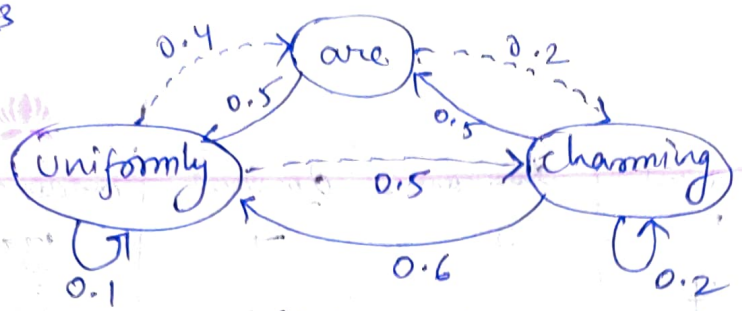
Sessional 2 2023

Q1

A = are
C = charming
U = uniformly

$P(A) = P(C) = P(U) = 1/3$



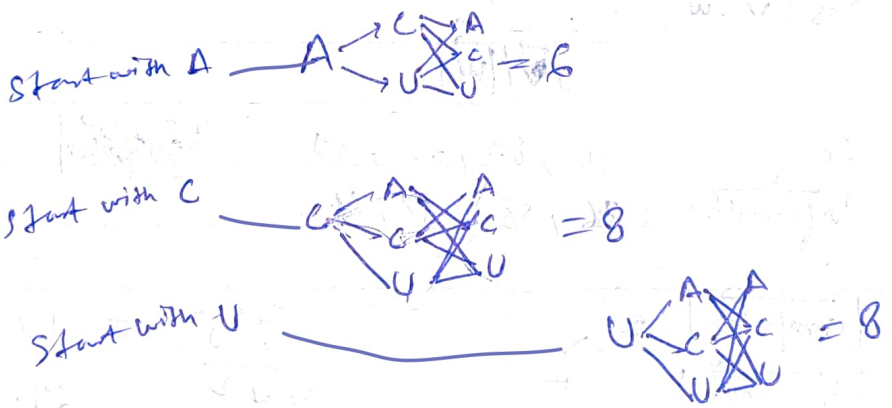
edges
outgoing
incoming

(1) Generate all the possible first order Markov chains of three words

Starting with A = { ACU, ACC, AUC, AUU, ACA, AUA }

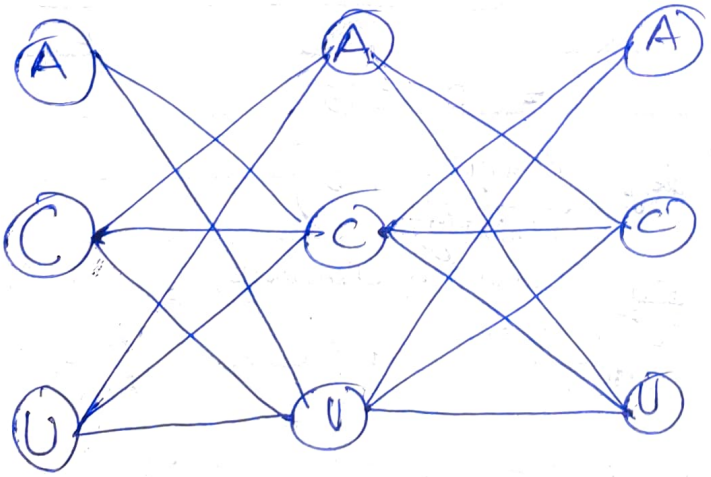
Starting with C = { CCC, CCA, CAC, CAU, CCU, CUC, CUU, CUA }

