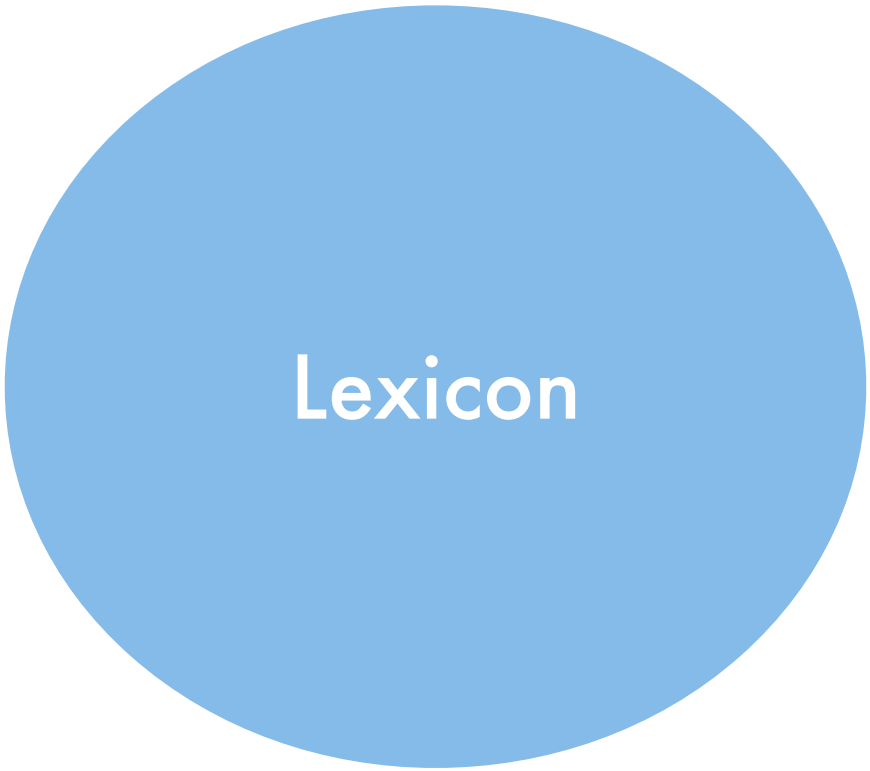
The Lexicon (1)

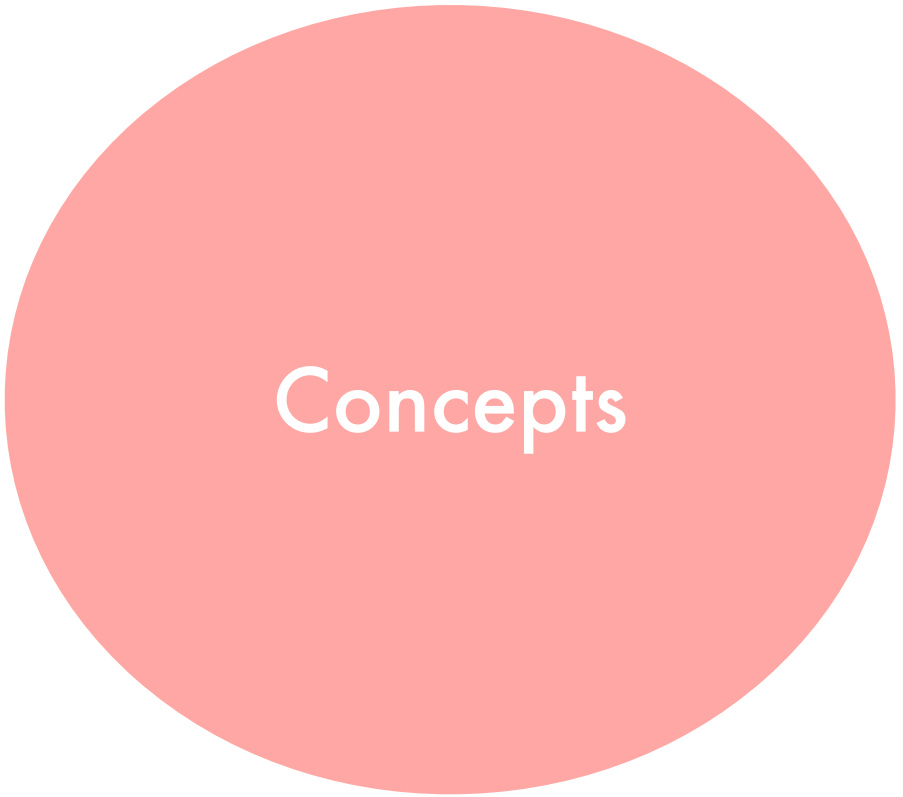
LIGN 170, Lecture 4

The Lexicon

- Connecting words and concepts:

  Linked but separate


Lexicon


Concepts

dog

padlock

horse

tomato

The Lexicon

- Connecting words and concepts:
  Linked but separate
- One word can have many concepts
  - bank: money *vs.* river
- One concept can have many words

The Lexicon

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The Lexicon

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  Linked but separate
- One word can have many concepts
  - bank: money *vs.* river
- One concept can have many words
  - pail *vs.* bucket
  - sofa *vs.* couch

- Pseudowords have no meaning
  - Lewis Carrol's Jabberwocky:
    - Twas brillig, and the slithy toves...
- Unfamiliar words have no / vague meaning
  - quadrille french square dance
  - ostracod subclass of small crustaceans

- One concept may require multiple words to express
  - at the house of French: *chez*
- Words change in meaning depending on context
  - Tall tale vs. tall man
  - Light reading vs. light suitcase
  - Large poodle vs. large bear

- Do words and concepts interact?

- Sapir-Whorf Hypothesis:
  - Cognition is constrained by language
- But, concepts are not strictly constrained:
  - Dani has only two color terms: mola (light) and mili (dark)
  - But speakers can distinguish other colors in non-linguistic tasks

Roadmap for Today and Tuesday

- How is conceptual space organized?

Today

  - Individual concepts
  - Categories/Relations between concepts

- How does the lexicon link to concepts?

Tuesday

  - How is the lexicon organized?
  - What information does it contain?
  - How do we access it?

