

TAC 2015

Cold Start

Knowledge Base Population



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What's New 2015

- Slot Filling Variant - Supersedes Slot Filling track
- New Variant - Entity Discovery. Produce skeleton KB with only entities and types
- Not these slides



The Task

Knowledge Base Variant

You are given:

Schema

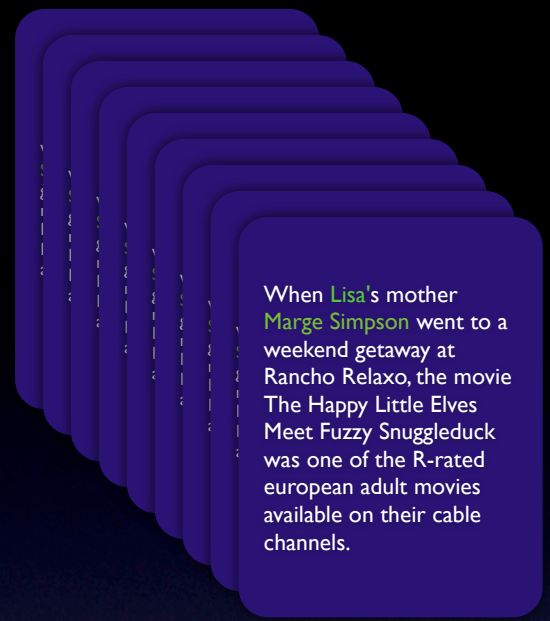
per:children
per:other_family
per:parents
per:siblings
per:spouse
per:employee_of
per:member_of
per:schools_attend

When Lisa's mother Marge Simpson went to a weekend getaway at Rancho Relaxo, the movie The Happy Little Elves Meet Fuzzy Snuggleduck was one of the R-rated european adult movies available on their cable channels.

Schema

- per:children
- per:other_family
- per:parents
- per:siblings
- per:spouse
- per:employee_of
- per:member_of
- per:schools_attend

You Must Produce:



When Lisa's mother Marge Simpson went to a weekend getaway at Rancho Relaxo, the movie The Happy Little Elves Meet Fuzzy Snuggleduck was one of the R-rated european adult movies available on their cable channels.

Springfield



Marge Simpson

per:cities_of_residence

per:children

per:children

per:spouse



Homer Simpson

per:alternate_names

BOTTOMLESS PETE, NATURE'S CRUELEST MISTAKE



Springfield Elementary

per:schools_attended

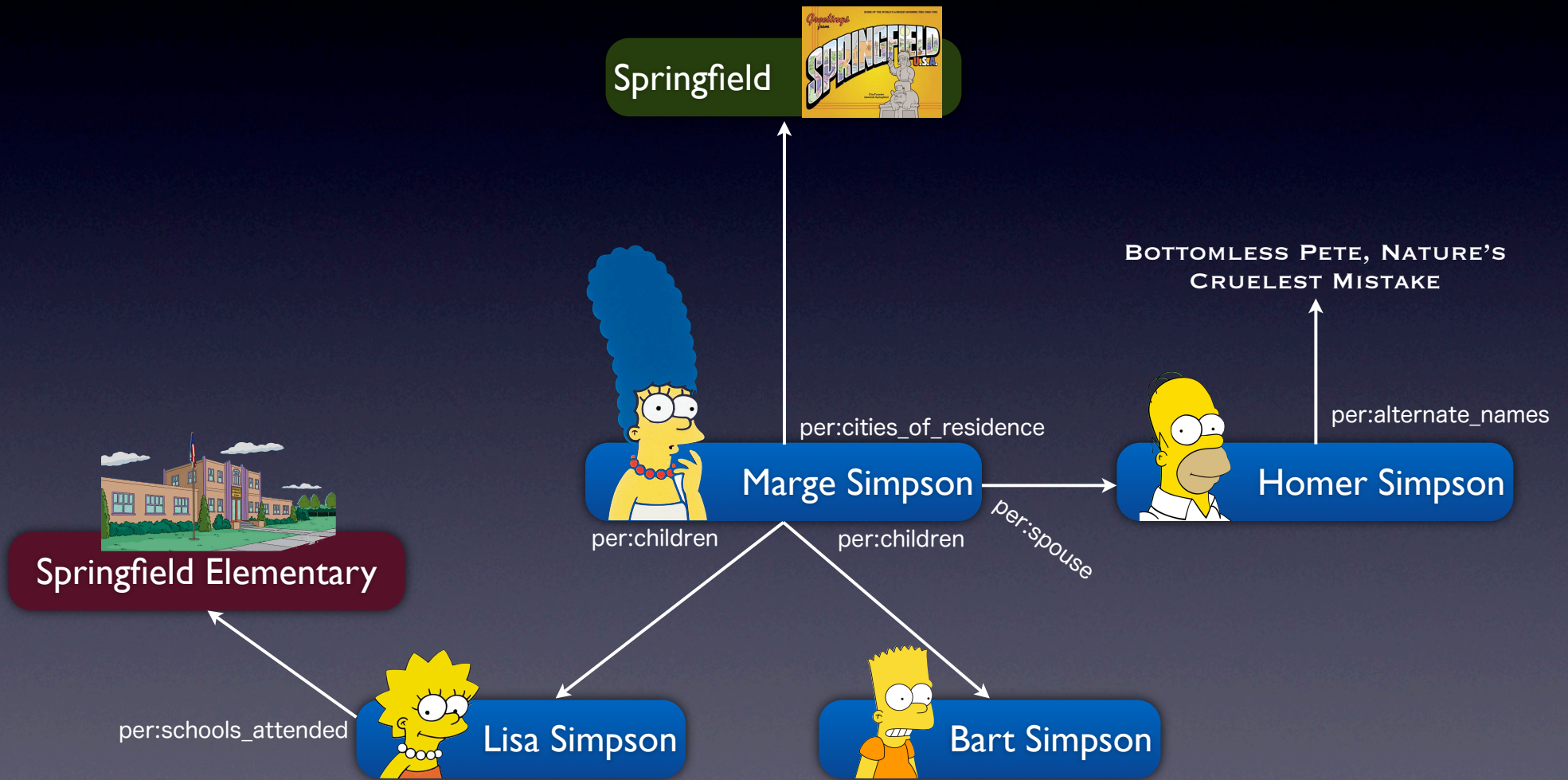


Lisa Simpson



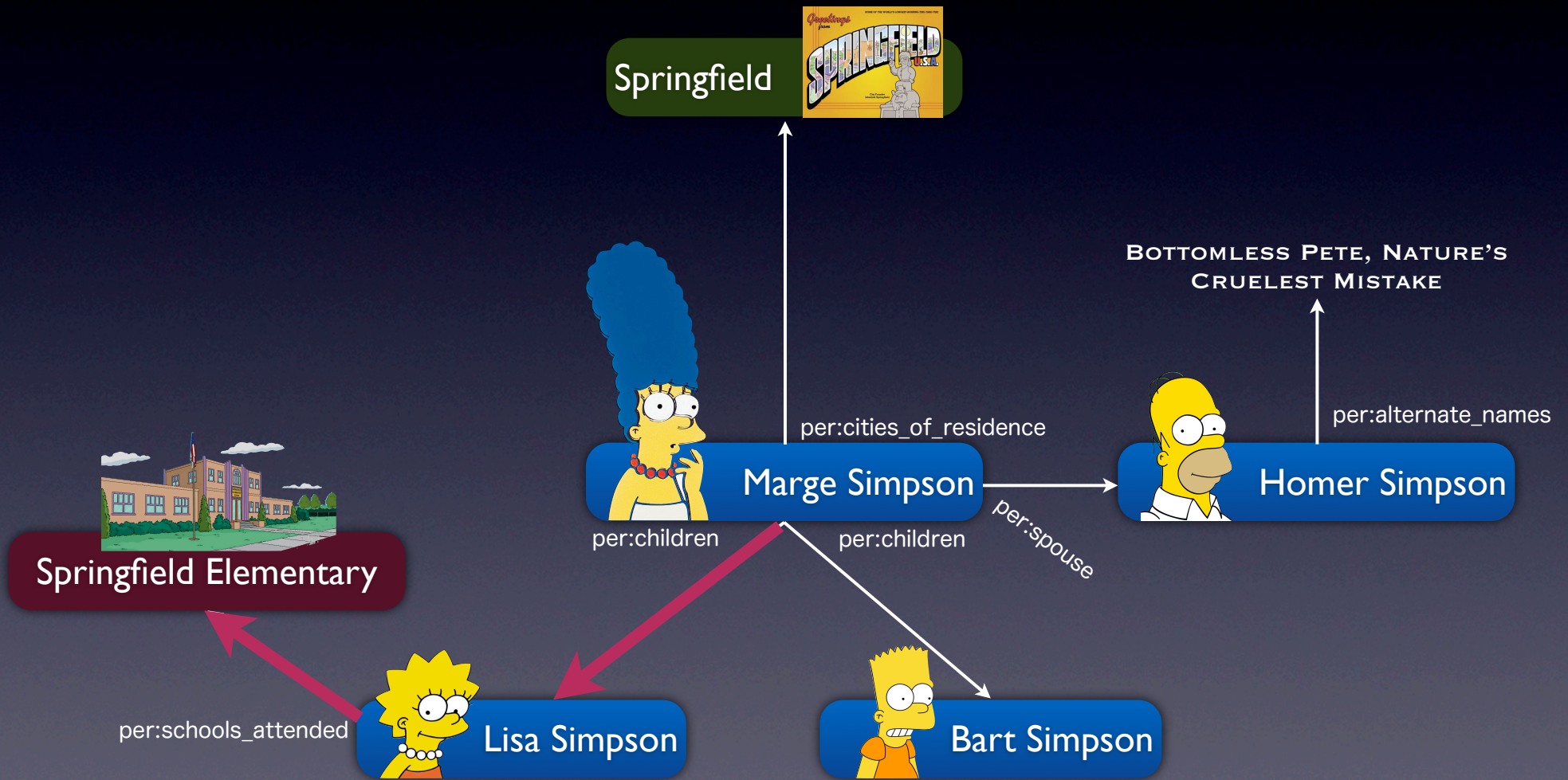
Bart Simpson

How do you know that your KB is any good?