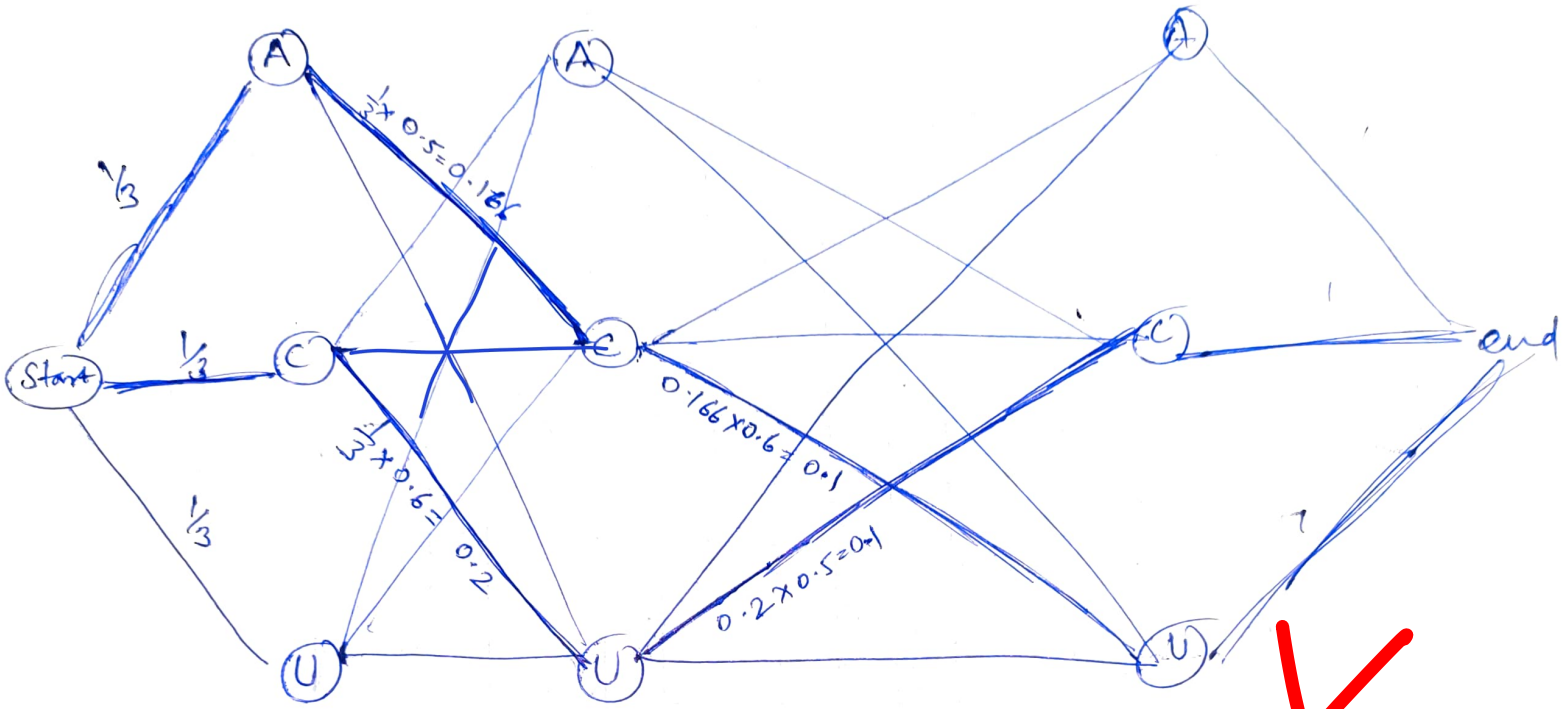
Starting with U = { UUU, UUA, UAU, UAC, UUC, UCU, UCC, UCA }



⇒ total possible first order Markov chains = 6 + 8 + 8 = 22

(2) Find out the chain which has maximum probability





$P(A|A) = 0 \times \frac{1}{3} = 0$ AA

A → $P(C|A) = 0.5 \times \frac{1}{3} = 0.166$ AC

$P(U|A) = 0.5 \times \frac{1}{3} = 0.166$ AU

$P(A|C) = 0.2 \times \frac{1}{3} = 0.066$ CA

C → $P(C|C) = 0.2 \times \frac{1}{3} = 0.066$ CC

$P(U|C) = 0.6 \times \frac{1}{3} = 0.2$ CU

$P(A|U) = 0.4 \times \frac{1}{3} = 0.133$ UA

U → $P(C|U) = 0.5 \times \frac{1}{3} = 0.166$ UC

$P(U|U) = 0.1 \times \frac{1}{3} = 0.033$ UU

max ⇒ P(U|C)

Don't stop Here

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PAGE

AA	$P(A\|AA) = 0$	$P(C\|AA) = 0$	$P(U\|AA) = 0$
AC	$P(A\|AC) = 0.1 \times 0.2 = 0.034$	$P(C\|AC) = 0.1 \times 0.2 = 0.034$	$P(U\|AC) = 0.1 \times 0.6$, $ACU = 0.1$
AU	$P(A\|AU) = 0.1 \times 0.4 = 0.066$	$P(C\|AU) = 0.1 \times 0.5 = 0.083$	$P(C\|AU) = 0.1 \times 0.1 = 0.17$
CA	$P(A\|CA) = 0.66 \times 0 = 0$	$P(C\|CA) = 0.06 \times 0.5 = 0.033$	$P(U\|CA) = 0.06 \times 0.5 = 0.03$
CC	$P(A\|CC) = 0.06 \times 0.2 = 0.013$	$P(C\|CC) = 0.066 \times 0.2 = 0.013$	$P(U\|CC) = 0.066 \times 0.6 = 0.04$
CU	$P(A\|CU) = 0.2 \times 0.4 = 0.08$	$P(C\|CU) = 0.2 \times 0.5$, $CUC = 0.1$	$P(U\|CU) = 0.2 \times 0.1 = 0.02$
UA	$P(A\|UA) = 0.133 \times 0 = 0$	$P(C\|UA) = 0.133 \times 0.5 = 0.066$	$P(U\|UA) = 0.133 \times 0.5 = 0.066$
UC	$P(A\|UC) = 0.166 \times 0.2 = 0.033$	$P(C\|UC) = 0.1666 \times 0.2 = 0.033$	$P(U\|UC) = 0.1666 \times 0.5 = 0.083$
UU	$P(A\|UU) = 0.03 \times 0.4 = 0.012$	$P(C\|UU) = 0.03 \times 0.5 = 0.015$	$P(U\|UU) = 0.033 \times 0.1 = 0.0033$

chain with max probability = ACU and CUC = 0.1

$\Rightarrow$ (A) → (C) → (U) and (C) → (U) → (C)

Are charming uniformly charming uniformly charming