Concepts

- How are concepts organized internally
  - Two kinds of theories:
    - Features
    - Real-world knowledge about concepts

Feature-based theories

- Features can be:
  - perceptual
  - functional
  - microstructural (composed of)
  - conventional
  - intrinsic
  - contextually-based

Classical view

- Set of necessary features to define an object

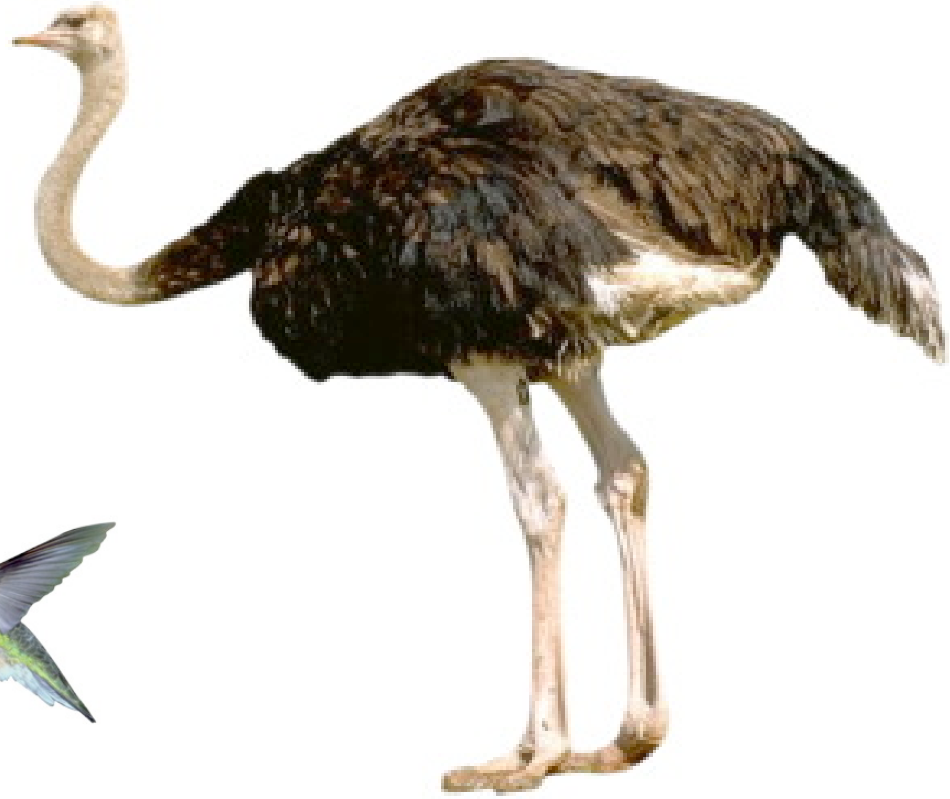
Triangle	Odd Numbers
geometric shape	number
three angles	not evenly divisible by two
three sides	

- All items which have these feature are equally good
- Categories have clear, precise boundaries

Birds

Birds

bird?



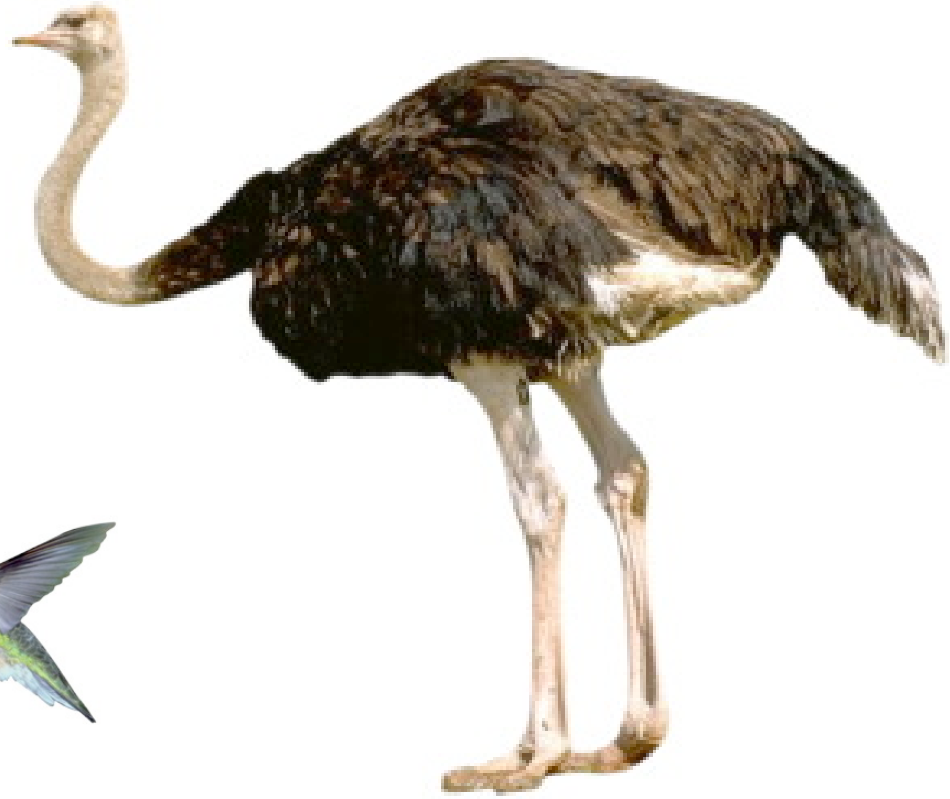
Family Resemblance

- Categories have characteristic features
  - common to many exemplars
  - most frequent features most important
  - Birds:
    - feathers, beak, lays eggs
    - flies, eats bugs

Family Resemblance

- Categories have fuzzy boundaries
  - Core of commonly identified exemplars
  - Best example of a category is the **prototype**
    - Prototype may not actually exist
  - Birds:
    - Core: robin, pigeon, seagull

bird?



Family Resemblance

- **Categories have fuzzy boundaries**
  - Core of commonly identified exemplars
  - Best example of a category is the prototype
    - Prototype may not actually exist
  - Fuzzy because items at periphery are likely to share features with other categories

- Tomatoes:
  - Many same functional properties as vegetables
    - Eaten in lettuce salads
    - Not made into pies or sweets
  - But, has physical properties of fruits

- How could otherwise intelligent well-educated people argue that a chicken is a mammal?
  - Physical features
    - Lays eggs
    - Has beak, wings, feathers
  - Functional features
    - Is often cooked and eaten

      (like cows and pigs)

Typicality effects

- Semantic Verification Task:
- How long does it take people to judge that an X is a Y?
  - A robin is a bird.
  - An ostrich is a bird.

- Supports idea of core and peripheral exemplars

What about classical examples?

Triangle	Odd Numbers
geometric shape	number
three angles	not evenly divisible by two
three sides	

- Even for these categories, people will rate "13" as a better odd number than "57"

Problems…

- What counts as a feature?
- Features appear to be differently available
  - Depending on task

Is “floats” a feature of basketball?

