Is this object "gray" or is this object "not blue" ?

Confirmatory and disconfirmatory strategies influence object identification during visual search

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opam 24

Distractor Rejection

- Find your blue car in a parking lot:
  1. Guide attention[1]
  2. **Decide "Is this my car?"**
     - **A "black box" in visual search research!**

- **People could identify whole objects, or they could reject objects on the basis of individual features**

[1]Wolfe, Cave, & Franzel (1989)

The Capacity Coefficient: C(t)

- Ratio of distractor rejection efficiency in single- and –dual-target search:

Find this: vs. Find either of these:

Is this (one of) the target(s)?

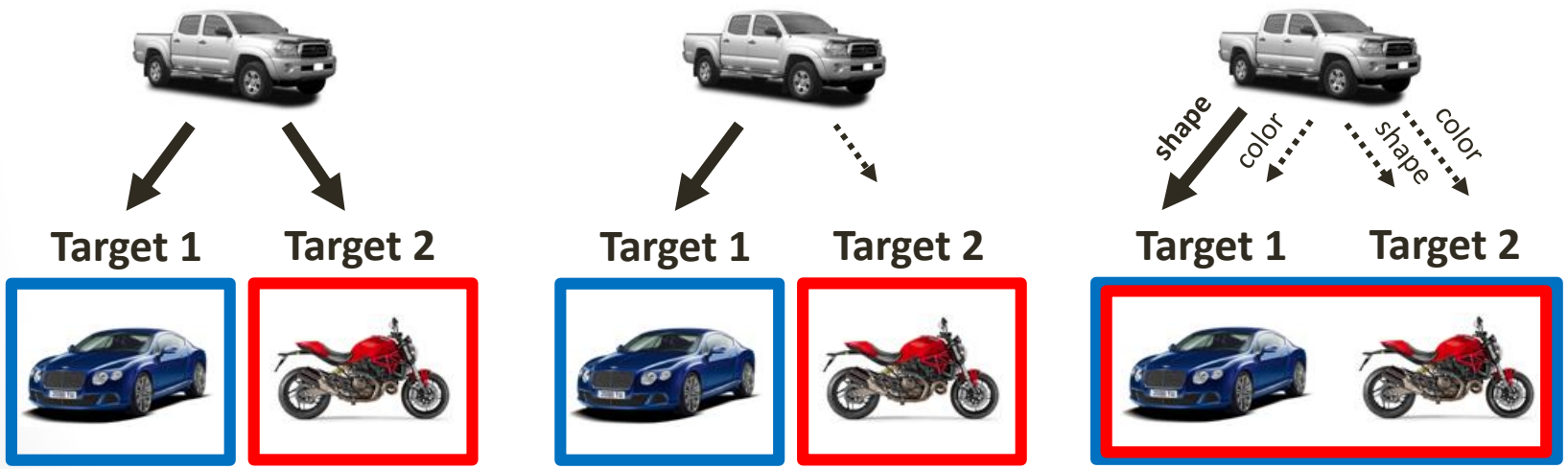
- Are people equally efficient, more efficient, or less efficient at rejecting distractors when looking for two targets versus either target in isolation?

The Capacity Coefficient: Potential Outcomes

C(*t*) = 1
UCIP Baseline
Equally efficient for single- and dual-target search.

C(*t*) < 1
Limited Capacity
Less efficient for dual- than single-target search.

C(*t*) > 1
Super Capacity
More efficient in dual-target search.
Any mismatching feature can disqualify a non-target



1. Cumulative distribution function for UCIP baseline:

$$P\{T_{12} \le t\} = P\{T_1 \le t\} \times P\{T_2 \le t\}$$

2. Cumulative reverse hazard function; logarithm of eq. 1:

$$K_{12}(t) = K_1(t) \times K_2(t)$$

3. Capacity Coefficient:

$$C_{AND}(t) = \frac{K_1(t) + K_2(t)}{K_{12}(t)}$$

Search for this target:

RED button = target

YELLOW button = distractor

RED button = target

YELLOW button = distractor

RED button = target

YELLOW button = distractor

RED button = target

YELLOW button = distractor

Search for either of these targets:

RED button = target

YELLOW button = distractor

RED button = target

YELLOW button = distractor

RED button = target

YELLOW button = distractor

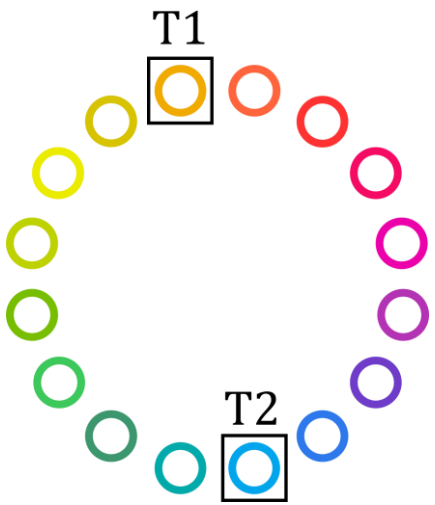
RED button = target

YELLOW button = distractor

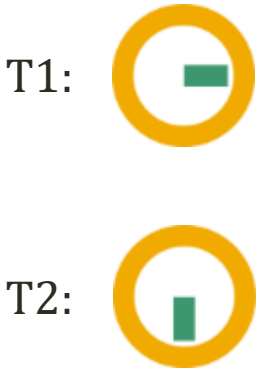
Experiment 1

- Single, relevant features, all tested separately
- All distractors differed from targets by one feature

