CS5560 Knowledge Discovery and Management

Problem Set (PS-1B)

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1. Given the text example below, show the following NLP operations.
    a. Sentence detection/Tokenization
    b. Lemmatization
    c. POS tagging/Chunking
    d. Parsing
    e. Name Entity Recognition
    f. Co-reference Resolution
2. Summarize and draw a knowledge graph.

CHICAGO (AP) — Citing high fuel prices, United Airlines said Friday it has increased fares by $6 per round trip on flights to some cities also served by lower-cost carriers. American Airlines, a unit AMR, immediately matched the move, spokesman Tim Wagner said. United, a unit of UAL, said the increase took effect Thursday night and applies to most routes where it competes against discount carriers, such as Chicago to Dallas and Atlanta and Denver to San Francisco, Los Angeles and New York.

1A)

A. Sentence detection/Tokenization:

CHICAGO-1, -LRB--2, AP-3, -RRB--4, ---5, Citing-6, high-7, fuel-8, prices-9, ,-10, United-11, Airlines-12, said-13,Friday-14,it-15,has-16,increased-17,fares-18,by-19,$-20,6-21,per-22,round-23,trip-24,on-25,flights-26,to-27,some-28,cities-29,also-30,served-31,by-32,lower-cost-33,carriers-34,.-35

B. Lemmatization

CHICAGO-1:CHICAGO -LRB--2:-lrb- AP-3:AP -RRB--4:-rrb- ---5:-- Citing-6:cite high-7:high fuel-8:fuel prices-9:price ,-10:, United-11:United Airlines-12:Airlines said-13:say Friday-14:Friday it-15:it has-16:have increased-17:increase fares-18:fare by-19:by $-20:$ 6-21:6 per-22:per round-23:round trip-24:trip on-25:on flights-26:flight to-27:to some-28:some cities-29:city also-30:also served-31:serve by-32:by lower-cost-33:lower-cost carriers-34:carrier .-35

C. POS Tagging/Chunking

CHICAGO-1:NNP -LRB--2:-LRB- AP-3:NNP -RRB--4:-RRB- ---5:: Citing-6:VBG high-7:JJ fuel-8:NN prices-9:NNS ,-10:, United-11:NNP Airlines-12:NNPS said-13:VBD Friday-14:NNP it-15:PRP has-16:VBZ increased-17:VBN fares-18:NNS by-19:IN $-20:$ 6-21:CD per-22:IN round-23:NN trip-24:NN on-25:IN flights-26:NNS to-27:TO some-28:DT cities-29:NNS also-30:RB served-31:VBD by-32:IN lower-cost-33:JJ carriers-34:NNS .-35:

D. Parsing

 (ROOT (NP (NP (NP (NNP CHICAGO)) (PRN (-LRB- -LRB-) (NP (NNP AP)) (-RRB- -RRB-))) (: --) (S (S (VP (VBG Citing) (NP (JJ high) (NN fuel) (NNS prices)))) (, ,) (NP (NNP United) (NNPS Airlines)) (VP (VBD said) (NP-TMP (NNP Friday)) (SBAR (S (NP (PRP it)) (VP (VBZ has) (VP (VBN increased) (NP (NNS fares)) (PP (IN by) (NP (NP ($ $) (CD 6)) (PP (IN per) (NP (NN round) (NN trip)))))) (PP (IN on) (NP (NNS flights))) (PP (TO to) (NP (NP (DT some) (NNS cities)) (VP (ADVP (RB also)) (VBD served) (PP (IN by) (NP (JJ lower-cost) (NNS carriers)))))))))))))) (. .))) (ROOT (S (S (NP (NP (NNP American) (NNPS Airlines)) (, ,) (NP (NP (DT a) (NN unit)) (NP (NNP AMR))) (, ,) (ADVP (RB immediately)) (VP (VBD matched) (NP (DT the) (NN move)))) (, ,) (NP (NN spokesman) (NNP Tim) (NNP Wagner)) (VP (VBD said)) (. .))) (ROOT (S (NP (NP (NNP United)) (, ,) (NP (NP (DT a) (NN unit)) (PP (IN of) (NP (NNP UAL)))) (, ,)) (VP (VBD said) (SBAR (S (NP (DT the) (NN increase)) (VP (VP (VBD took) (NP (NN effect)) (NP-TMP (NNP Thursday) (NN night))) (CC and) (VP (VBZ applies) (PP (TO to) (NP (JJS most) (NNS routes))) (SBAR (WHADVP (WRB where)) (S (NP (PRP it)) (VP (VBZ competes) (PP (IN against) (NP (NP (NN discount) (NNS carriers)) (, ,) (PP (JJ such) (IN as) (NP (NP (NP (NNP Chicago)) (PP (TO to) (NP (NNP Dallas) (CC and) (NNP Atlanta)))) (CC and) (NP (NP (NNP Denver)) (PP (TO to) (NP (NP (NNP San) (NNP Francisco)) (, ,) (NP (NNP Los) (NNP Angeles)) (CC and) (NP (NNP New) (NNP York))))))))))))))))) (. .)))

