CS6320, Fall 2015
Dr. Mithun Balakrishna
Homework 3
Due November 15th, 2015 11:59pm

A. Submission Instructions:

Submit your solutions via eLearning.
Please submit a single zip file with the following files:
- For programming questions:
  - Source code file(s) in C/C++, Java, or Python. For using any other programming language, please get prior approval from the TA. A ReadMe file with instructions on how to compile/run the code.
- For all other questions, a PDF/Doc/PS/Image file with the solutions.

Late Submission Penalty:
- up to 2 hours late — 10% deduction
- 2 - 4 hours late — 20% deduction
- 4 - 12 hours late — 35% deduction
- 12 - 24 hours late — 50% deduction
- 24 - 48 hours late — 75% deduction
- more than 48 hours late — 100% deduction (zero credit)

B. Problems:

1. Statistical Parsing (25 points)

$S \rightarrow NP\ VP$	.80		$Det \rightarrow the$	.40
$NP \rightarrow Det\ N$	.30		$Det \rightarrow a$	.40
$VP \rightarrow V\ NP$	.20		$N \rightarrow meal$	.01
$V \rightarrow includes$	.05		$N \rightarrow flight$	.02

Using the above grammar rules, fill out the rest of the probabilistic CKY chart in the figure below:

Det: .40	NP: .30 * .40 * .02 = .0024			S: 2.3o4e −8
[0,1]	[0,2]	[0,3]	[0,4]	[0,5]
	N: .02			
	[1,2]	[1,3]	[1,4]	[1,5]
		V: .05		VP: 1·2e−5
		[2,3]	[2,4]	[3,5]
			Det: .4	NP: .0012
			[3,4]	[3,5]
				N: .01
				[4,5]

The flight includes a meal

$.4 \times .01 \times .30 = .0012$

$.05 \times .0012 \times .2 = 1.2 \times 10^{-5}$

$.0024 \times 1.2 \times 10^{-5} \times .8 = 2.3 \times 10^{-8}$

2. Thematic Roles (25 points)

Thematic Role	Definition / Example
Agent	The volitional causer of an event *The waiter* spilled the soup.
Experiencer	The experiencer of and event *John* has a headache.
Force	The non-volitional causer of the event *The wind* blows debris from the mall into our yards.
Theme	The participant most directly affected by an event Only after Benjamin Franklin broke *the ice...*
Result	The end product of an event The French government has built a *regular-size baseball diamond...*
Content	The proposition or content of a propositional event Mona asked *"You met Mary Ann at a super market?"*
Instrument	An instrument used in an event He turned to poaching catfish, stunning them *with a shocking device...*
Beneficiary	The beneficiary of an event Whenever Ann Callahan makes hotel reservations *for her boss...*
Source	The origin of the object of a transfer event I flew in *from Boston.*
Goal	The destination of an object of a transfer event I drove *to Portland.*

Using the thematic role definitions from the above table, assign the various verb arguments in the following WSJ examples to their appropriate thematic roles:

1. The intense heat buckled the highway about three feet.

2. He melted her reserve with a husky-voiced paean to her eyes.

3. But Mingo, a major Union Pacific shipping center in the 1890s, has melted away to little more than the grain elevator now.

Ans →

1. [FORCE The intense heat] buckled [Theme the highway]
[RESULT about three feet].

2. [AGENT He] melted [THEME her reserve] [INSTRUMENT with a husky-voiced paean to her eyes].

3. But [EXPERIENCER Mingo, a major Union Pacific shipping center in the 1890s] has melted away [RESULT to little more than the grain elevator] now.