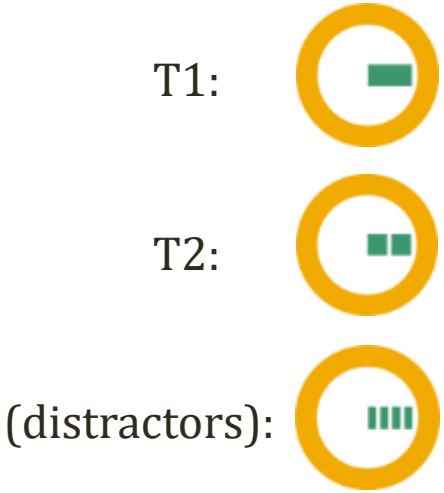
Circle Color or Line Color



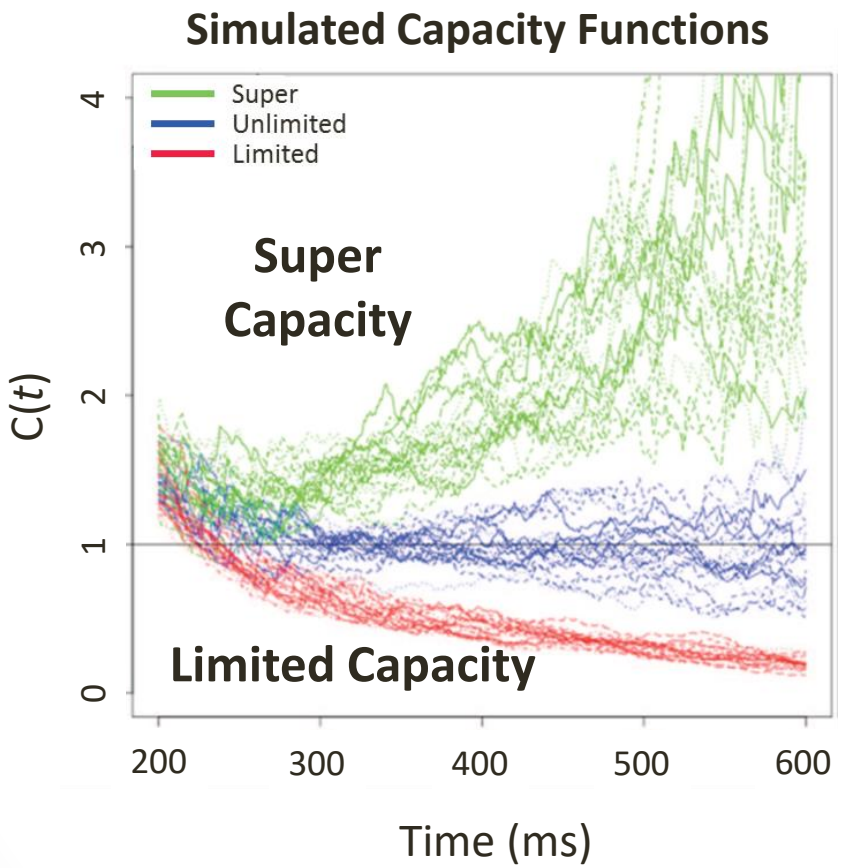
Orientation



Dash Type



Interpreting C(t)

