NLP Assignment 1

Task 2

Question 2. Compare the probabilities obtained from both and give an argument for which is better

Bigram probability no smoothing—
        (('i', 'wanna'), 0.0002642706131078224)
        (('i', 'meant'), 0.0002642706131078224)
        (('i', 'gain'), 0.0002642706131078224)
        (('i', 'once'), 0.0002642706131078224)
        (('i', 'guess'), 0.003171247357293869)

Bigram probability Laplace smoothing—
        (('i', 'wanna'), 0.00021706099413935315)
        (('i', 'gain'), 0.00021706099413935315)
        (('i', 'once'), 0.00021706099413935315)
        (('i', 'meant'), 0.00021706099413935315)
        (('i', 'guess'), 0.0014108964619057955)

Bigram probability Kneser-Ney smoothing—
        (('i', 'once'), 0.01605965095305789)
        (('i', 'wanna'), 0.04797111687037012)
        (('i', 'meant'), 0.04797111687037012)
        (('i', 'gain'), 0.09584784950729275)
        (('i', 'guess'), 0.8609763059257162)

After applying Laplace smoothing, we observe that the probabilities of bigrams are more aligned with the probabilities obtained without smoothing. Consequently, when we reconstruct the count from these probabilities, denoted as C*, it closely approximates the original count C (i.e., $C \cong C^*$). Therefore, Laplace smoothing demonstrates superior performance compared to Kneser-Ney smoothing. This is particularly advantageous in our scenario due to the sparsity of our dataset. Laplace smoothing proves effective in mitigating the issue of zero probability values, which commonly arises in sparse datasets.

<u>**Point 1 :**</u> **Top 5 bigrams before smoothing and after each of the 2 selected smoothing techniques, along with their probabilities BEFORE applying the emotion component.**

Top–5
No smoothing (un-normalize)
(('streets', 'of'), 1.0)
(('curler', 'lashes'), 1.0)
(('tools', 'met'), 1.0)
(('folk', 'to'), 1.0)
(('followed', 'the'), 1.0)

Laplace (un-normalize)
(('<start>', 'i'), 0.2693486590038314)
(('i', 'feel'), 0.11048404601693075)
(('feel', 'like'), 0.035092684307343996)
(('i', 'am'), 0.031907966138484914)
(('<start>', 'im'), 0.027203065134099615)

Knese-ney (un-normalize)
(('i', 'm'), 0.9863855208846114)
(('i', 'am'), 0.9426514705041402)
(('a', 'lot'), 0.935500851551415)
(('the', 'rest'), 0.8990279836714317)
(('http', 'www'), 0.8990279836714317)

<u>**Point 2:**</u> **The reasoning for method used for including emotion component**

Each Bigram is assigned a probability score indicating its likelihood of occurrence during selection based solely on these probabilities, expressed as $P(W_i / W_{i-1}) = P(W_i) / P(W_{i-1})$. This formulation generates sentences with random chances devoid of any emotional context.

To infuse emotions into the generation process, we introduced an input parameter representing the desired emotion for sequence generation. For each bigram, we utilised the emotional scores obtained through util.py. Subsequently, a linear combination was calculated to incorporate the emotional aspect, allowing for the creation of sequences associated with the specified emotion:

$P(W_i / W_{i-1}) = P(W_i) * alpha * B_{emotion}/P(W_{i-1})$, where alpha serves as the temperature parameter.

Point 3: **2 generated samples for each emotion, for a total of 12 generated samples**

Anger

- dont need a gut or my to head i was another relationship it without them yet there wasnt an ear immediately related to
- am hating ants are no i put it to poke me to spend another person who doesnt happen to wall is being on

Fear

- think are distressed about a bit uncertain and folks in the midst of doctors that of nervousness and out with my pattern by
- accidentally feel helpless and all of jason i d alene im feeling indecisive and releases these days of fear may not feeling frantic

Joy

- feel special on your life long outing yesterday was worth discussing the gorgeous and bright coloured lipsticks are likely to feel however feel
- feel all time lapse photography only describe as ever get your presence he was painstakingly discovered i try to fly i own good

Love

- love of lovely polish i love everyone or passionate but instead of the range kg for supportive i love the faithful dukes watcher
- am yearning for feeling treasured enough sleep on my faithful as gentle breeze and loved safe again after sweet nostalgic when youre feeling