Where did the children of Marge Simpson go to school?

per:children
per:schools_attended



When Lisa's mother Marge Simpson went to a weekend getaway at Rancho Relaxo, the movie The Happy Little Elves Meet Fuzzy Snuggleduck was one of the R-rated european adult movies available on their cable channels.

After two years in the academic quagmire of Springfield Elementary, Lisa finally has a teacher that she connects with. But she soon learns that the problem with being middle-class is that

Springfield



Marge Simpson

per:children

per:cities_of_residence

per:children

per:spouse



Homer Simpson

per:alternate_names

BOTTOMLESS PETE, NATURE'S CRUELEST MISTAKE



Springfield Elementary

per:schools_attended



Lisa Simpson



Bart Simpson

Entity-Valued Relations



Relation

Inverse(s)

per:children	per:parents
per:other_family	per:other_family
per:parents	per:children
per:siblings	per:siblings
per:spouse	per:spouse
per:employee_or_member_of	{org,gpe}:employees_or_members*
per:schools_attended	org:students*
per:city_of_birth	gpe:births_in_city*
per:stateorprovince_of_birth	gpe:births_in_stateorprovince*
per:country_of_birth	gpe:births_in_country*
per:cities_of_residence	gpe:residents_of_city*
per:statesorprovinces_of_residence	gpe:residents_of_stateorprovince*
per:countries_of_residence	gpe:residents_of_country*
per:city_of_death	gpe:deaths_in_city*
per:stateorprovince_of_death	gpe:deaths_in_stateorprovince*
per:country_of_death	gpe:deaths_in_country*
org:shareholders	{per,org,gpe}:holds_shares_in*
org:founded_by	{per,org,gpe}:organizations_founded*
org:top_members_employees	per:top_member_employee_of*
{org,gpe*}:member_of	org:members
org:members	{org,gpe*}:member_of
org:parents	{org,gpe*}:subsidiaries
org:subsidiaries	org:parents
org:city_of_headquarters	gpe:headquarters_in_city*
org:stateorprovince_of_headquarters	gpe:headquarters_in_stateorprovince*
org:country_of_headquarters	gpe:headquarters_in_country*
org:country_of_headquarters	gpe:headquarters_in_country*

String-Filled Relations

per:alternate_names

per:date_of_birth

per:age

per:origin

per:date_of_death

per:cause_of_death

per:title

per:religion

per:charges

org:alternate_names

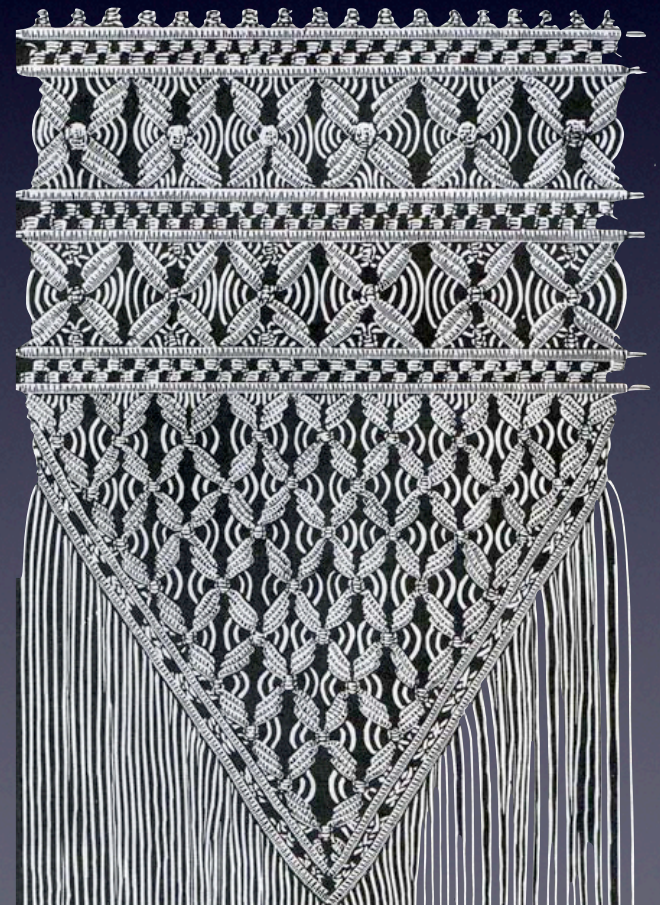
org:political_religious_affiliation

org:number_of_employees_members

org:date_founded

org:date_dissolved

org:website



Sample Evaluation Query

```
<query id="CS15_ENG_0954">
  <name>McDonald's</name>
  <docid>5637c4092dffaf2b94448f365f2f6fb3</docid>
  <beg>403</beg>
  <end>412</end>
  <name>Mickey D's</name>
  <docid>542f252fac77c3b1015ed1646614478f</docid>
  <beg>439</beg>
  <end>448</end>
  <name>McD's</name>
  <docid>NYT_ENG_20130625.0068</docid>
  <beg>4290</beg>
  <end>4294</end>
  <name>McDonald's Corp.</name>
  <docid>69735cd30f0fead03ae6b6f031588271</docid>
  <beg>649</beg>
  <end>664</end>
  <name>MCD</name>
  <docid>da5778f5d9c2b0939ea206a85518ba87</docid>
  <beg>495</beg>
  <end>497</end>
  <enttype>org</enttype>
  <slot0>org:employees_or_members</slot0>
  <slot1>per:date_of_birth</slot1>
</query>
```

Multiple Entrypoints

Location of Mention
in Document

Up to Two Slots
(called hop 0 and hop 1)



Query Decomposition

```
<query id="CSI5_ENG_0954">
  <name>McDonald's</name>
  <docid>5637c4092dffaf2b94448f365f2f6fb3</docid>
  <beg>403</beg>
  <end>412</end>
  <name>Mickey D's</name>
  <docid>542f252fac77c3b1015ed1646614478f</docid>
  <beg>439</beg>
  <end>448</end>
  <name>McD's</name>
  <docid>NYT_ENG_20130625.0068</docid>
  <beg>4290</beg>
  <end>4294</end>
  <name>McDonald's Corp.</name>
  <docid>69735cd30f0fead03ae6b6f031588271</docid>
  <beg>649</beg>
  <end>664</end>
  <name>MCD</name>
  <docid>da5778f5d9c2b0939ea206a85518ba87</docid>
  <beg>495</beg>
  <end>497</end>
  <enttype>org</enttype>
  <slot0>org:employees_or_members</slot0>
  <slot1>per:date_of_birth</slot1>
</query>
```



```
<query id="CSSFI5_ENG_1781079fa5">
  <name>McD's</name>
  <docid>NYT_ENG_20130625.0068</docid>
  <beg>4290</beg>
  <end>4294</end>
  <enttype>org</enttype>
  <slot0>org:employees_or_members</slot0>
  <slot1>per:date_of_birth</slot1>
</query>
```