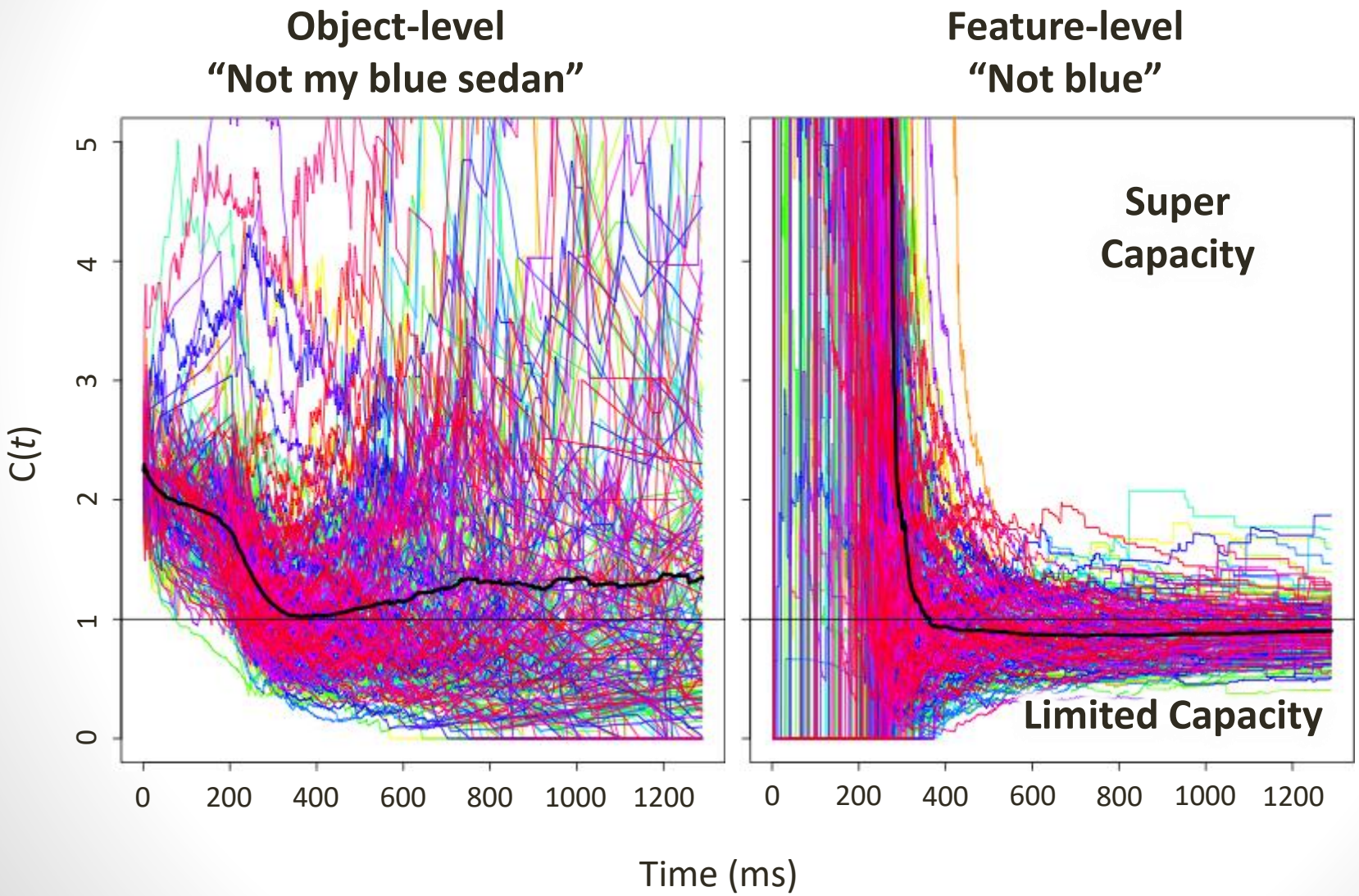


More efficient

Less efficient

Experiment 1 Results

Circle Color