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- Situational (ad hoc) categories


7

Problems…

- What counts as a feature?
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  - Depending on task
  - Depending on context
- Situational (ad hoc) categories

Knowledge-based theories

- Focus on how and why items get grouped together into categories
- Features are cues to more complex understanding of categories

grey hair

grey hair

must be old enough to have children who can have children

Knowledge-based theories

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Psychological Essentialism

- People behave as if things have underlying natures that give them identity
- We know the underlying reason for features (or know that someone does)
- White vs grey
  - clouds / / hair

- Essentially a version of feature theory
  - Features have underlying quantifiable causes
  - Must have certain DNA structure to be a raccoon,
    - But in absence of portable DNA kit (now available at Toys'R'Us), we use obvious features
      - Knowing they are derived from the more fundemantal features

Psychological contextualism

- Certain contexts can provide bond between features in a concept(s)

Cup and bowl continuum

When mixed features:
“cup” with tea
“bowl” with soup

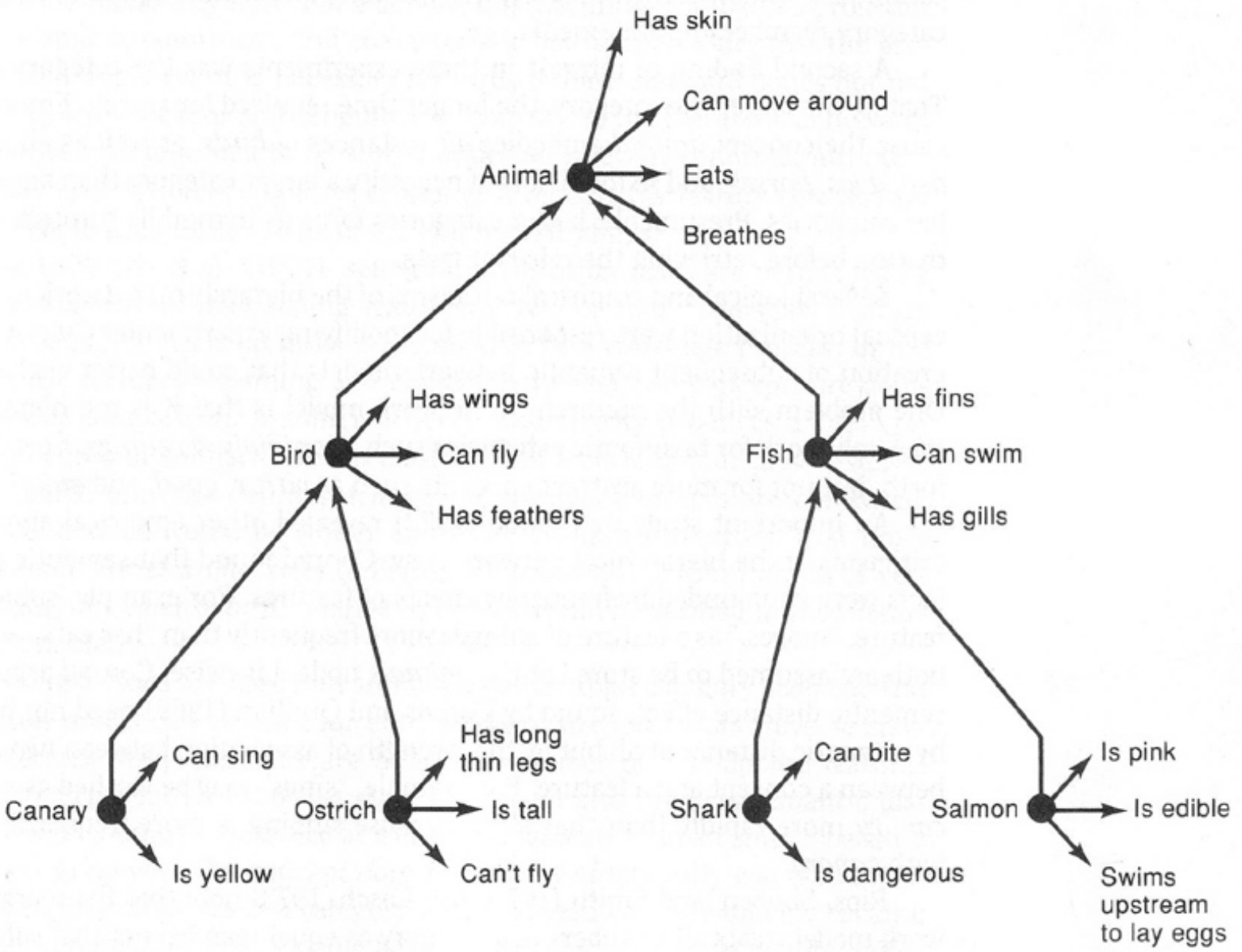
Psychological contextualism

- Certain contexts can provide bond between features in a concept(s)
- Distinction between intrinsic features and temporary context-dependent features

Concepts

- How are concepts organized internally
  - Features
  - Knowledge about concepts
- How are concepts related to each other and organized into a larger pattern?

Hierarchical networks



- Supporting evidence
  - Semantic distance effects
    - A canary is a bird
    - A canary is an animal
  - Category-size effects
    - Larger categories take longer to verify

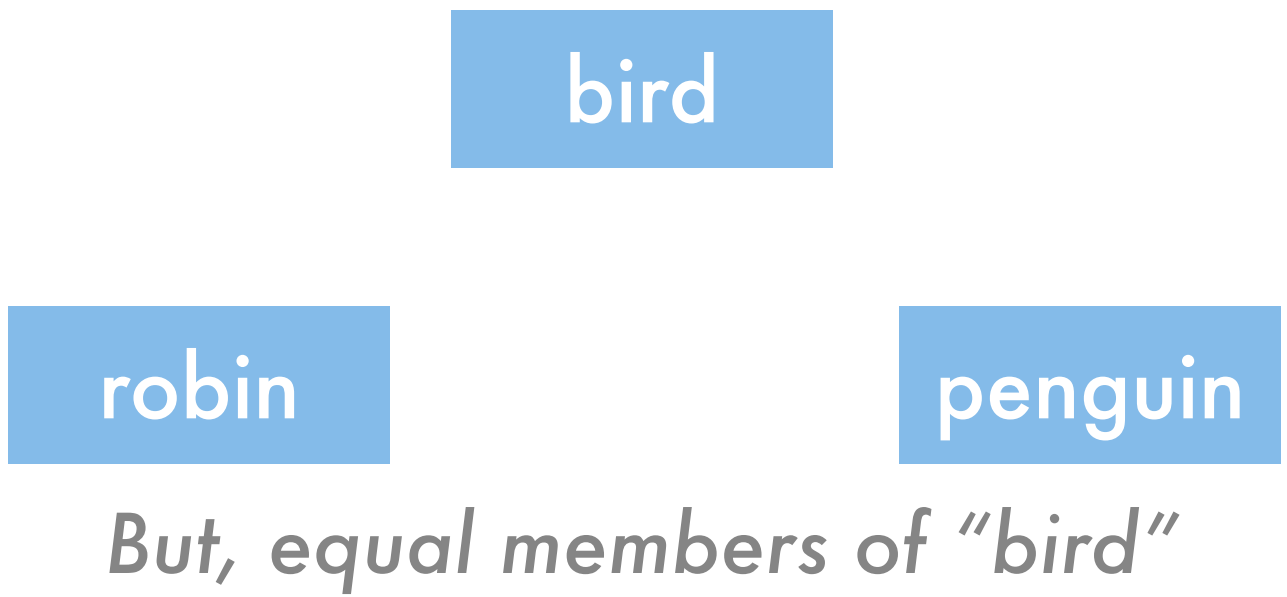
- Problems for strict hierarchical models
  - Abstract concepts
  - Strength of association
    - *A canary sings.* vs. *A canary has skin.*
    - Singing more frequently associated with canaries
  - Equal members problem

- Typicality Effects:

  (1) A penguin is a bird.