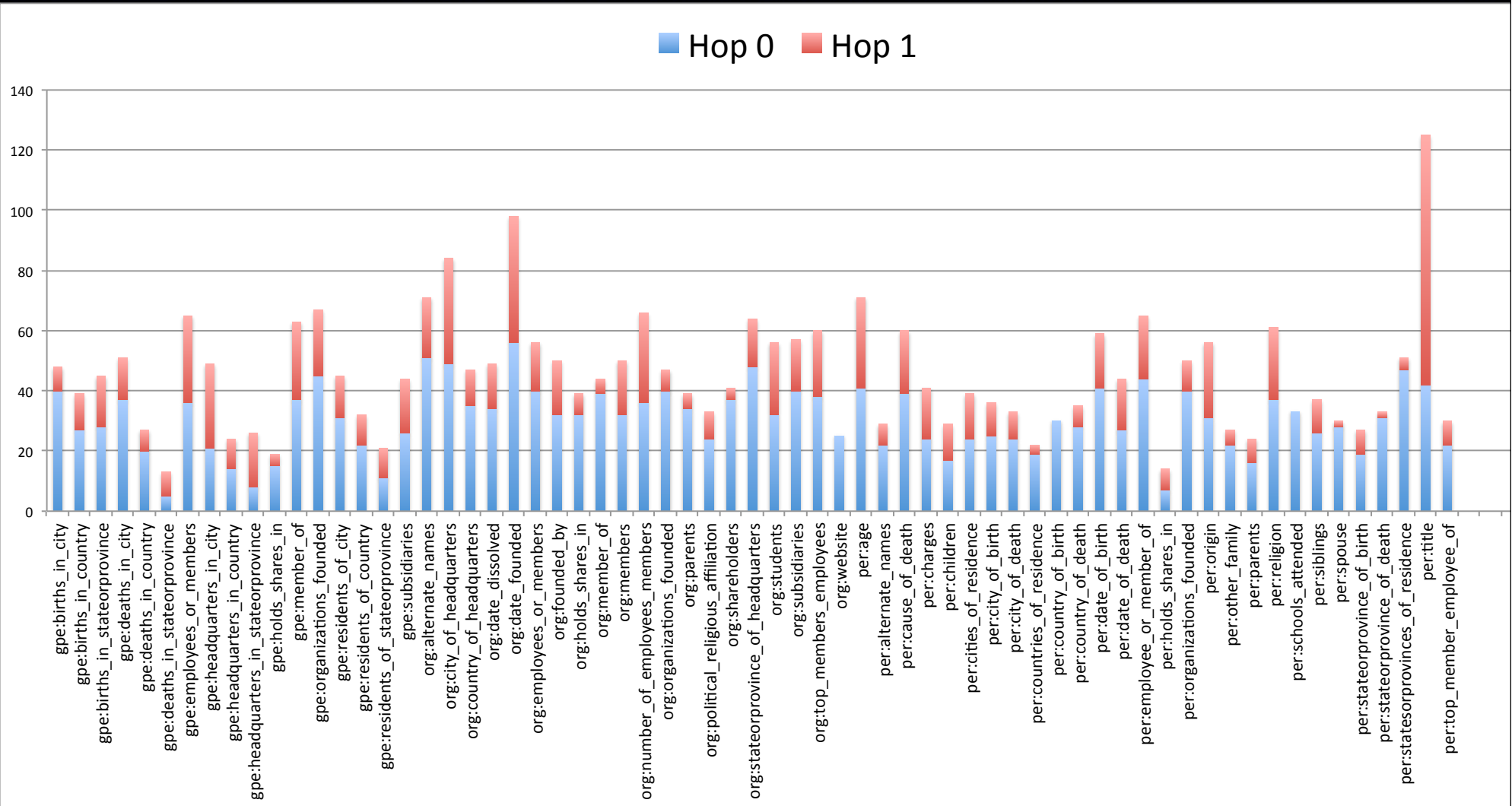
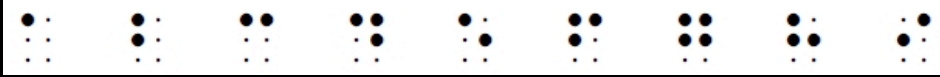
```
<query id="CSSFI5_ENG_178f4789a5">
  <name>McDonald's</name>
  <docid>5637c4092dffaf2b94448f365f2f6fb3</docid>
  <beg>403</beg>
  <end>412</end>
  <enttype>org</enttype>
  <slot0>org:employees_or_members</slot0>
  <slot1>per:date_of_birth</slot1>
</query>
```

```
<query id="CSSFI5_ENG_23d20fa825">
  <name>McDonald's Corp.</name>
  <docid>69735cd30f0fead03ae6b6f03158
```

More Sample 2015 Evaluation Queries

Query Entity	First Relation	Second Relation
Sun Bo	per:date_of_birth	
Sun Bo	per:employee_or_member_of	org:students
Sun Bo	per:employee_or_member_of	org:country_of_headquarters
Chattanooga	gpe:residents_of_city	per:city_of_birth
Facebook	org:subsidiaries	org:alternate_names
TECO Energy	org:top_members_employees	per:religion
Sally Ride	per:spouse	per:title

Slot Counts in CS Queries



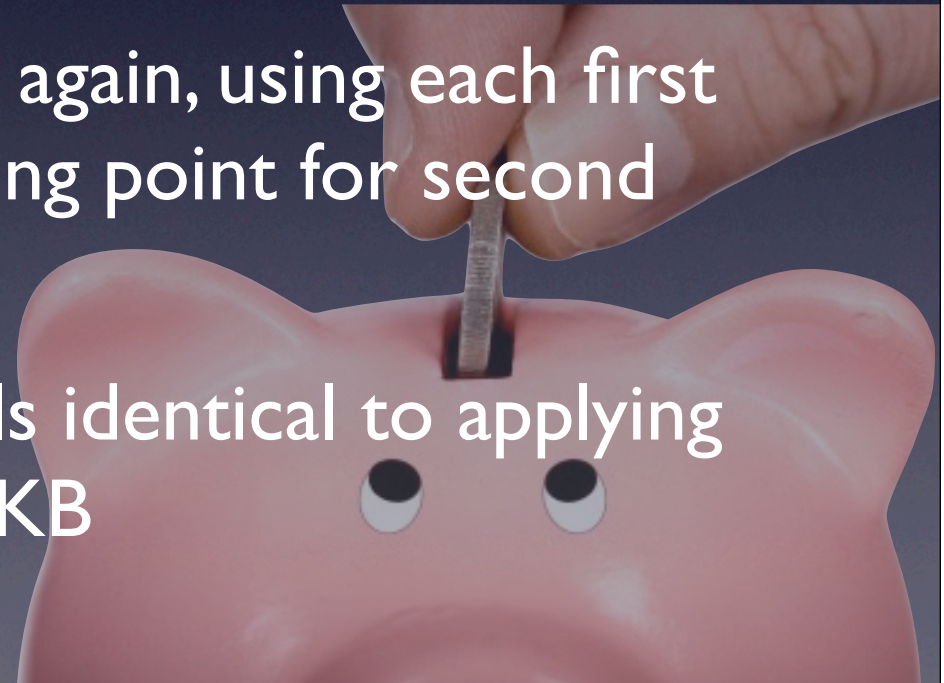


Slot Filling Variant



Slot Filling Variant

- Participants receive evaluation queries
- Run slot filling system to find fills for first query slot
- Run slot filling system again, using each first round slot fill as starting point for second query slot
- Result is set of slot fills identical to applying evaluation queries to KB




```
<query id="Simpsons_001">
  <name>Marge Simpson</name>
  <slot0>per:children</slot0>
  <slot1>per:schools_attended</slot1 >
</query>
```

The waiting is over!
The BBC today revealed that the companion for the next series of Doctor Who will be Marge Simpson. 34 year old Marge will star alongside new Doctor Matt Smith when the TARDIS returns to BBC One in spring 2010

Marge's son Bart Simpson has said
Doctor vwho is cool,

When Lisa's mother Marge Simpson went to a weekend getaway at Rancho Relaxo, the movie The Happy Little Elves Meet Fuzzy Snuggleduck was one of the R-rated european adult movies available on their cable channels.

Simpsons_001 per:children Lisa

Simpsons_001 per:children Bart Simpson



Simpsons_001 per:children Lisa

```
<query id="Simpsons_001_def">  
  <name>Lisa</name>  
  <slot0>per:schools_attended</slot1>  
</query>
```

Simpsons_001 per:children Bart Simpson

```
<query id="Simpsons_001_abc">  
  <name>Bart Simpson</name>  
  <slot0>per:schools_attended</slot1>  
</query>
```



```
<query id="Simpsons_001_def">  
  <name>Lisa</name>  
  <slot0>per:schools_attended</slot1 >  
</query>
```

After two years in the academic quagmire of Springfield Elementary, Lisa finally has a teacher that she connects with. But she soon learns that the problem with being middle-class is that

Simpsons_001_def per:schools_attended Springfield Elementary

```
<query id="Simpsons_001_abc">  
  <name>Bart Simpson</name>  
  <slot0>per:schools_attended</slot1 >  
</query>
```



How Slot Filling Variant is Different

From Previous Years' Slot Filling Tasks:

- Single information need
- Inverse slots

From Cold Start Knowledge Base variant:

- Perfect (first round) query name mentions
- Cross-document coreference resolution



Entity Discovery Variant

- Build a knowledge base with no relations
 - Entities
 - Entity types
 - Entity mentions
- Direct mapping onto TEDL submission format
- Scored by TEDL scorer