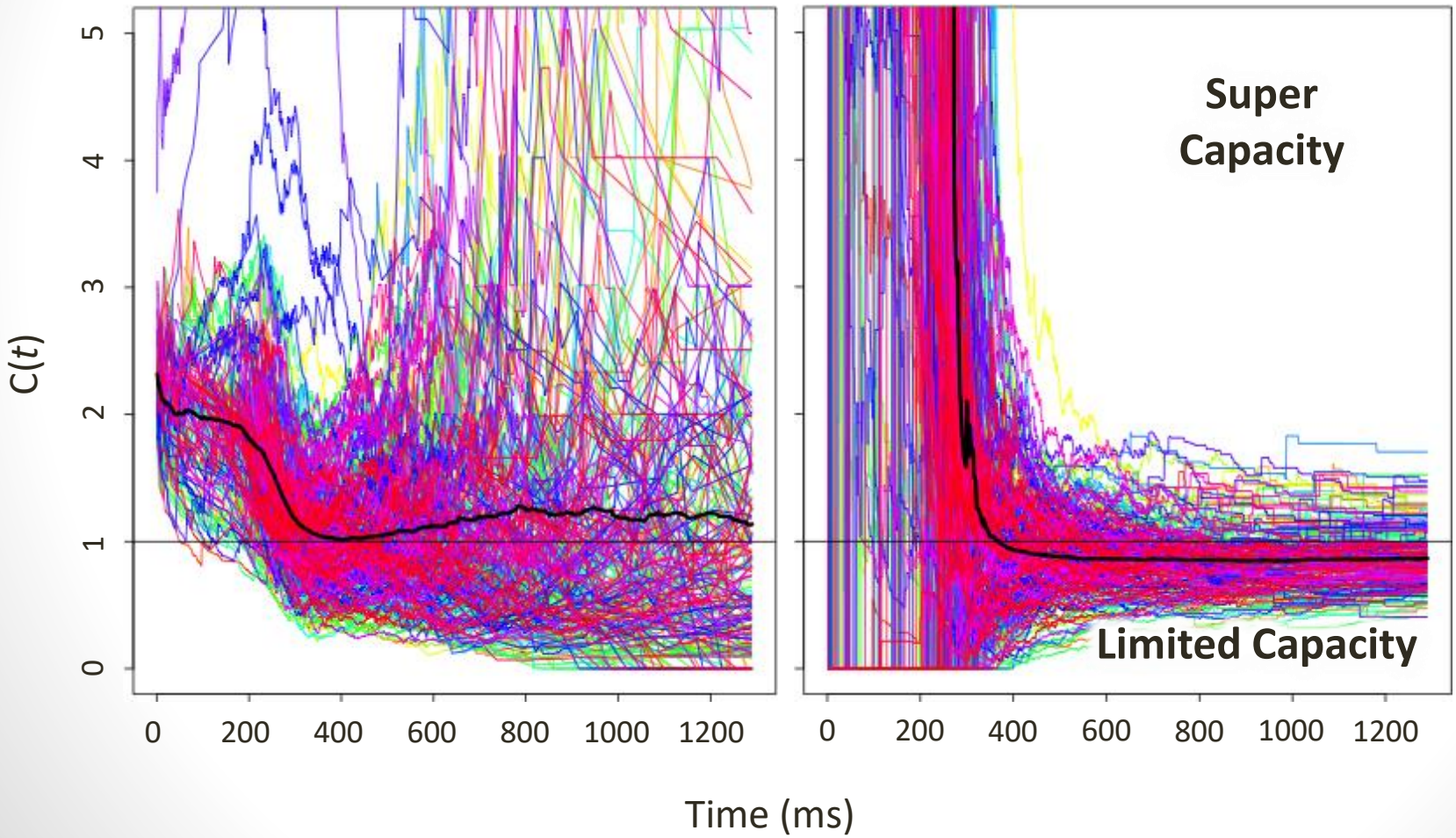


Experiment 1 Results

Line Color

Object-level
"Not my blue sedan"

Feature-level
"Not blue"