Sadness

- find myself shame on drinking a worthless failure but after failing to all emotions unloved tude naughty girl and foggy wall leaving me
- forgot my feelings fade away from today after six days i don t always beaten down over and remove clutter i should all
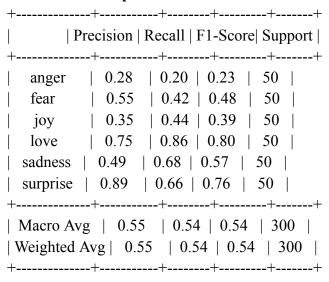
Suprise

- feel strange internal feeling weird that shocked and that funny cuz its ludicrous even funny cuz its editors feel surprised about them as
- am curious about me shocked awe of shocked rat race and friend curious about life in general feeling dazed and filled with his

Point 4: Accuracy and macro F1 scores obtained from extrinsic evaluation

No-Smoothing

Metric	Value
Accuracy	0.5433
F1 Score	0.5386

Classification Report:

	Precision	Recall	F1-Score	Support
anger	0.28	0.20	0.23	50
fear	0.55	0.42	0.48	50
joy	0.35	0.44	0.39	50
love	0.75	0.86	0.80	50
sadness	0.49	0.68	0.57	50
surprise	0.89	0.66	0.76	50
Macro Avg	0.55	0.54	0.54	300
Weighted Avg	0.55	0.54	0.54	300

Laplace

Metric	Value
Accuracy	0.7733
F1 Score	0.7618

Classification Report:

	Precision	Recall	F1-Score	Support
anger	0.81	0.44	0.57	50
fear	0.70	0.70	0.70	50
joy	0.73	0.74	0.73	50
love	0.81	1.00	0.89	50
sadness	0.75	0.80	0.78	50
surprise	0.84	0.96	0.90	50
Macro Avg	0.77	0.77	0.76	300
Weighted Avg	0.77	0.77	0.76	300

Knese-ney

Metric	Value
Accuracy	0.6633
F1 Score	0.6583

Classification Report:

	Precision	Recall	F1-Score	Support
anger	0.60	0.42	0.49	50
fear	0.61	0.62	0.61	50
joy	0.52	0.50	0.51	50
love	0.72	0.88	0.79	50
sadness	0.61	0.76	0.68	50
surprise	0.93	0.80	0.86	50
Macro Avg	0.67	0.66	0.66	300
Weighted Avg	0.67	0.66	0.66	300

<u>Point 5</u>: For each emotion, pick 1 of the generated sample and reason why it is generated according to its corresponding emotion.

For Laplace

Anger :
need to reduce the characters on craisins when he is something with the toy i declined this class or separation divorce bitchy as
For the above sentence emotion score is {'label': 'anger', 'score': 0.9912217855453491},
Also the human picked phrases referring to anger are divorce, bitchy, reduce, declined
Angry emotion of these words are
Divorce : {'label': 'anger', 'score': 0.3324894309043884},,
Bitchy : {'label': 'anger', 'score': 0.9973236322402954},
Reduce : {'label': 'anger', 'score': 0.2957198917865753},
Declined : {'label': 'anger', 'score': 0.09154751151800156},

Fear :
accidentally feel helpless and all of jason i d alene im feeling indecisive and releases these days of fear may not feeling frantic
For the above sentence emotion score is {'label': 'fear', 'score': 0.9969224333763123},

Also the human picked phrases referring to anger are fear, indecisive, helpless, may not feeling frantic

Fear emotion of these words are

Fear : {'label': 'fear', 'score': 0.9276753067970276},,

Indecisive : {'label': 'fear', 'score': 0.9900189638137817},,

Helpless : {'label': 'fear', 'score': 0.8767467737197876},,

may not feeling frantic : {'label': 'fear', 'score': 0.9971074461936951},

Joy :

feel about anime fandom in feeling a moisturizer and feel generally more i do six other but all ready to feeling good memories

For the above sentence emotion score is {'label': 'joy', 'score': 0.9974736571311951},

Also the human picked phrases referring to joy are feel about anime fandom, feeling a moisturizer, good memories

Joy emotion of these words are

feel about anime fandom : {'label': 'joy', 'score': 0.967825174331665},

feeling a moisturizer : {'label': 'joy', 'score': 0.7912872433662415},

good memories : {'label': 'joy', 'score': 0.9915332198143005},

Love :

want you kiss her tender teenager with me to dress six days i love by loved feeling very tender mercy for me feeling

For the above sentence emotion score is {'label': 'love', 'score': 0.9939577579498291},

Also the human picked phrases referring to love are kiss, love, tender mercy for me feeling,

Love emotion of these words are

kiss : {'label': 'love', 'score': 0.9126942753791809},

love :{'label': 'love', 'score': 0.9171563982963562},

tender mercy for me feeling : {'label': 'love', 'score': 0.9943859577178955},

Sadness :

failed the tears of sadness and second rather disheartened so my life now i still have struggled with her journey terribly low at

