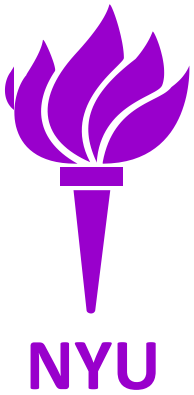


Semantic Grammar

CSCI-GA.2590 – Lecture 5B

Ralph Grishman

Finishing the Pipeline

- name tagger
- semantic patterns for information extraction

Name Tagging

- names play an important role in IE, so we need to be able to identify and classify names
- a big name dictionary will help (e.g., from Wikipedia), but we can't just use a dictionary … there will be many names we have not seen before
  - Fred Motelybush
  - Association of Snow Shovelers

Patterns for Name Tagging

- person:
  - title cap+ (Mr. Ziporah Schindler)
  - common-first-name cap+ (Fred Schindler)
  - cap+ verb-with-human-subject (Ziporah Schindler believes)
- organization
  - cap+ corporate suffix (Amalgamated Nonesense Inc.)
- location
  - cap+ , state (Newark, New Jersey)

from census data

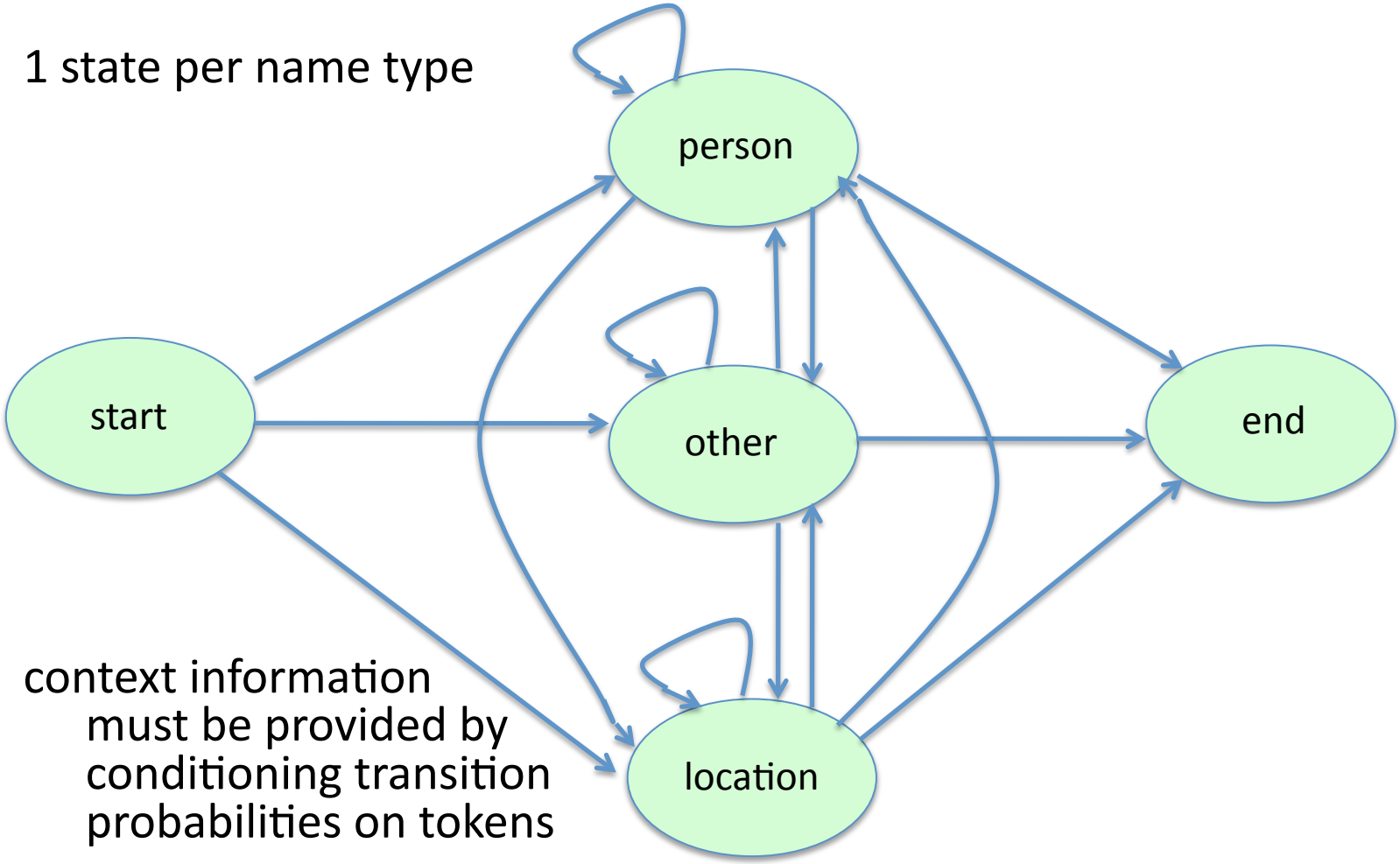
Corpus-trained Name Taggers

Name tagging is also a sequence tagging task … another opportunity to use an HMM (or TBL)

(lots of training data available for many languages … a widely used testbed for trying out new sequence taggers)

A simple HMM for name tagging with 2 name types

1 state per name type

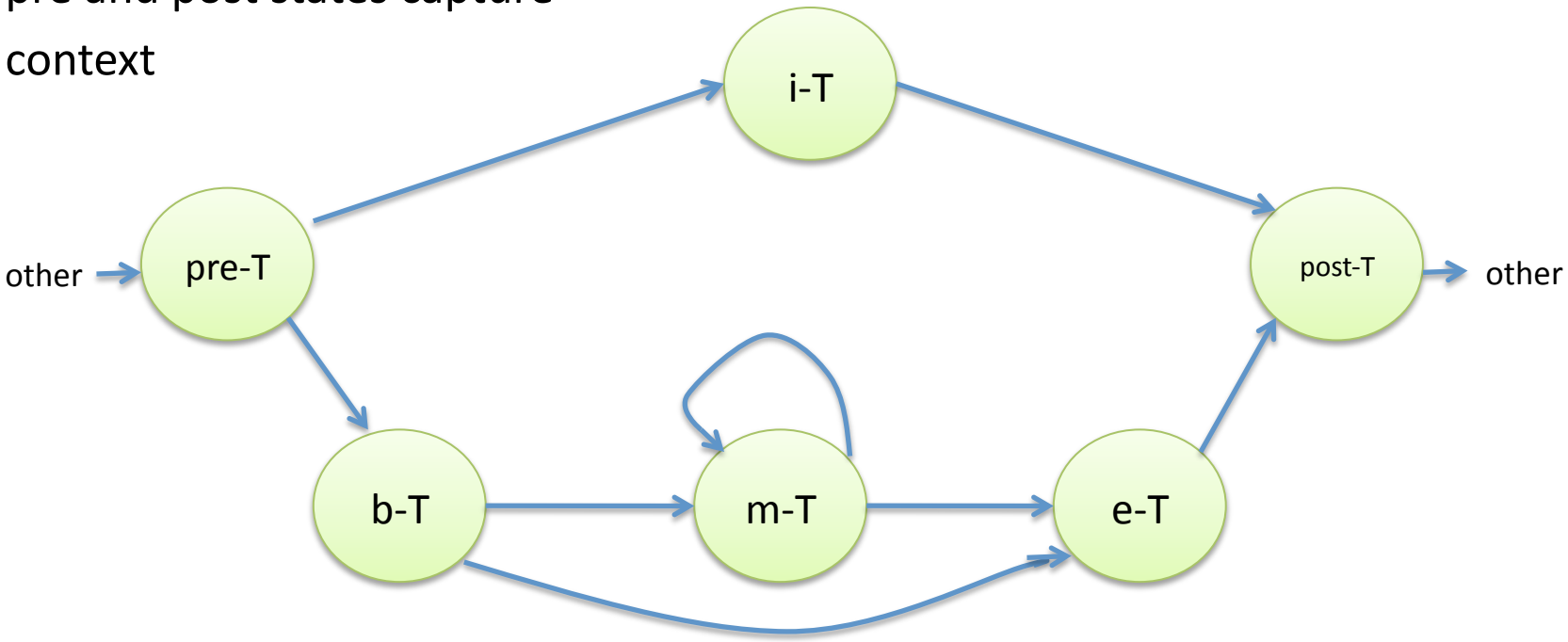


context information must be provided by conditioning transition probabilities on tokens