  (2) A robin is a bird.

  - (2) verified faster than (1)



But, equal members of "bird"

- Problems for strict hierarchical models
  - Abstract concepts
  - Strength of association
    - *A canary sings.* vs. *A canary has skin.*
    - Singing more frequently associated with canaries
  - Equal members problem
  - Subset problem

- Standard subset effect
  - A robin is a bird vs. A robin is an animal.
    - But, for certain categories, people are faster to verify superordinate relations that are further away
      - A dog is an animal. vs. A dog is a mammal.
      - "Relatedness" measure

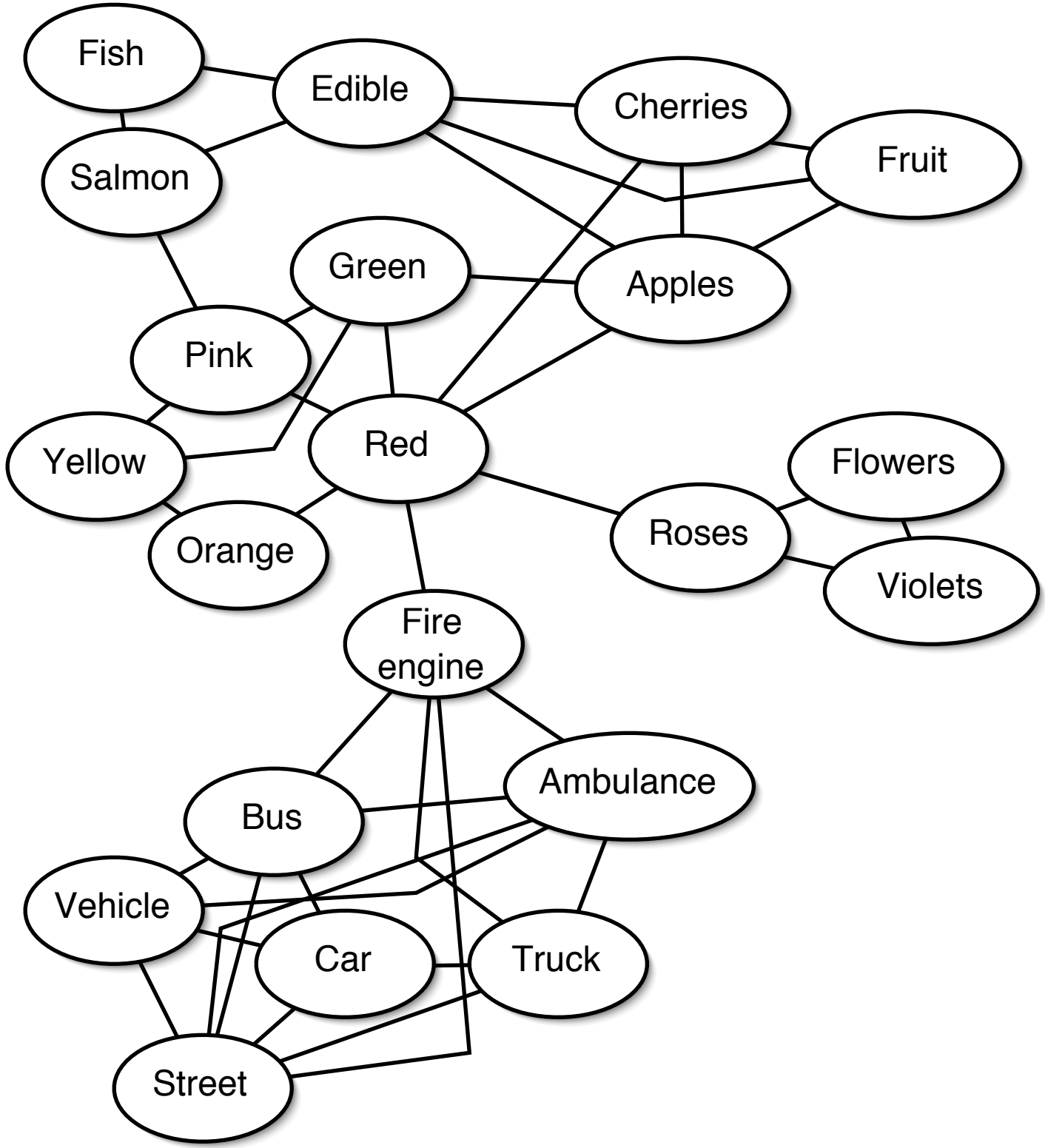
Feature comparison

- Two kinds of features
  - Defining: critical for category
  - Characteristic: common but not necessary for category
- Stage 1: Compare all features
  - Enough overlap to say yes?
- Stage 2: If no: Compare defining features only

- Problems with this approach
  - Early problems about features
    - How to define them
    - How to make them work with context
  - Notion of “semantic similarity” still important