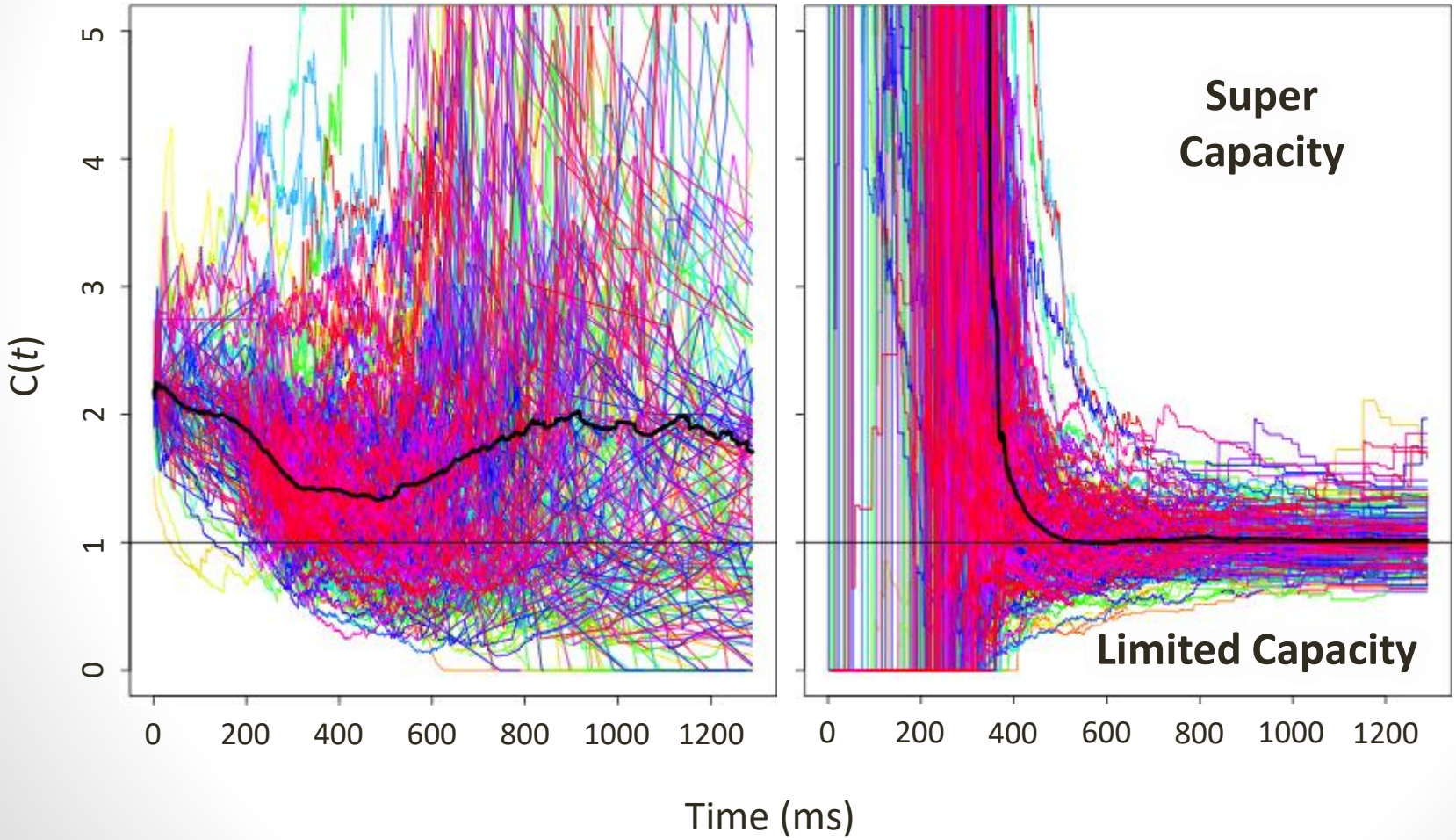


Experiment 1 Results

Orientation

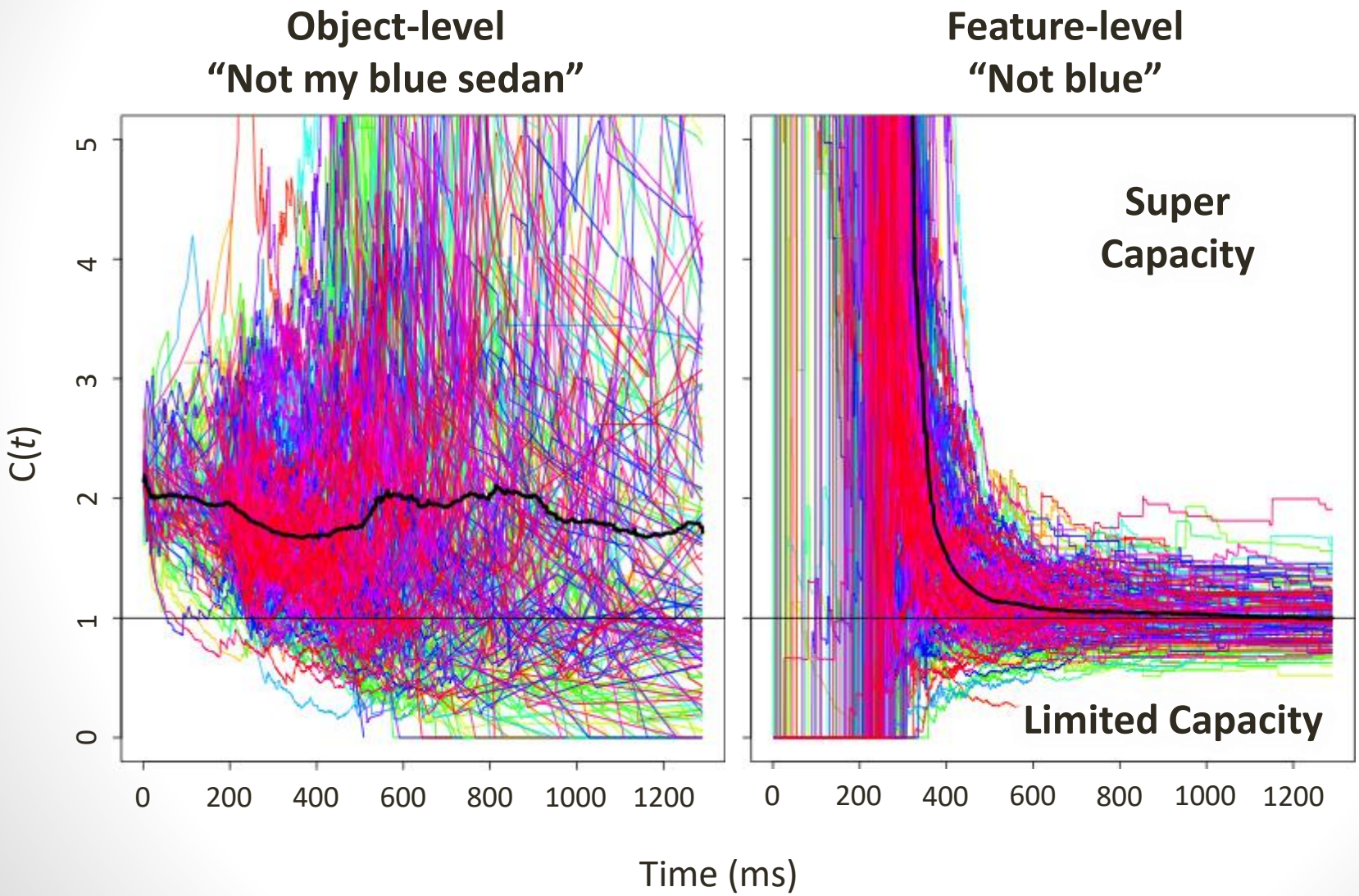
Object-level
"Not my blue sedan"

Feature-level
"Not blue"