Jet name tagger: HMM structure for each name type

(simplified) state configuration for each name type *T*

pre and post states capture context



Semantic Patterns

- We cannot build patterns for larger constituents based on syntactic categories:
  - too much ambiguity
  - we must look for more specific patterns based on *semantic* categories

Appointment Patterns (1)

Goal: extract information on executive hiring … patterns like

- *company "appointed" person "as" position*
- *company "named" person "as" position*
- *company "selected" person "as" position*

Appointment Patterns (2)

Need to generalize over tenses:

- *company ("appointed" | "appoint" | "appoints") person "as" position*

Appointment Patterns (3)

More conveniently, we can make use of the *pa* feature assigned by the Jet lexicon, which records the base form of verbs and nouns:

- *company [constit cat=tv pa=[head=appoint]] person "as" position*

Appointment Patterns (4)

Want to also handle *verb groups* such as

- Enron *has appointed* Fred Smith as treasurer for the day.
- Enron *will appoint* Fred Smith as comptroller.

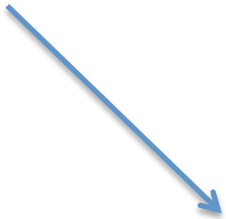
Appointment Patterns (5)

We can do this by defining a verb group for each verb:

```
vg-appoint := [constit cat=tv pa=[head=appoint]] |
   [constit cat=w] vg-inf-appoint | tv-vbe vg-ving-appoint;
vg-inf-appoint := [constit cat=v pa=[head=appoint]] |
   "be" vg-ving-appoint;
vg-ving-appoint := [constit cat=ving pa=[head=appoint]];
when vg-appoint add [constit cat=vgroup-appoint];
```

Appointment Patterns (6)

It is much more efficient to define a single verb group with a variable feature value which is bound and later used



```
vg := [constit cat=tv pa=PA-verb] |
   [constit cat=w] vg-inf | tv-vbe vg-ving;
vg-inf := [constit cat=v pa=PA-verb] | "be" vg-ving;
vg-ving := [constit cat=ving pa=PA-verb];
when vg add [constit cat=vgroup pa=PA-verb];
```

Appointment Patterns (7)

Still inconvenient to write a separate pattern for each word …

- [constit cat=vgroup pa=[head=appoint]] | [constit cat=vgroup pa=[head=name]] | etc

Appointment Patterns (8)

We can define an appointment concept and associate it with a set of appointment words:

[constit cat=vgroup pa=[head?isa(*cAppoint*)]]

Patterns for Appointment Events (1)

```
appoint:= appoint-act | appoint-pass | appoint-nom;
// pattern for active verb phrase:  appointed <person> as <position>
appoint-act:= [constit cat=vgroup pa=[head?isa(cAppoint)]]
    [constit cat=ngroup]:Person
     ("as" | "to" [constit cat=ngroup pa=[head=position]] "of" |    "to"
    "become")    [constit cat=ngroup]:Position;
// pattern for passive clause:  <person> was appointed as <position>
appoint-pass:= [constit cat=ngroup]:Person
    [constit cat=vgroup-pass pa=[head?isa(cAppoint)]]
    ("as" | "to" [constit cat=ngroup pa=[head=position]] "of" | "to" "become")
    [constit cat=ngroup]:Position;
```

Patterns for Appointment Events (2)

```
// pattern for nominalization:  appointment of <person> as <position>
appoint-nom:= [constit cat=ngroup pa=[head?isa(cAppointment)]] "of"
     [constit cat=ngroup]:Person
     ("as" | "to" [constit cat=ngroup pa=[head=position]] "of"  |    "to"
     "become" | "to")   [constit cat=ngroup]:Position;
// write out person and position to standard output
when appoint    write "Appointed " + Person + " as " + Position;
```