2015 Cold Start Document Collection

```
<doc id="05cb395b273ec302895b7fd6982eddae">
<headline> </headline>
<post author="tom" datetime="2006-06-16T17:24:00" id="p1">
well soon i will be goignto sandeigo lookin gforwar do going to see friends again
on vaction yea
</post>
<post author="Orchids" datetime="2006-06-18T22:37:00" id="p2">
Terrific! I love San Diego! 


</post>
<post author="VioletAngel" datetime="2006-06-20T23:31:00" id="p3">
San Diego is a great place!! 
</post>
<post author="JPPT1974" datetime="2006-07-05T20:21:00" id="p4">
I heard that it is good as my parents loved it!
</post>
<post author="bgoddenia" datetime="2006-07-19T01:35:00" id="p5">
cool
</post>
<post author="JPPT1974" datetime="2006-08-07T20:50:00" id="p6">
Good for you my friend!
</post>
</doc>
```

#Docs	Type
8,938	Newsire
40,186	Discussion Forum
49,124	Total

Assessment

- All CSKB and CSSF responses are pooled and anonymized
- Responses are grouped by original (multi-entriypoint) query
- LDC assesses correctness of each response
- LDC also groups responses into equivalence classes (representing the set of different response strings for a given entity)
- All hop 0 responses to a given query are assessed together. All hop 1 responses stemming from a single equivalence class that was judged CORRECT are assessed together

Scoring: Metrics

- **Correct** = total number of system output responses judged correct
- **System** = total number of system output responses
- **Reference** = number of single-valued slots with a correct response + number of equivalence classes for all list-valued slots
- **Recall** = $\text{Correct} / \text{Reference}$
- **Precision** = $\text{Correct} / \text{System}$
- **F₁** = $2 * \text{Precision} * \text{Recall} / (\text{Precision} + \text{Recall})$
- Average over all queries

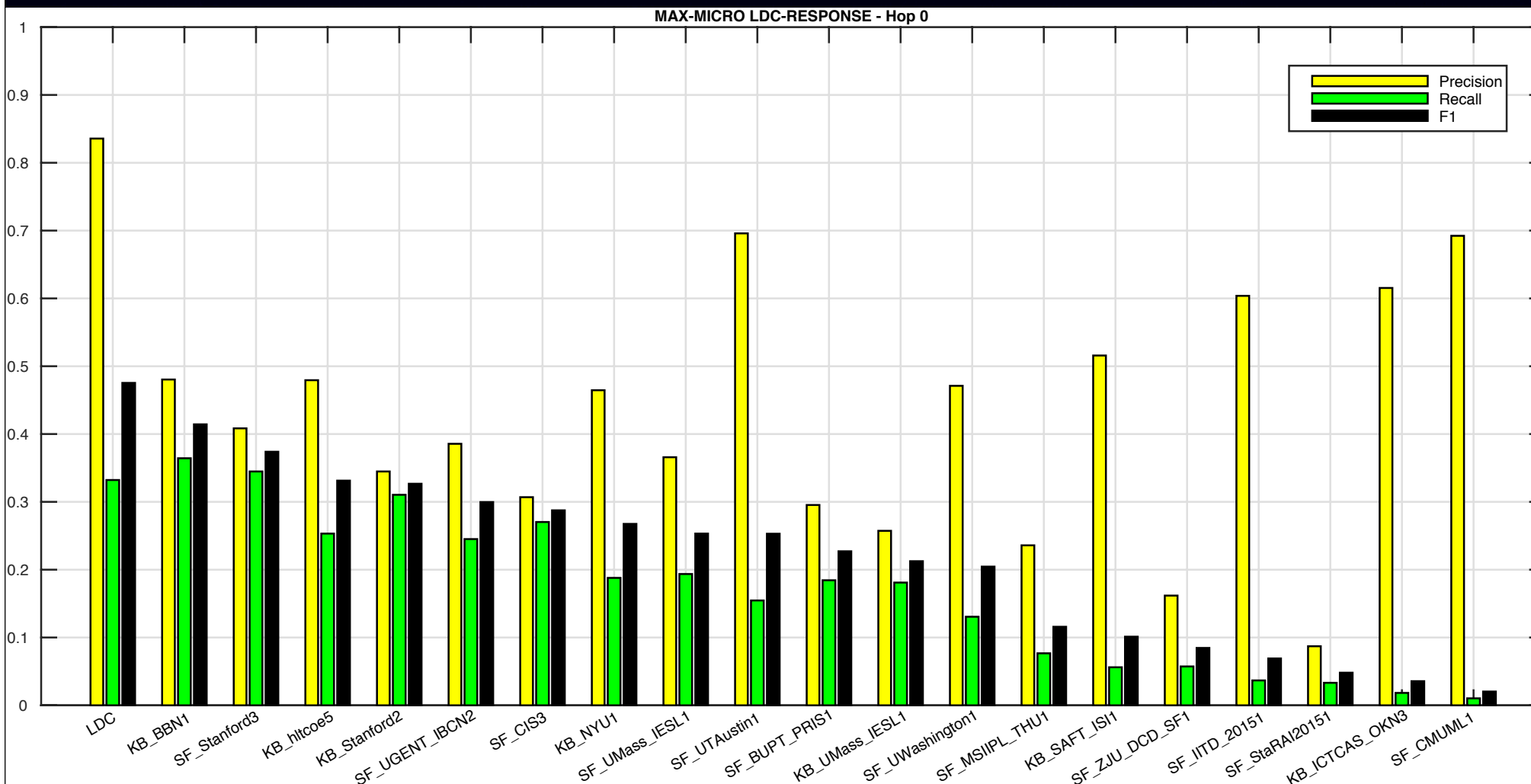
Scoring: Averaging

```
<query id="CS15_ENG_0954">
  <name>McDonald's</name>
  <docid>5637c4092dffaf2b94448f365f2f6fb3</docid>
  <beg>403</beg>
  <end>412</end>
  <name>Mickey D's</name>
  <docid>542f252fac77c3b1015ed1646614478f</docid>
  <beg>439</beg>
  <end>448</end>
  <name>McD's</name>
  <docid>NYT_ENG_20130625.0068</docid>
  <beg>4290</beg>
  <end>4294</end>
  <name>McDonald's Corp.</name>
  <docid>69735cd30f0fead03ae6b6f031588271</docid>
  <beg>649</beg>
  <end>664</end>
  <name>MCD</name>
  <docid>da5778f5d9c2b0939ea206a85518ba87</docid>
  <beg>495</beg>
  <end>497</end>
  <enttype>org</enttype>
  <slot0>org:employees_or_members</slot0>
  <slot1>per:date_of_birth</slot1>
</query>
```

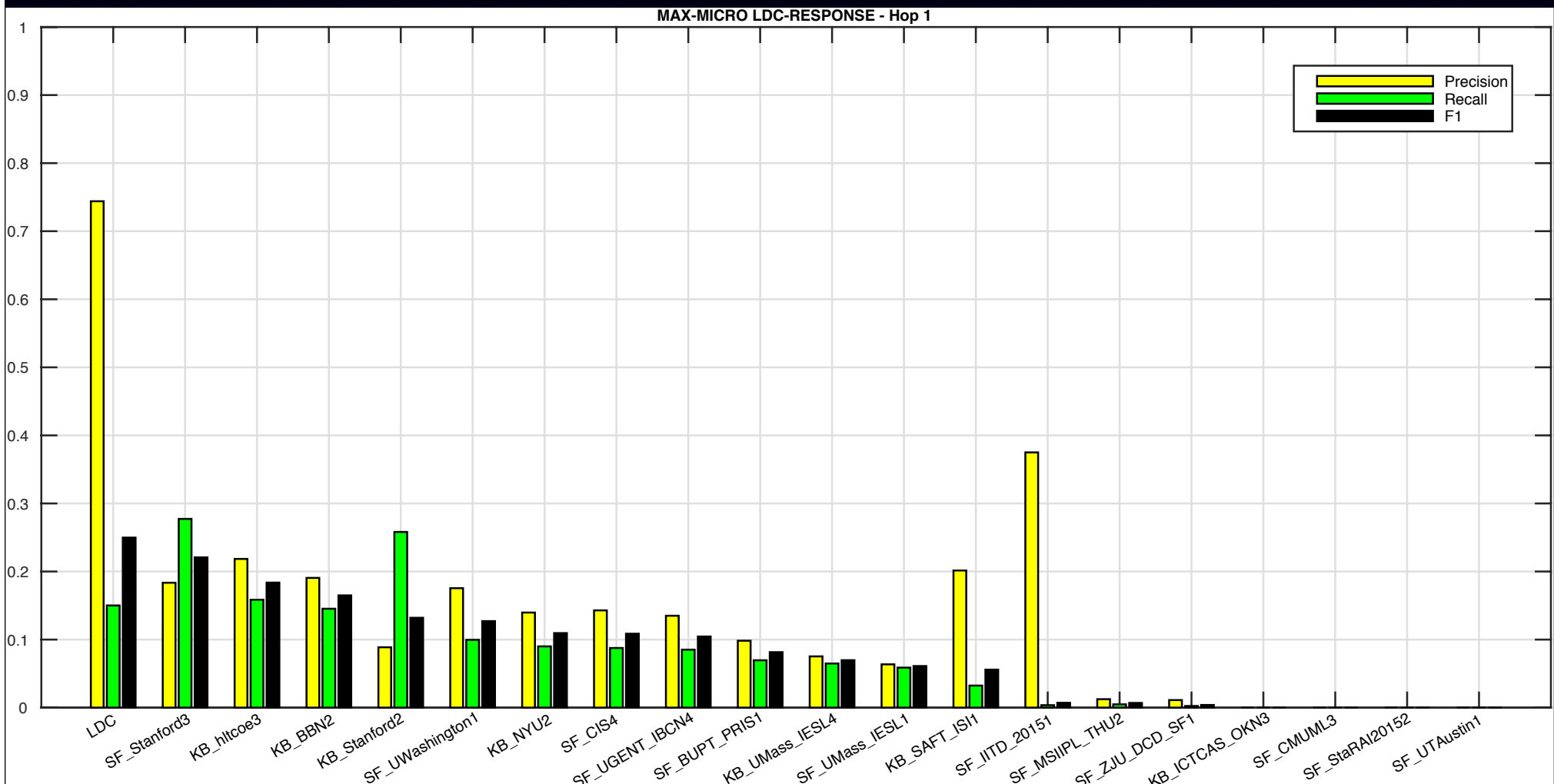
Multiple Entrypoints
average scores
use highest score