Another view

- Spreading activation model
  - Features are treated as concepts in their own right
  - Concepts are nodes
  - Associated concepts are connected
  - Activation spreads from node to node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Cherries
Fruit
Salmon
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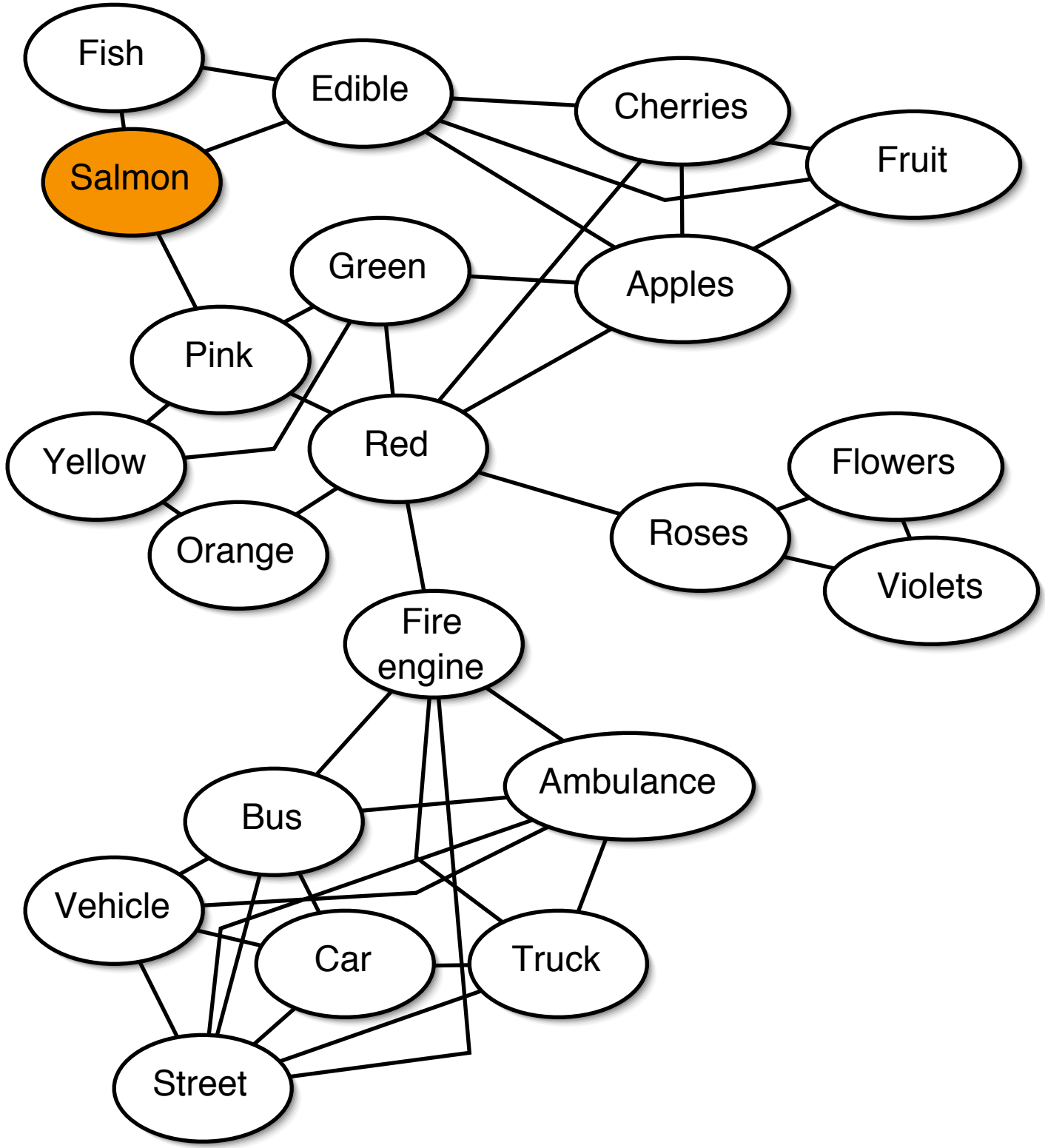
Apples
Pink
Yellow