E. Named Entity Recognizer

CHICAGO-1:LOCATION -LRB--2:O AP-3:ORGANIZATION -RRB--4:O ---5:O Citing-6:O high-7:O fuel-8:O prices-9:O ,-10:O United-11:ORGANIZATION Airlines-12:ORGANIZATION said-13:O Friday-14:DATE it-15:O has-16:O increased-17:O fares-18:O by-19:O $-20:MONEY 6-21:MONEY per-22:O round-23:O trip-24:O on-25:O flights-26:O to-27:O some-28:O cities-29:O also-30:O served-31:O by-32:O lower-cost-33:O carriers-34:O .-35:

F. Co-reference Resolution:

[CHAIN1-["AP" in sentence 1], CHAIN2-["United Airlines" in sentence 1, "it" in sentence 1], CHAIN3-["CHICAGO -LRB- AP -RRB- -- Citing high fuel prices , United Airlines said Friday it has increased fares by $ 6 per round trip on flights to some cities also served by lower-cost carriers ." in sentence 1], CHAIN4-["high fuel prices" in sentence 1], CHAIN5-["Friday" in sentence 1], CHAIN7-["fares" in sentence 1], CHAIN8-["round trip" in sentence 1], CHAIN9-["flights" in sentence 1], CHAIN10-["some cities also served by lower-cost carriers" in sentence 1], CHAIN11-["lower-cost carriers" in sentence 1], CHAIN12-["American Airlines" in sentence 2, "a unit AMR" in sentence 2], CHAIN13-["AMR" in sentence 2], CHAIN14-["American Airlines , a unit AMR" in sentence 2], CHAIN16-["the move" in sentence 2], CHAIN17-["spokesman Tim Wagner" in sentence 2], CHAIN18-["United" in sentence 3, "a unit of UAL" in sentence 3], CHAIN19-["UAL" in sentence 3], CHAIN20-["Dallas" in sentence 3], CHAIN21-["Atlanta" in sentence 3], CHAIN22-["San Francisco" in sentence 3], CHAIN23-["Los Angeles" in sentence 3], CHAIN24-["New York" in sentence 3], CHAIN25-["United , a unit of UAL" in sentence 3], CHAIN27-["the increase" in sentence 3, "it" in sentence 3], CHAIN28-["Thursday night" in sentence 3], CHAIN29-["most routes" in sentence 3], CHAIN31-["discount carriers , such as Chicago to Dallas and Atlanta and Denver to San Francisco , Los Angeles and New York" in sentence 3], CHAIN32-["discount carriers" in sentence 3], CHAIN33-["Chicago to Dallas and Atlanta and Denver to San Francisco , Los Angeles and New York" in sentence 3], CHAIN34-["Chicago to Dallas and Atlanta" in sentence 3], CHAIN35-["Dallas and Atlanta" in sentence 3], CHAIN36-["Denver to San Francisco , Los Angeles and New York" in sentence 3], CHAIN37-["San Francisco , Los Angeles and New York" in sentence 3]]

2A)

5A)

Fuel price charges

Type Airlines unit Thursday Friday Travels chicago

American Airlines United airlines division DAY cities Dallas

AMR UAL Price Denver

$6 per round trip Los Angeles New york