Multiple Hops
micro-average scores
macro-average scores

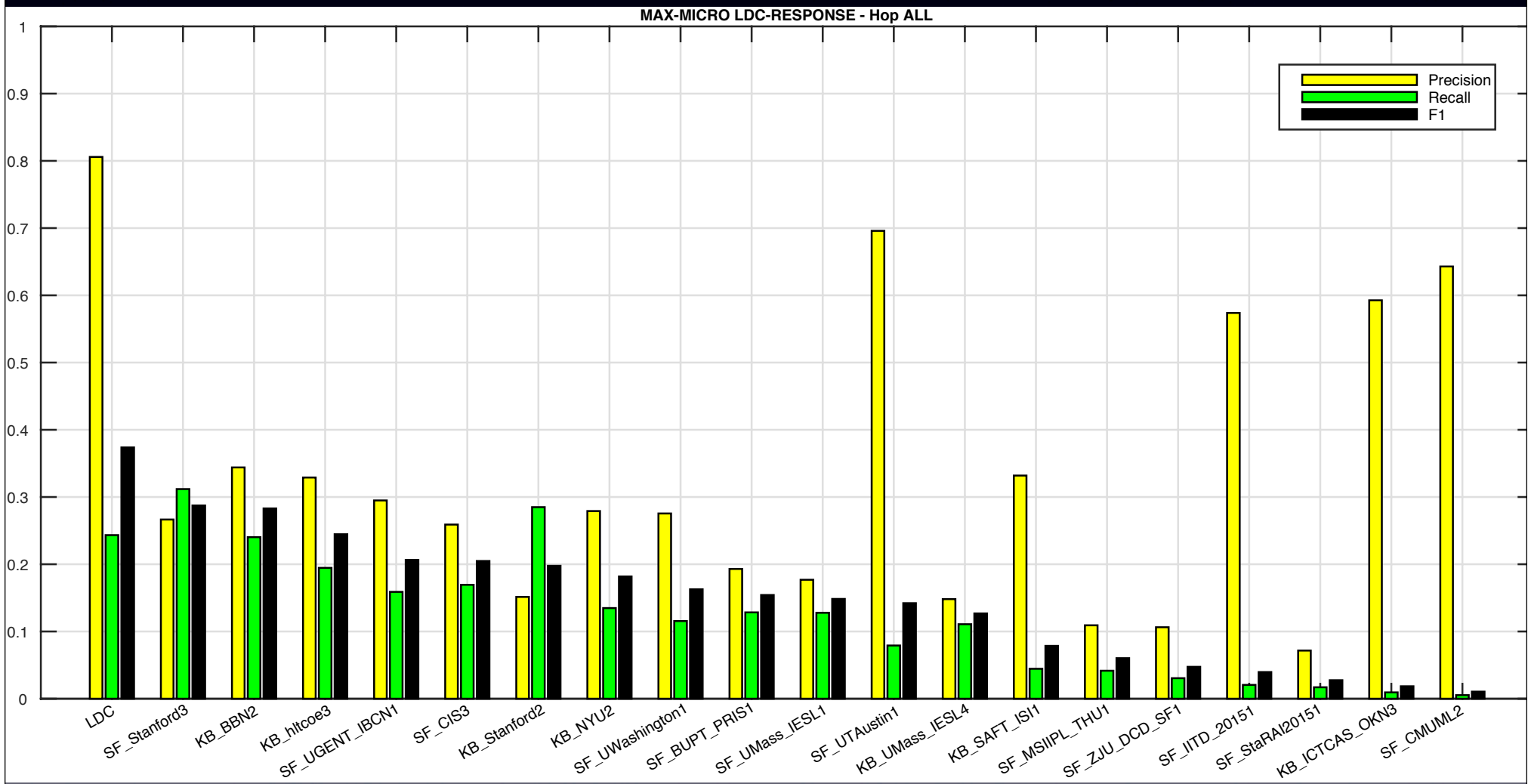
Max-Micro, LDC Response, Hop 0



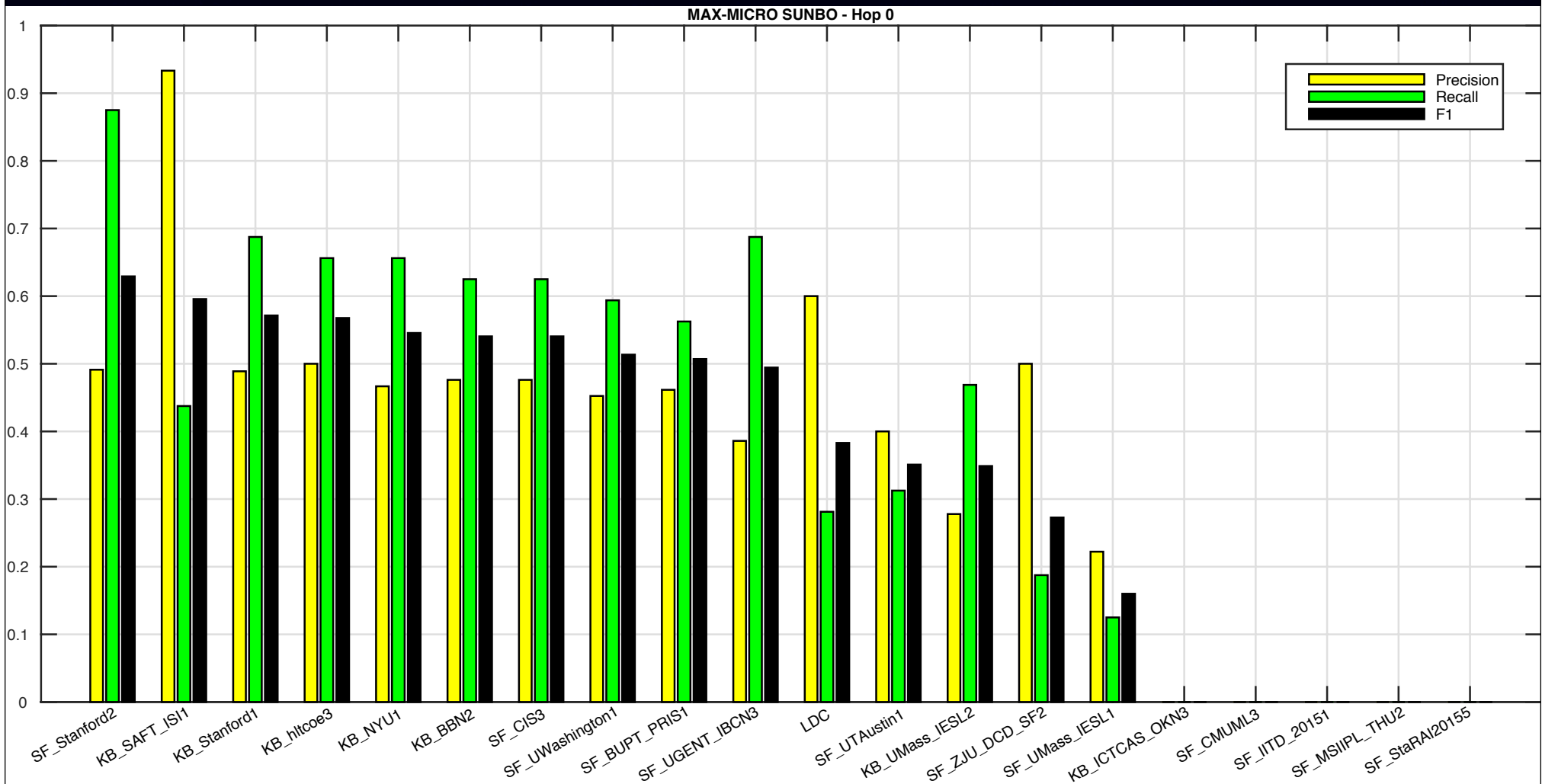