Red
Flowers
Roses
Violets
Orange
Fire engine
Ambulance
Bus
Vehicle
Car
Truck
Street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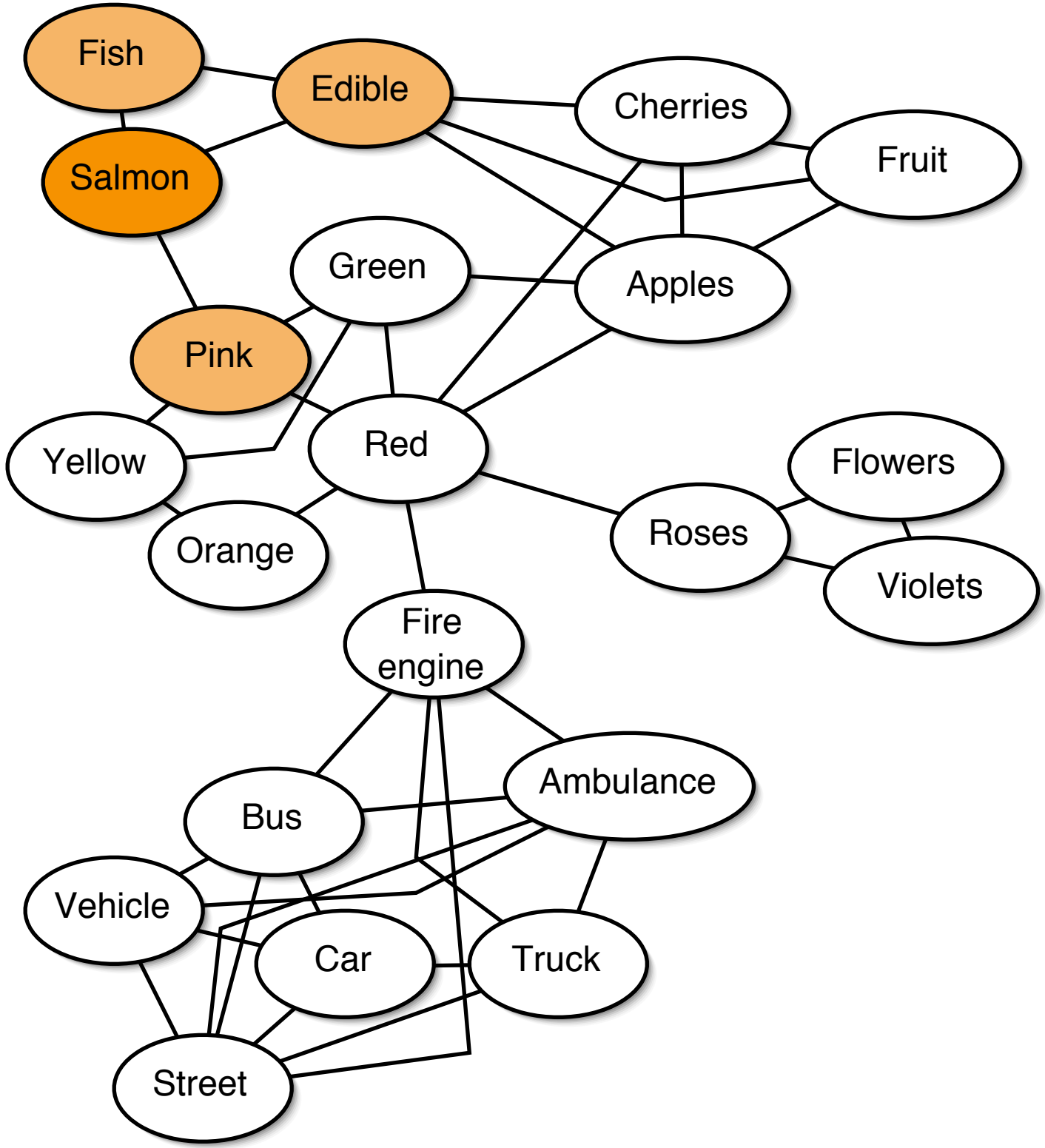
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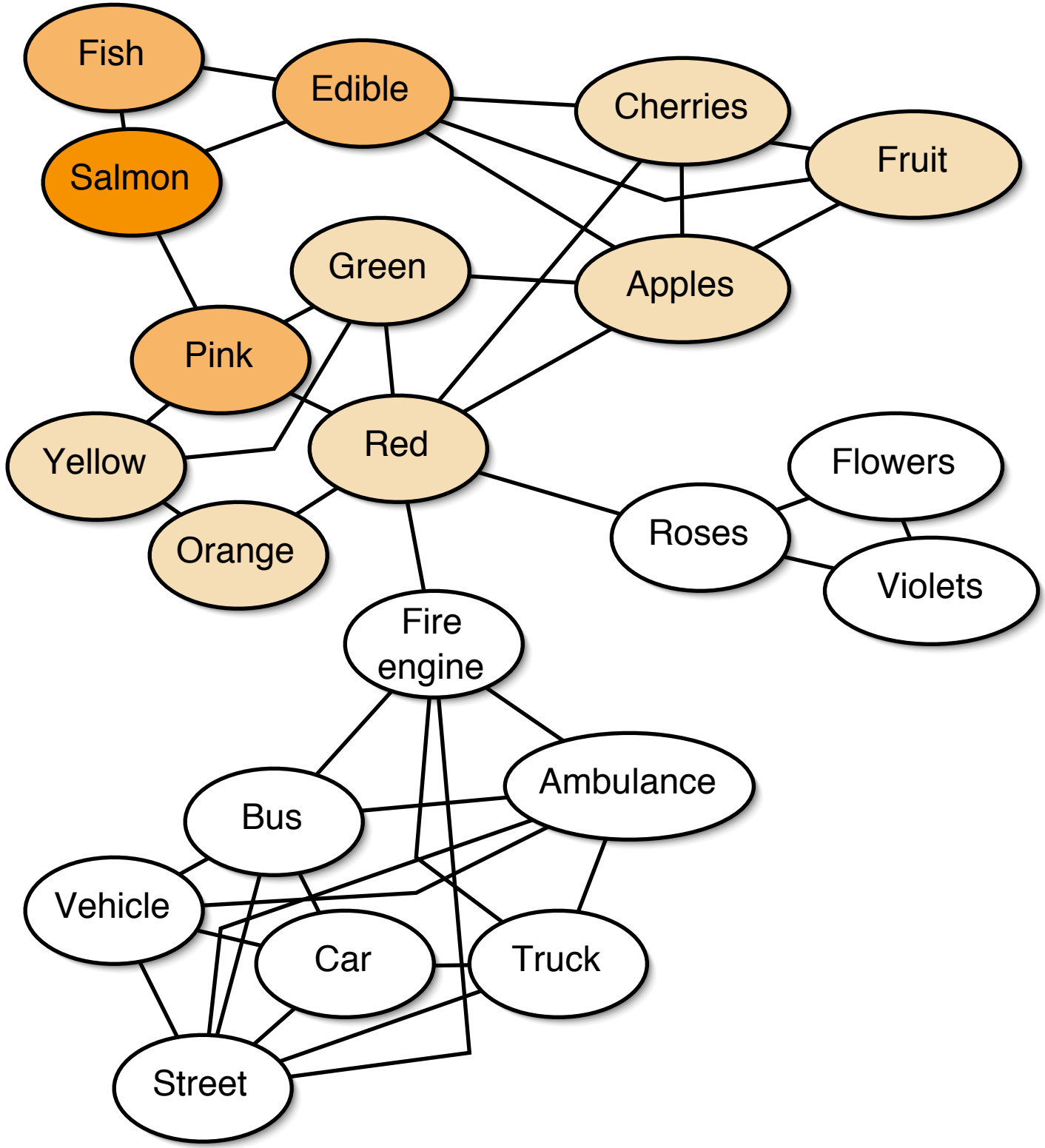
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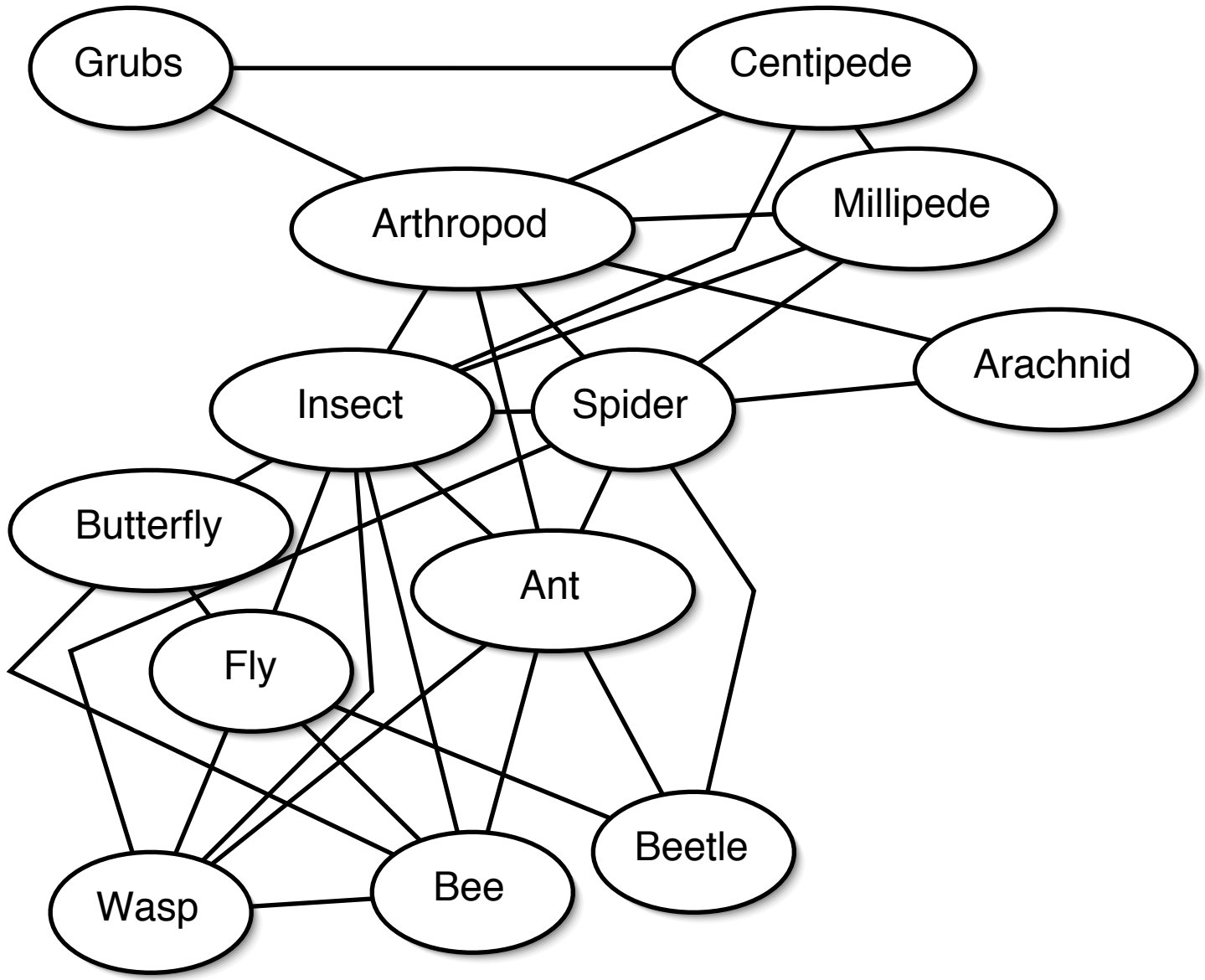
Spreading activation