Experiment 1 Results

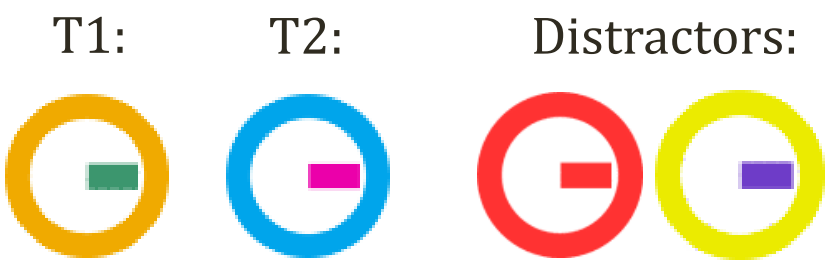
Dash Type



Experiment 2

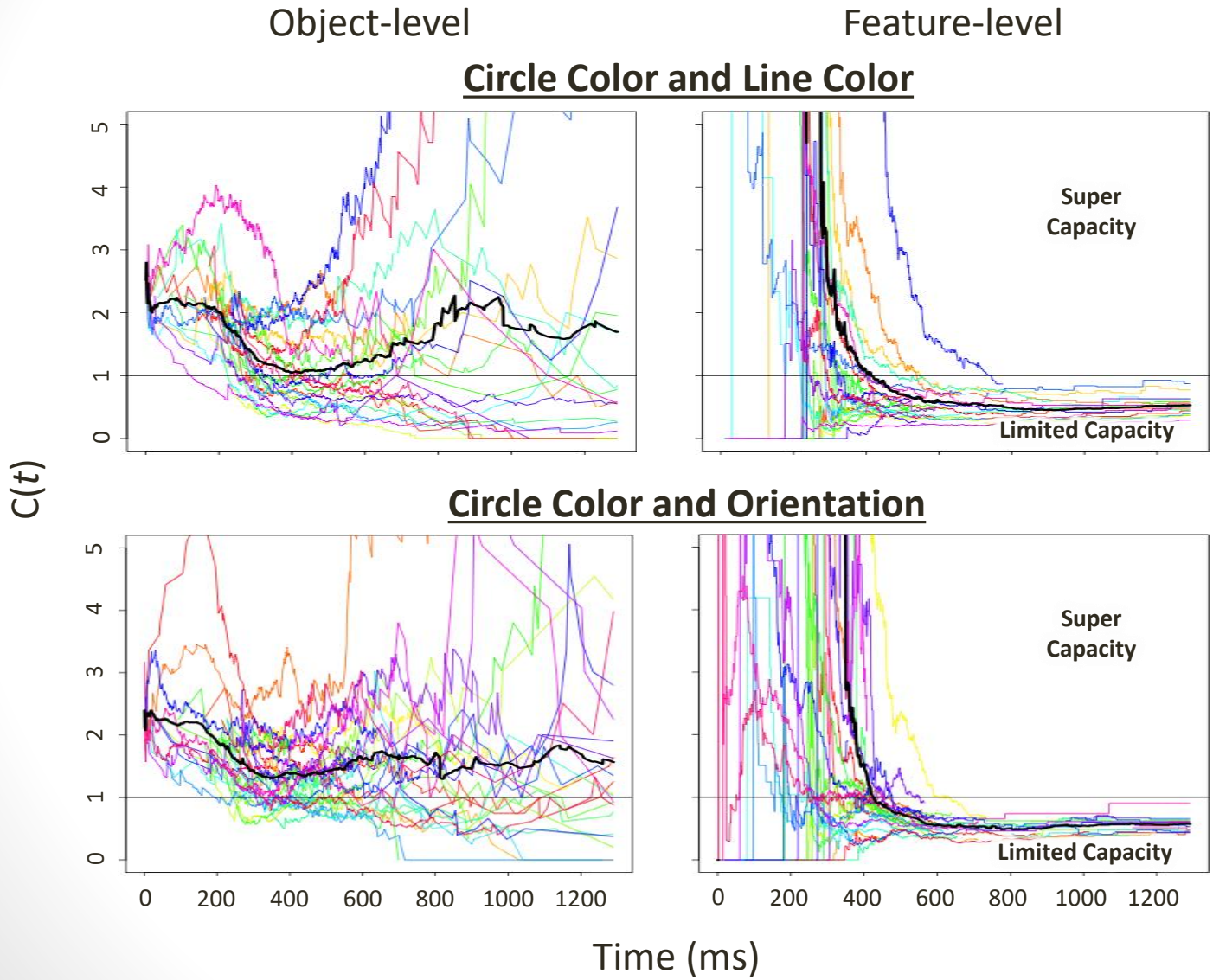
- Two relevant feature conjunctions selected for each target:

Example: Circle Color and Line Color

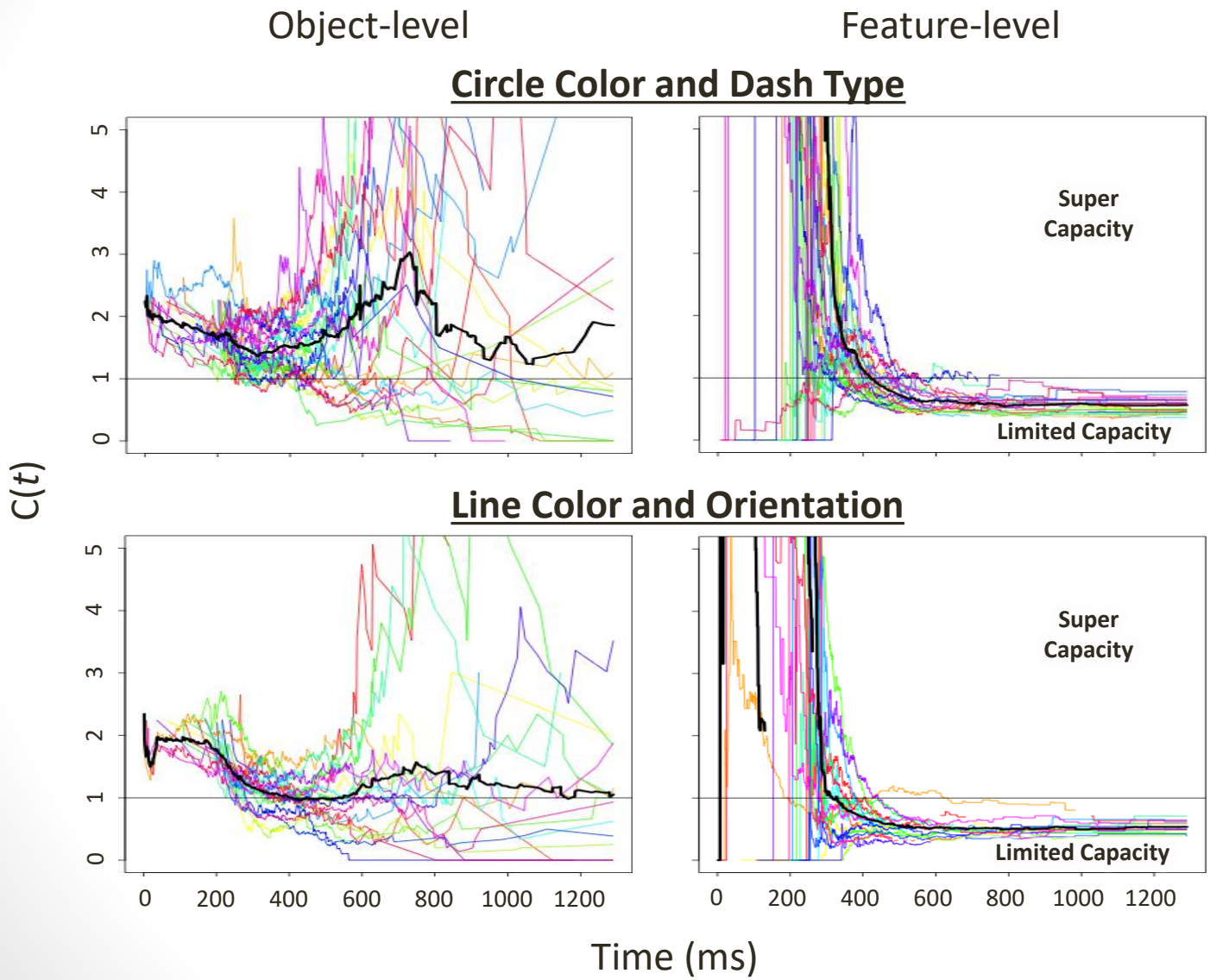


- Distractors now differ by 2 features rather than 1
- All possible feature combinations