Max-Micro, LDC Response, Hop 1



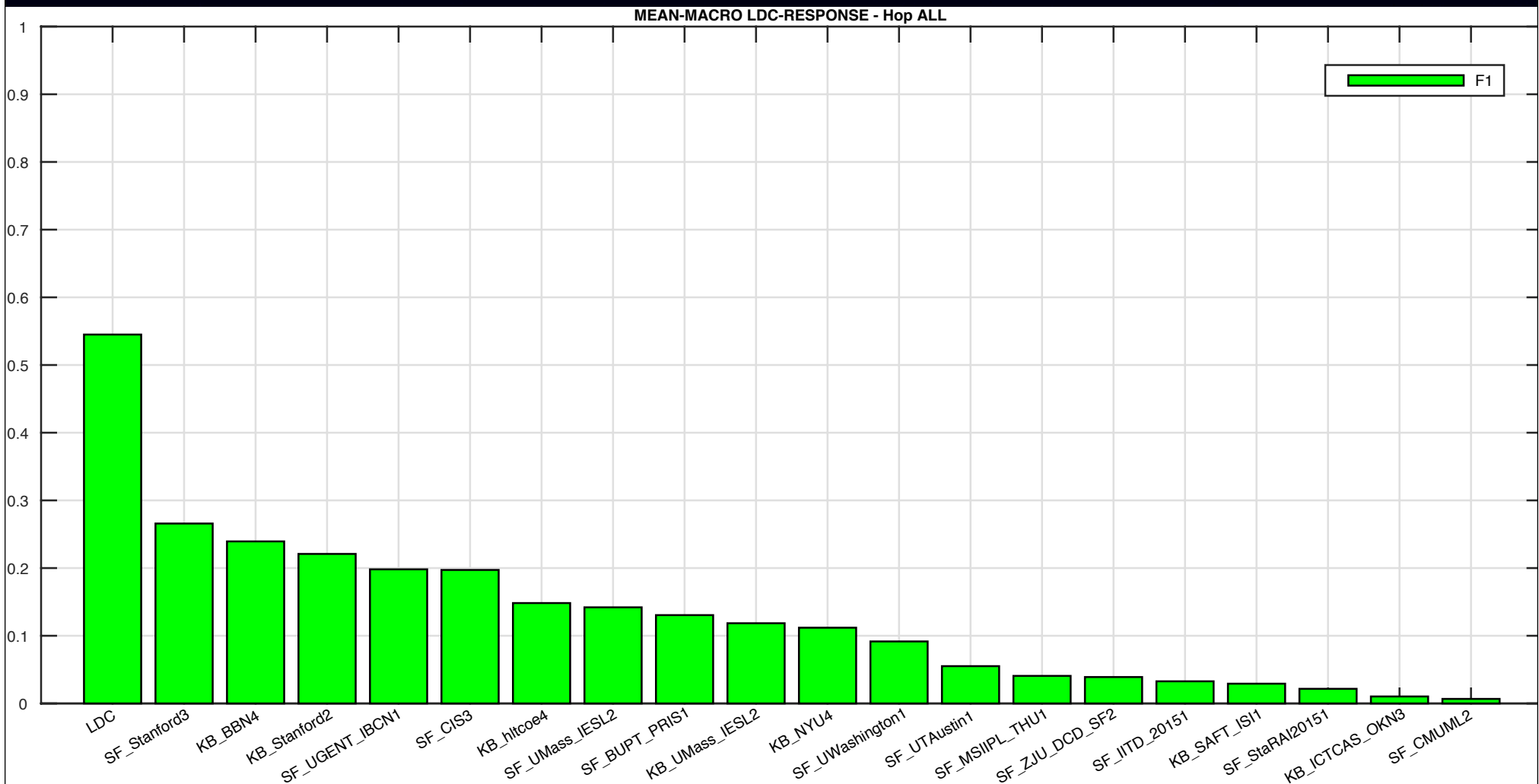
Max-Micro, LDC Response



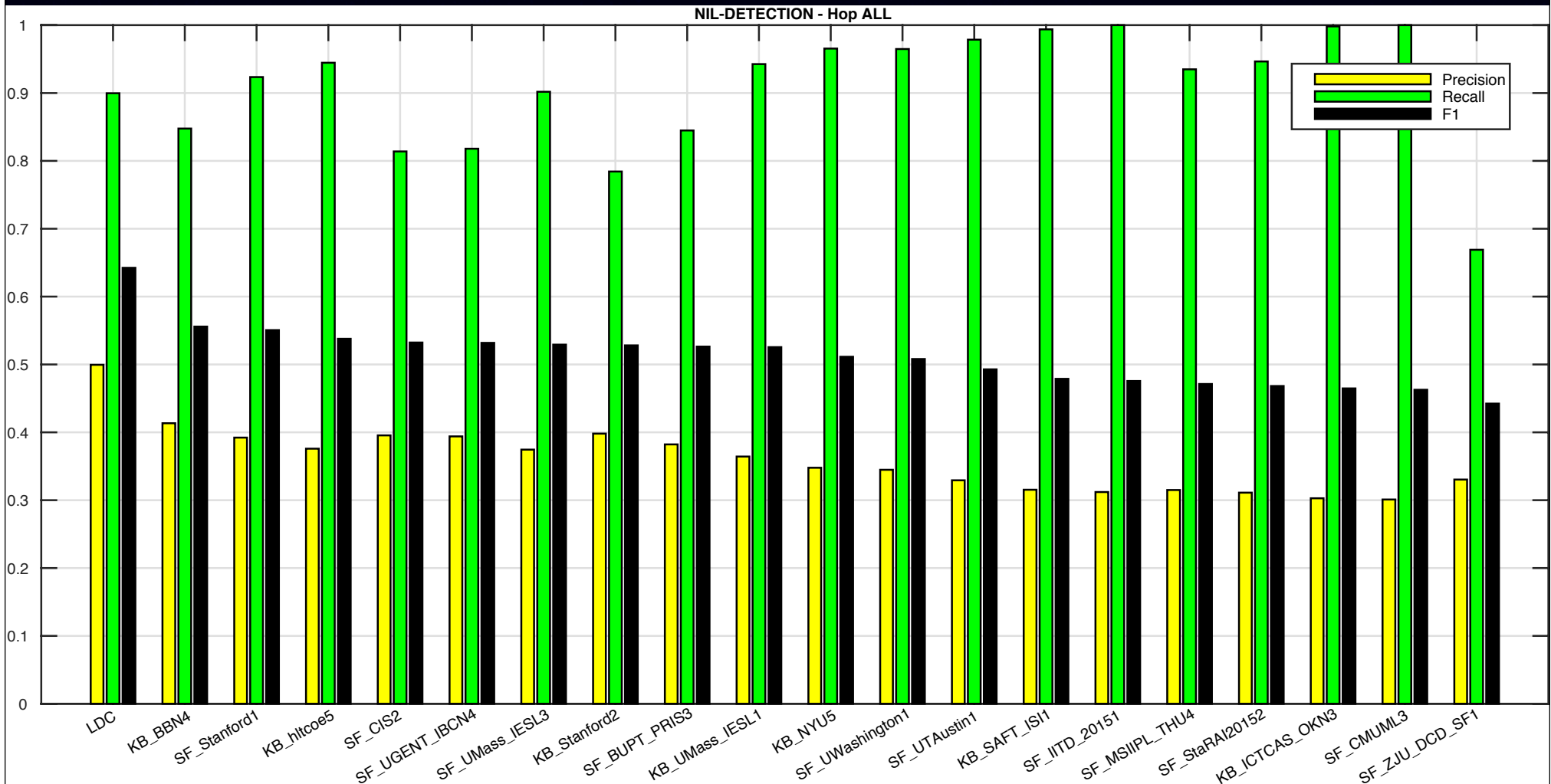
Max-Micro, SunBo, Hop 0



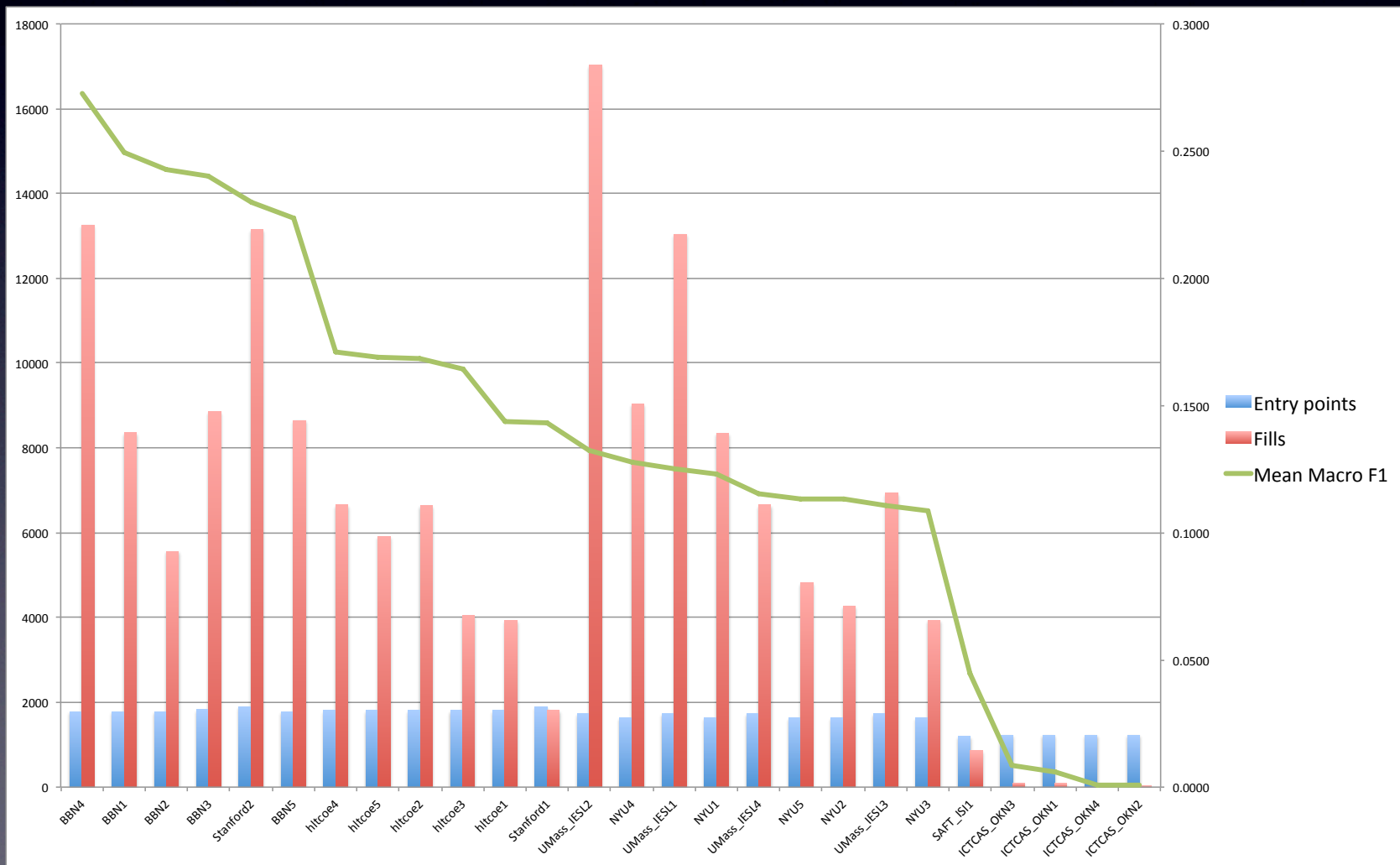