- More highly associated concepts are closer together in the network
- Proximity means activation
  - Typicality Effects
    - Robin is closer to bird than robin
  - Subset Effects
    - Dog is closer to animal than mammal

A note about knowledge

- The problem with spiders
  - A spider is a kind of _____

    arachnid, arthropod
  - Not actually an insect
    - But that is most frequent response
  - Knowledge of "correct" conceptual organization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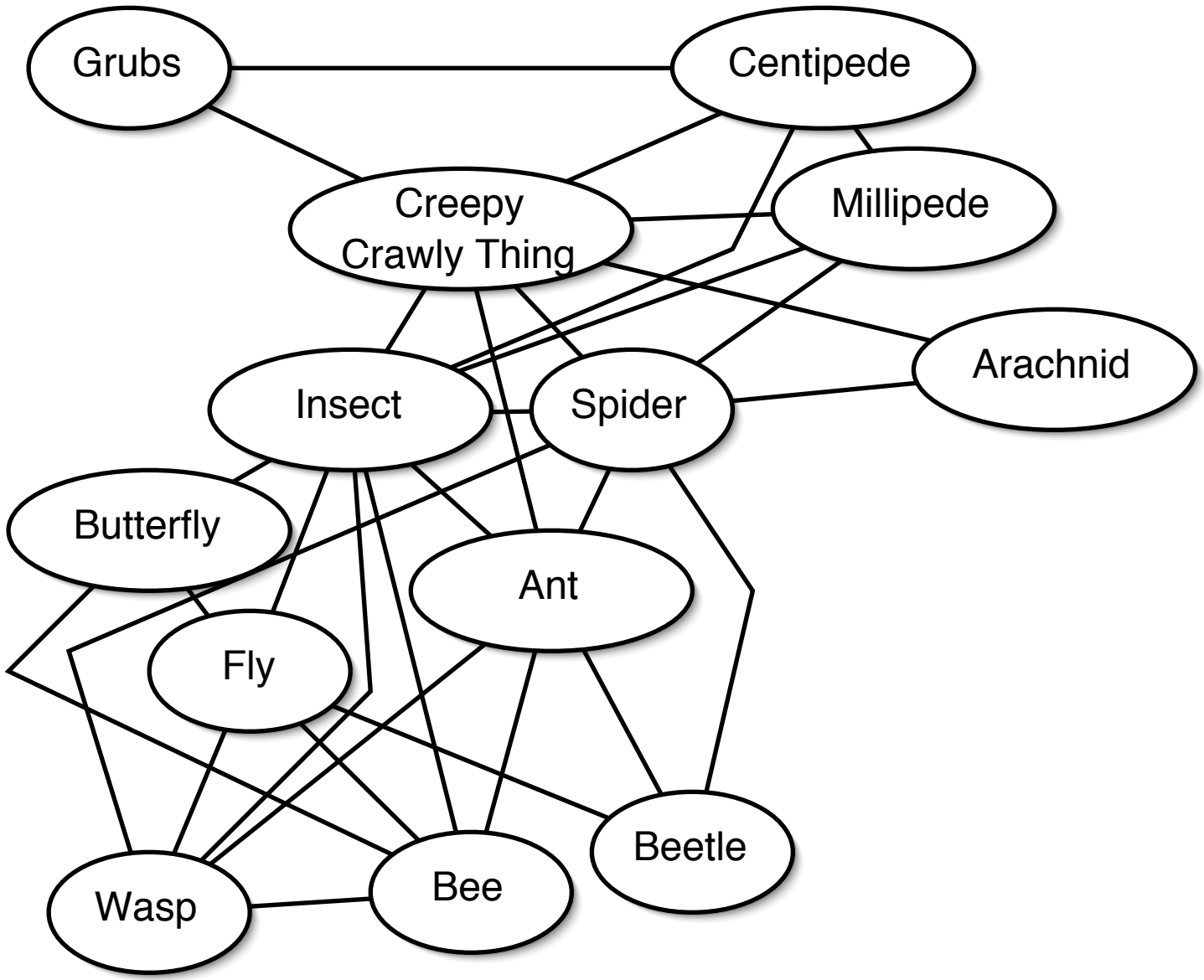
Arthropod
Millipede
Arachnid
Insect
Spider
Butterfly
Ant
Fly
Beetle
Wasp