For the above sentence emotion score is {'label': 'sadness', 'score': 0.9991211295127869},

Also the human picked phrases referring to sadness are tears of sadness, disheartened, struggled, terribly, low

Sadness emotion of these words are

sadness :{'label': 'sadness', 'score': 0.9891372323036194},

disheartened :{'label': 'sadness', 'score': 0.9987442493438721},
struggled : {'label': 'sadness', 'score': 0.6431671977043152} ,

Suprise :
m surprised if all and curious again feeling overwhelmed with whom i will be strange land with you know why when having the color
For the above sentence emotion score is {'label': 'surprise', 'score': 0.9295268654823303}

Also the human picked phrases referring to suprise are m surprised, overwhelmed, strange,
Surprise emotion of these words are
m surprised : {'label': 'surprise', 'score': 0.9850733876228333},
overwhelmed : {'label': 'surprise', 'score': 0.22803835570812225},
strange : {'label': 'surprise', 'score': 0.4319486618041992},

For Kneser-Ney

Surprise:

wonder woman reaching adulthood and continues to witness some strange internal feeling dazed deserted id done before washing unusual and some tasks that impressed by noticing my bedside

For the above sentence emotion score is {'label': 'surprise', 'score': 0.987542450428009}

The picked phrases referring to surprise are wonder, dazed and impressed

Surprise emotion of these words are

wonder : {'label': 'surprise', 'score': 0.75849848985672}

dazed : {'label': 'surprise', 'score': 0.9678311944007874}

impressed : {'label': 'surprise', 'score': 0.9844937324523926}

Sadness:

cry discomforting feeling crappy because each task separately id recommend using stellarium to mourn for them dancing with regret and aging ill add ons that unwell it doesn

For the above sentence emotion score is {'label': 'sadness', 'score': 0.9984980821609497}

The picked phrases referring to sadness are crappy, mourn, regret, unwell and aging.

Sad emotion of these words are

crappy : {'label': 'sadness', 'score': 0.8896456956863403}

mourn : {'label': 'sadness', 'score': 0.9828245639801025}

regret : {'label': 'sadness', 'score': 0.9744142889976501}

unwell : {'label': 'sadness', 'score': 0.9000433087348938}

aging : {'label': 'sadness', 'score': 0.9892922639846802}

Love:

m loving recently agreed to kiss her son uhuru being married to kiss her sweet communing teach him tightly and cared for themselves sitting right track im loving recently

For the above sentence emotion score is {'label': 'love', 'score': 0.9953984618186951}

The picked phrases referring to love are loving, kiss, sweet and cared.

Love emotion of these words are

loving : {'label': 'love', 'score': 0.9945108890533447}

kiss : {'label': 'love', 'score': 0.9126942753791809}

sweet : {'label': 'love', 'score': 0.8148155808448792}

cared : {'label': 'love', 'score': 0.7496193051338196}

Joy:

tend to reflect on usa today ptl i forgive myself right direction going down throughout the chance i adapt and yes i anticipated to midori that companion who

For the above sentence emotion score is {'label': 'joy', 'score': 0.8705699443817139}

The picked phrase referring to joy are anticipated

Joy emotion of the words is:

anticipated : {'label': 'joy', 'score': 0.8292506337165833}

Fear:

m gradually feeling helpless now wondering if someone relating to fits of nervousness and suddenly startled catch criminals of which turned on chatting is pedestrian at sunrise this emptiness

For the above sentence emotion score is {'label': 'fear', 'score': 0.984828531742096}

The picked phrases referring to fear are helpless and nervousness

Fear emotion of these words are:

helpless : {'label': 'fear', 'score': 0.8767467737197876}

nervousness : {'label': 'fear', 'score': 0.9956657290458679}

Anger:

ve heard a character while everyone together enough away from committing suicide she backed off which turned on toes and anger people harrass me anymore i walked away from

For the above sentence emotion score is {'label': 'anger', 'score': 0.9947718977928162}

The picked phrases referring to anger are backed, anger and harass.

Anger emotion of these words are:

backed : 'label': 'anger', 'score': 0.8176900744438171}

anger : {'label': 'anger', 'score': 0.9964317083358765}

harrass : {'label': 'anger', 'score': 0.749623715877533}

<u>Point 6:</u> A credit statement reflecting the contribution of each member of the group for the assignment.

Q1   Manvendra , Sumit

Q2-1Aditi, Tarang

Q2-2 Sumit, Aditi

Q2-3 Manvendra

Q2-4 Aditi, Tarang