Mean-Macro, LDC Response



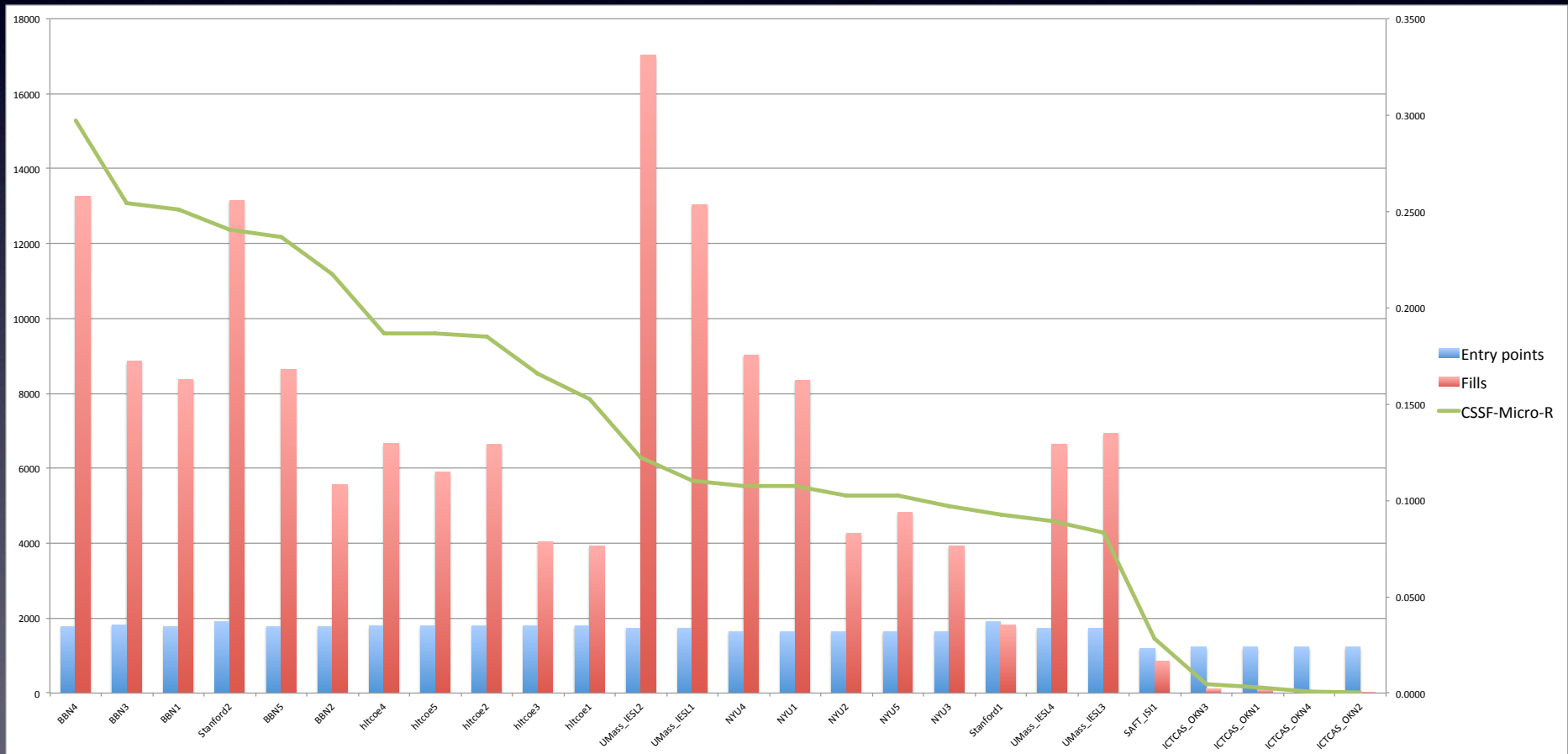
NIL Detection



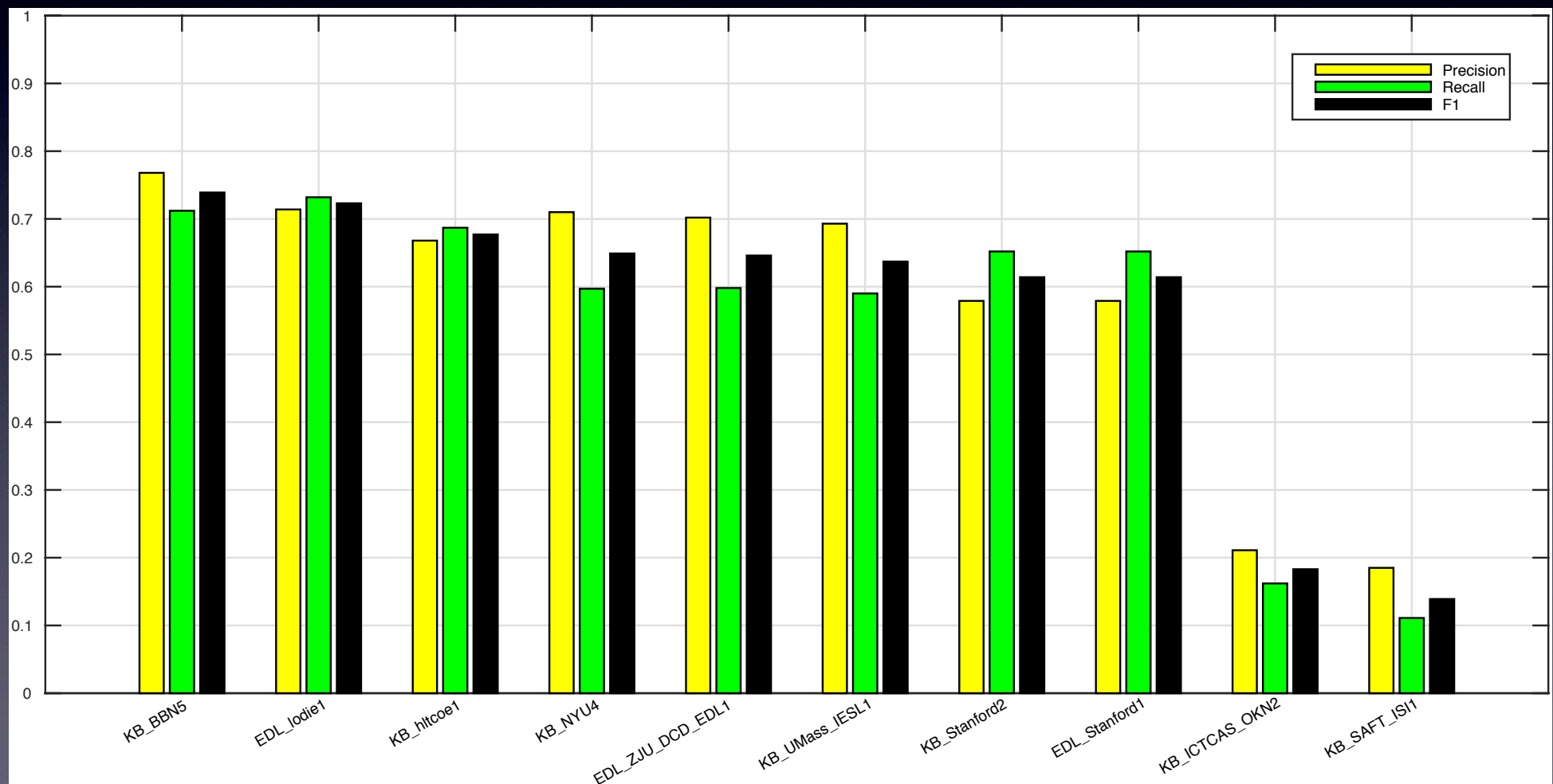
Relationship between Entry Points, Fills, and F₁