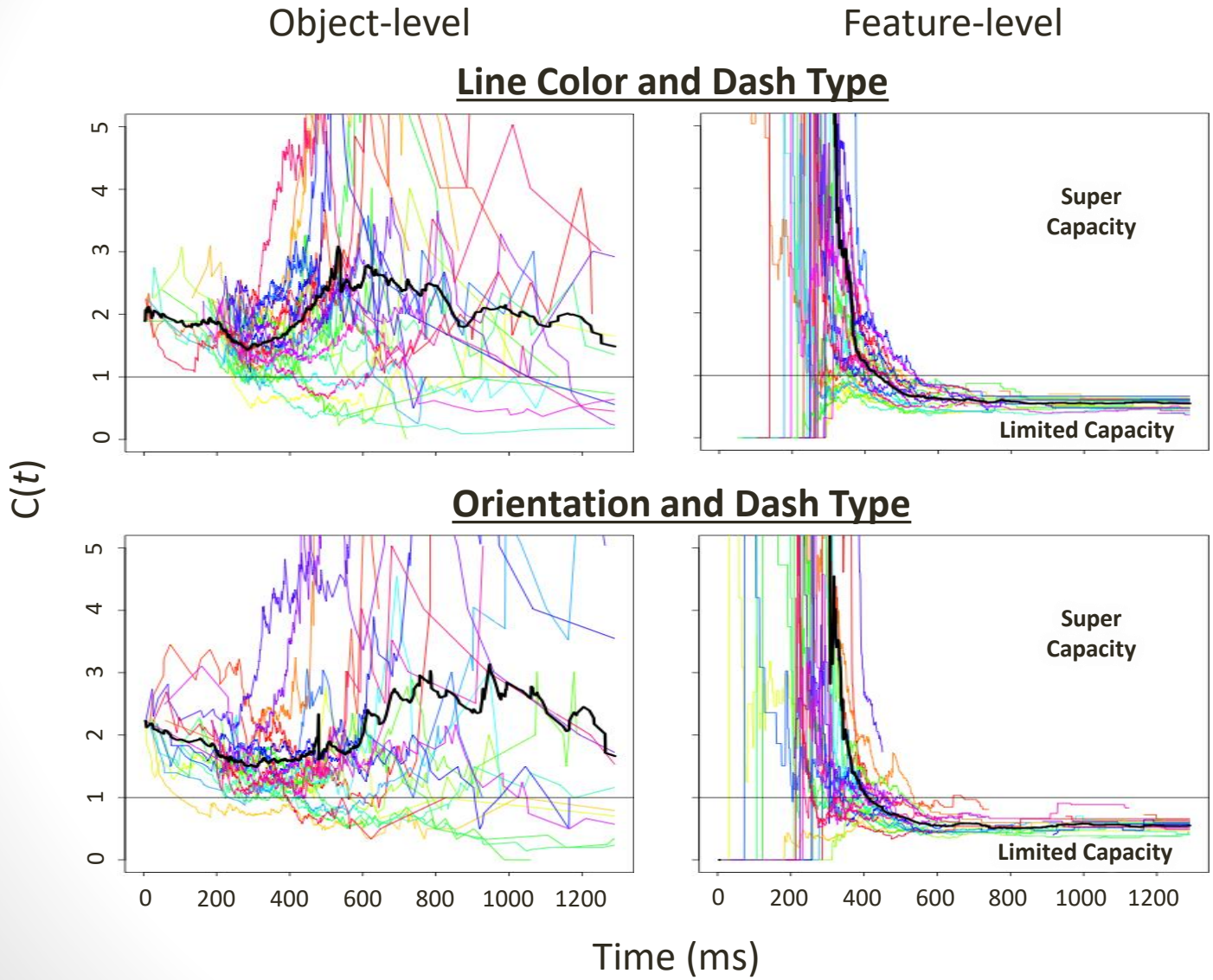
Experiment 2 Results



Experiment 2 Results

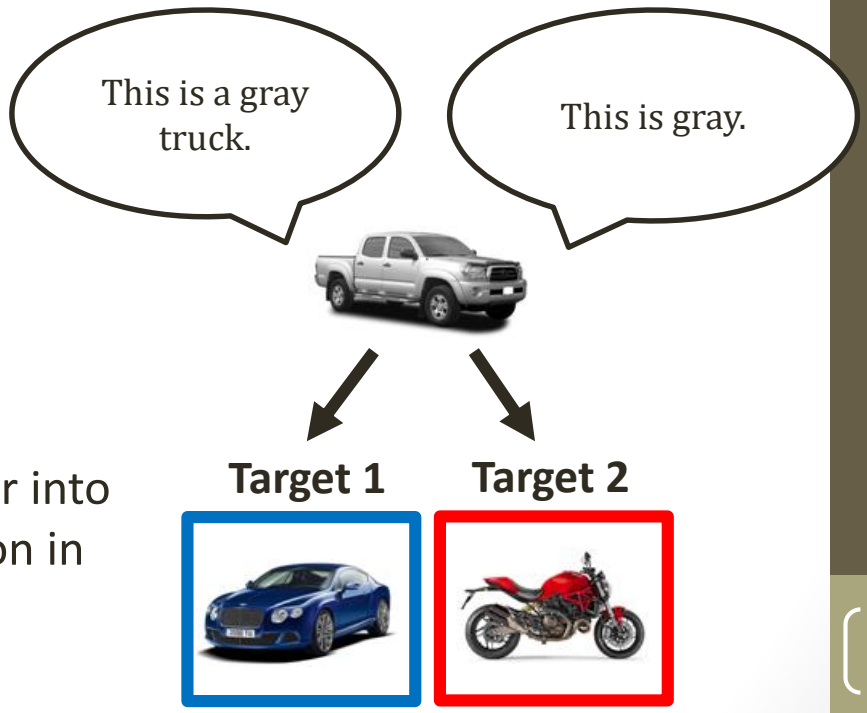


Experiment 2 Results



Conclusions

- People can reject distractors on the basis of whole objects or individual features.
- Assuming whole objects, people appear to be better-than-expected.
- Assuming individual features, people are more reasonable.
- Overall, these findings help us to peer into the “black box” of object identification in visual search.



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NM STATE UNIVERSITY

The Feature Model

- A race to reject the current distractor:

Time to affirm a feature's presence: $T^{+}_{feature}$

Time to reject a feature's presence: $T^{-}_{feature}$

1. **Time to reject a distractor based on unique features not shared with either target = minimum time required to affirm any of those features:**

$$T^{-}_{P,1} = \min_{f:l \in \mathcal{P} \setminus \mathcal{P}_{AB}} \{T^{+}_{f:l}\}$$

2. **Time to reject a distractor that shares features with only Target A or Target A (at least one overlapping feature from each must be processed):**

$$T^{-}_{P,2} = \max \left[\min_{f:l \in \mathcal{P}_A} \{T^{+}_{f:l}\}, \min_{f:l \in \mathcal{P}_B} \{T^{+}_{f:l}\} \right]$$

3. **One can also reject a distractor based on the absence of features shared between targets:**

$$T^{-}_{P,3} = \min_{f:l \in (\mathcal{A} \cap \mathcal{B}) \setminus (\mathcal{P}_A \cup \mathcal{P}_B)} \{T^{-}_{f:l}\}$$

4. **…or based on absent features unique to either target:**

$$T^{-}_{P,4} = \max \left[\min_{f:l \in \mathcal{A} \setminus \mathcal{P}_A} \{T^{-}_{f:l}\}, \min_{f:l \in \mathcal{B} \setminus \mathcal{P}_B} \{T^{-}_{f:l}\} \right]$$