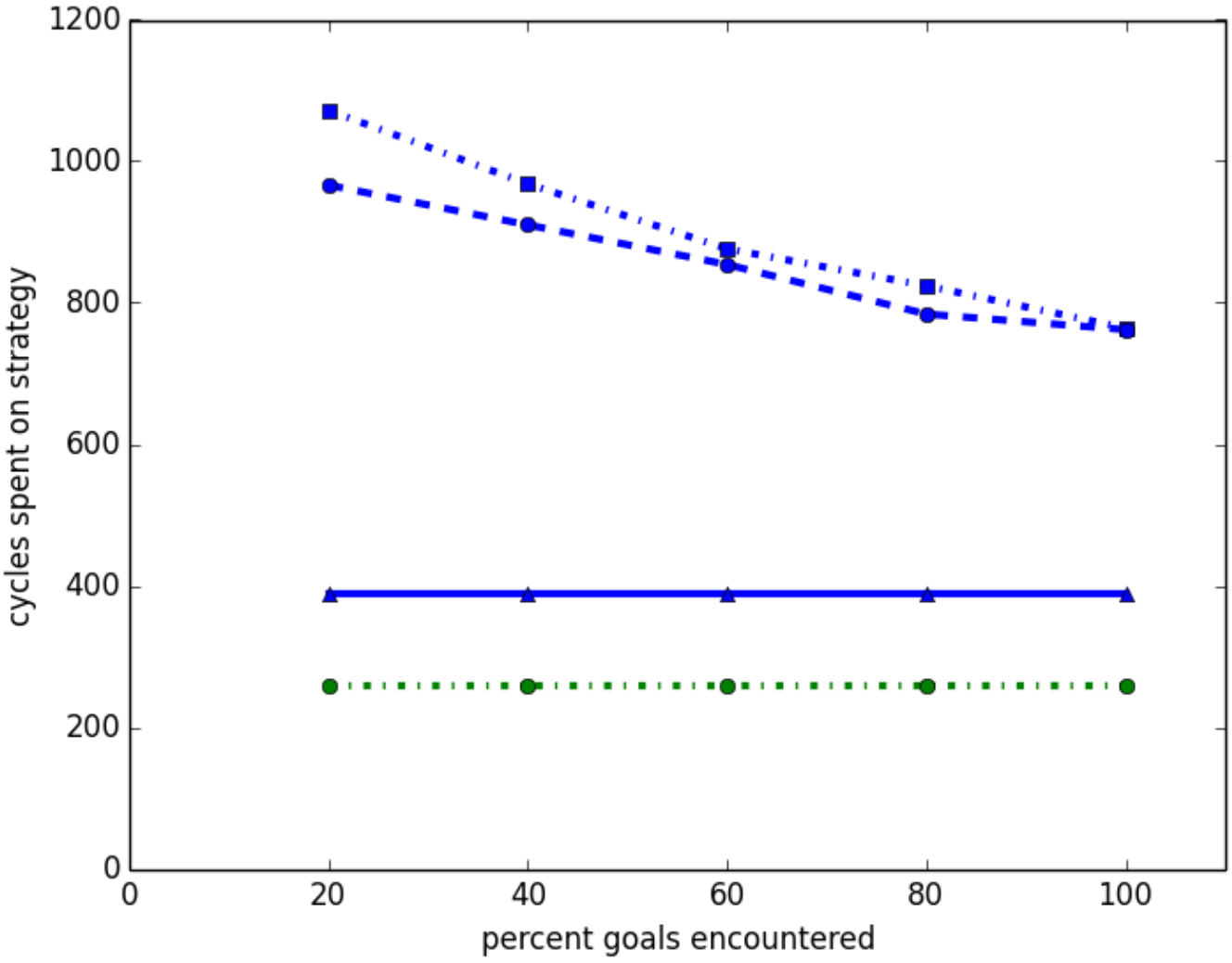


Nuggets and Coal

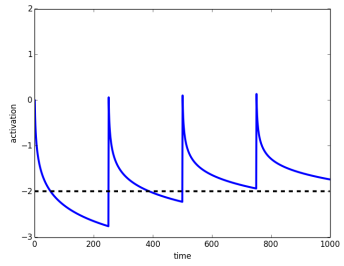
Nuggets

- Flexible domain for testing goal-reactivation strategies
- Appropriate metrics for differentiating between strategies

Coal

- Sparse data (ongoing work)
- Both tested strategies have ongoing costs

Questions?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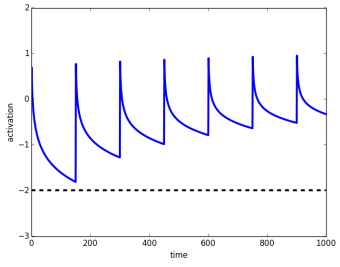
time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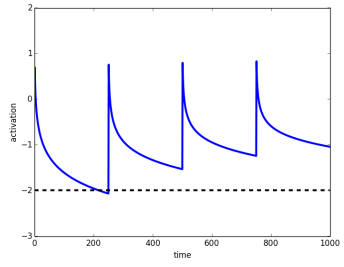
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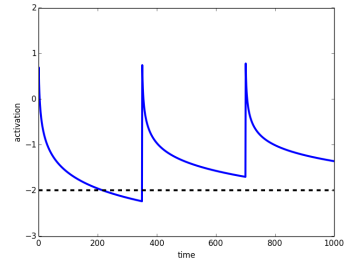
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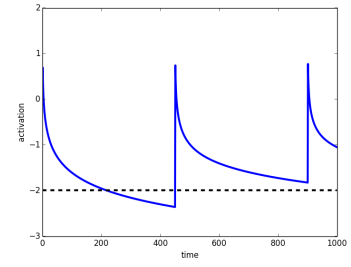
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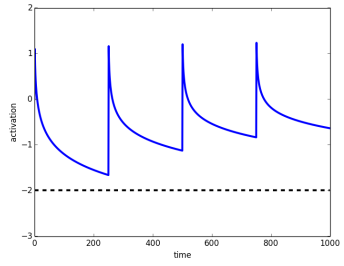
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