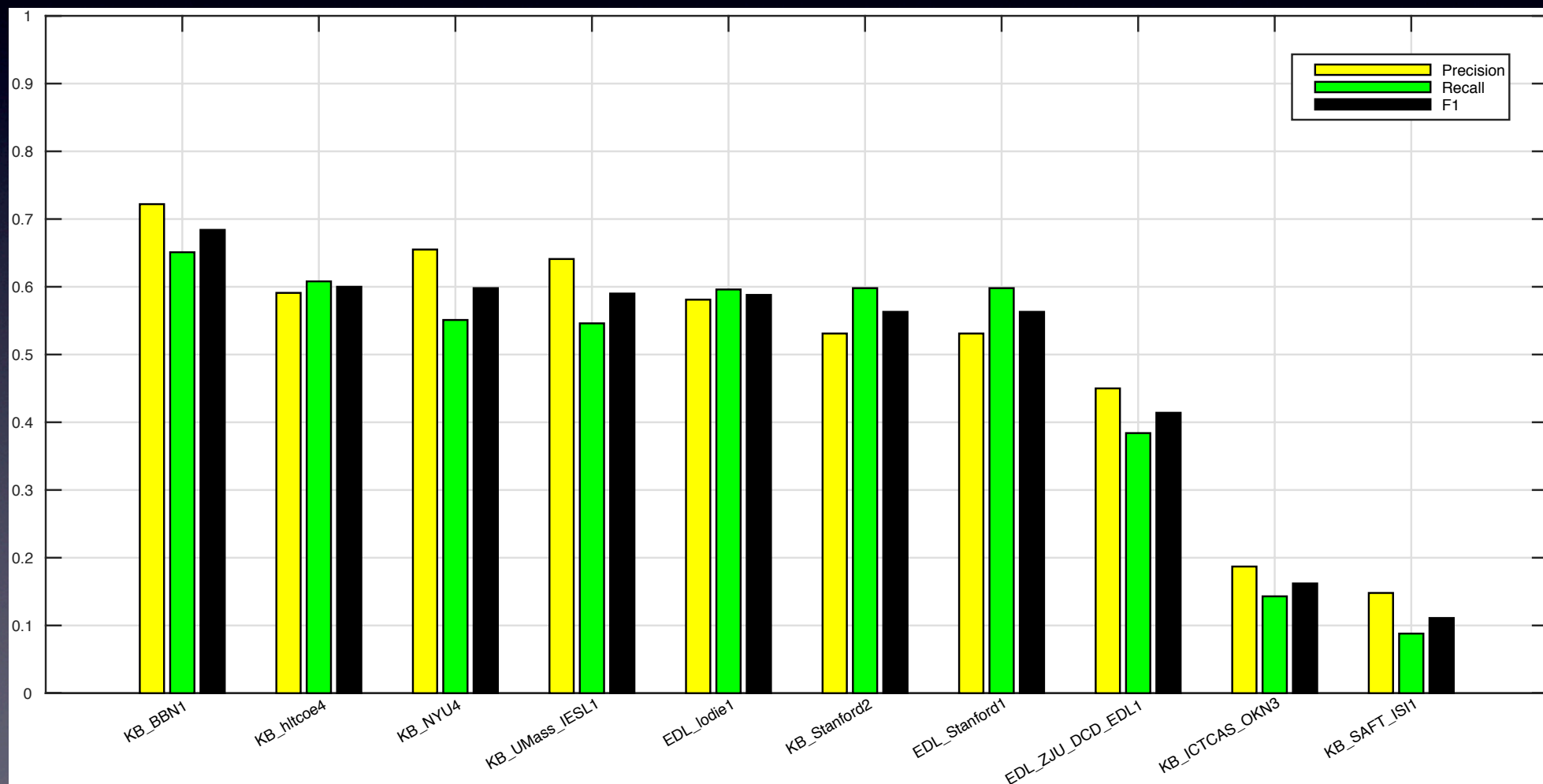
Relationship between Entry Points, Fills and Recall



Entity Discovery Results: NER + Entity Type



Entity Discovery Results: NER + Entity Type + Clustering (CEAF)



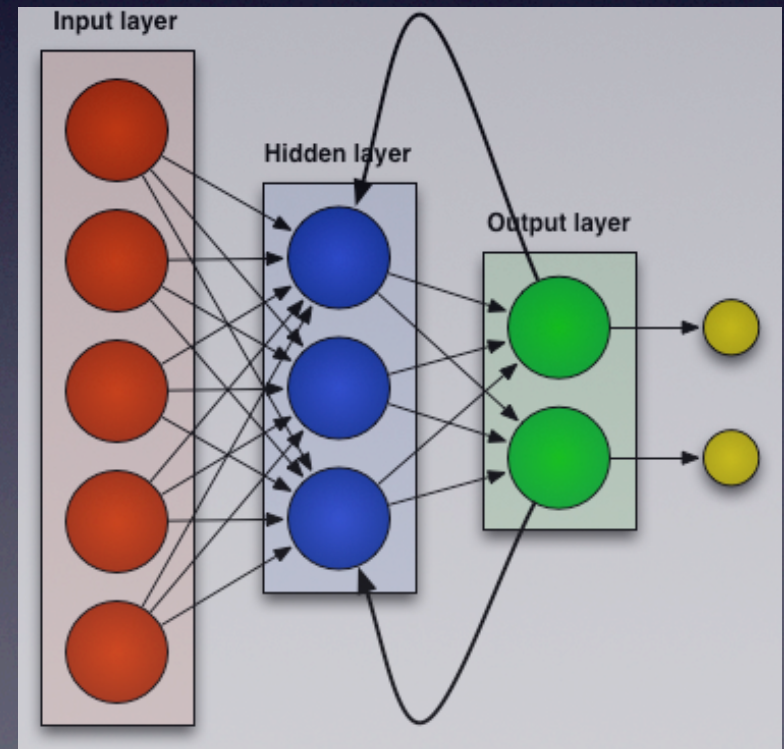
2015 Cold Start Approaches and Themes

- Meaningful confidence values, derived from
 - statistical systems
 - confidence on patterns
 - weighting number of rules to find relation
 - regression models
 - cosine similarity
- Heavy use of outside tools for some phases
 - CoreNLP, NLTK, Factorie, ReVerb
- More reliance on in-house tools for cross-document coreference resolution, relation extraction



2015 Cold Start Approaches and Themes, cont.

- Wide range of (mostly machine learning) approaches to extraction
 - Patterns
 - Universal schema patterns
 - Distant supervision
 - Logistic classification
 - Bootstrapping
 - Gradient descent
 - Maxent
 - SVMs
 - CRFs
 - Bagging
 - Open IE
 - RNNs, CNNs (nowhere is safe)



2015 Cold Start Approaches and Themes, cont.

- Commonly used resources
 - Freebase
 - Wikipedia
 - GeoNames
 - WordNet
- Post-Processing
 - Location normalization
 - Location inference
 - Date normalization
 - Sanity checks
 - Confidence values
 - Normative values
 - Knowledge base



Next:



NYU

UMASS



Raytheon
BBN Technologies