Bee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Crawly Thing
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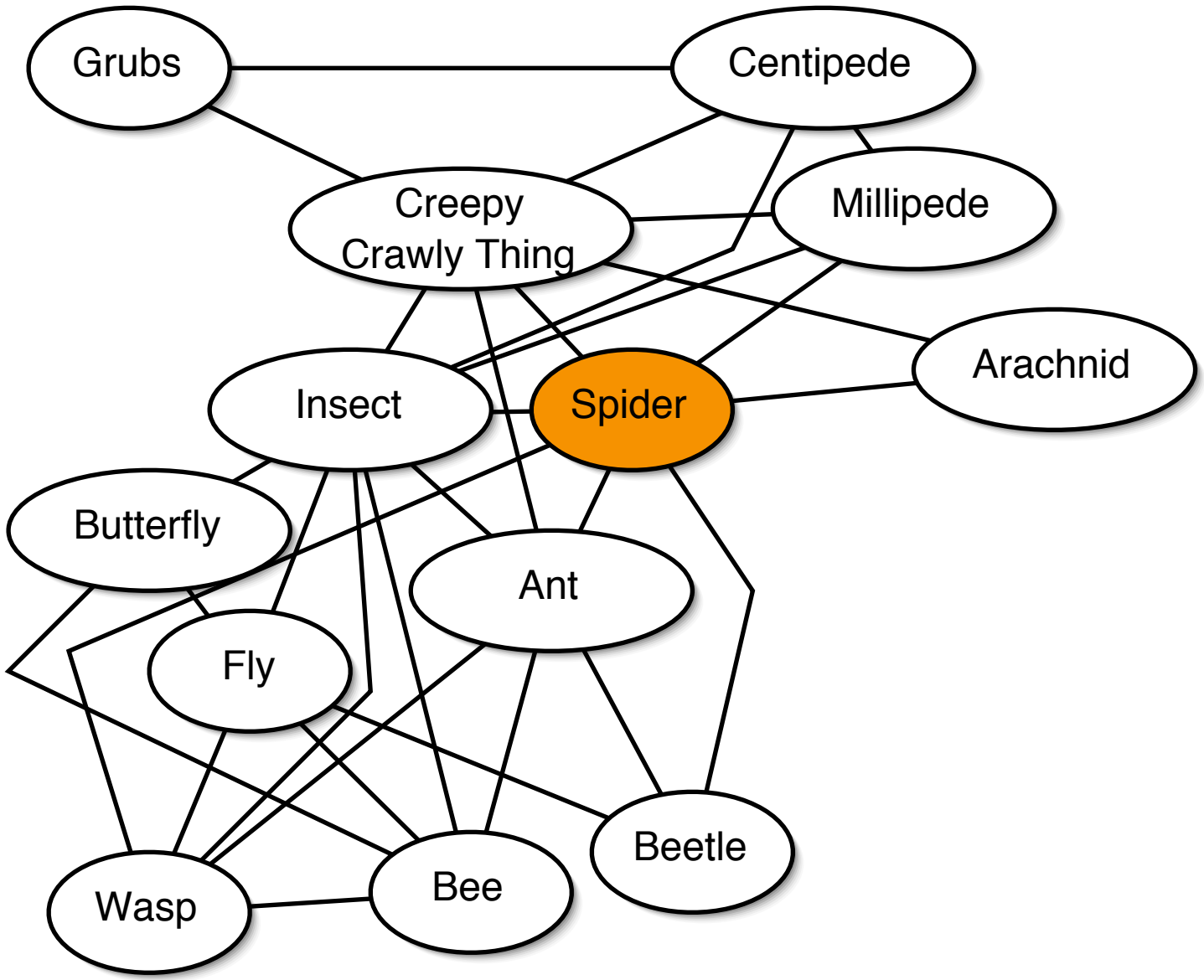
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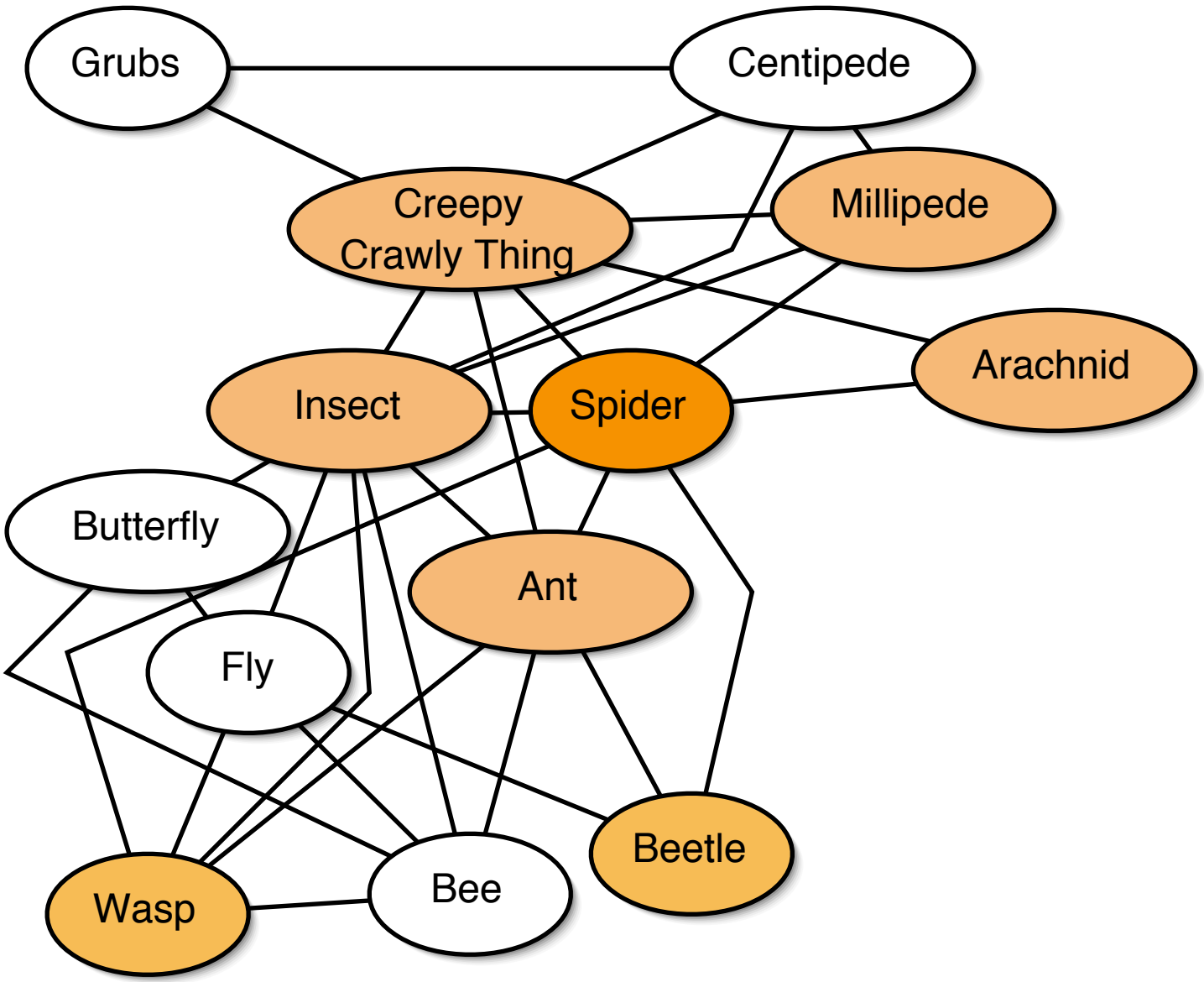
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Summary of concepts

- Concepts have substructure
  - Features (Context)
- Concept organization appears to have some hierarchical structure
  - Based on internal representations not direct real world
  - Not strictly taxonomic
    - Similarity plays an important role

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