

BAZER-Bot Therapeutic AI Assistant

Filière :

Systemes Distribués et Intelligence Artificielle

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Plan

1. Définition et Objectif
2. Collecte et Préparation de données
3. Architecture du modèle
4. Entraînement
5. Résultats
6. Discussion
7. Conclusion

Définition et Objectif

- **Problématique :**

La santé mentale des adolescents, aggravée par la pandémie de COVID-19, souffre de l'impact des réseaux sociaux, qui amplifient l'anxiété, la solitude et le cyberharcèlement. Les services de santé mentale sont débordés, et les outils numériques existants manquent d'empathie et de personnalisation pour répondre efficacement à ces besoins.

- **Solution proposée :**

Développer un chatbot intelligent utilisant des modèles avancés de traitement du langage naturel (NLP), tels que BERT et BiLSTM, pour fournir un soutien en temps réel.

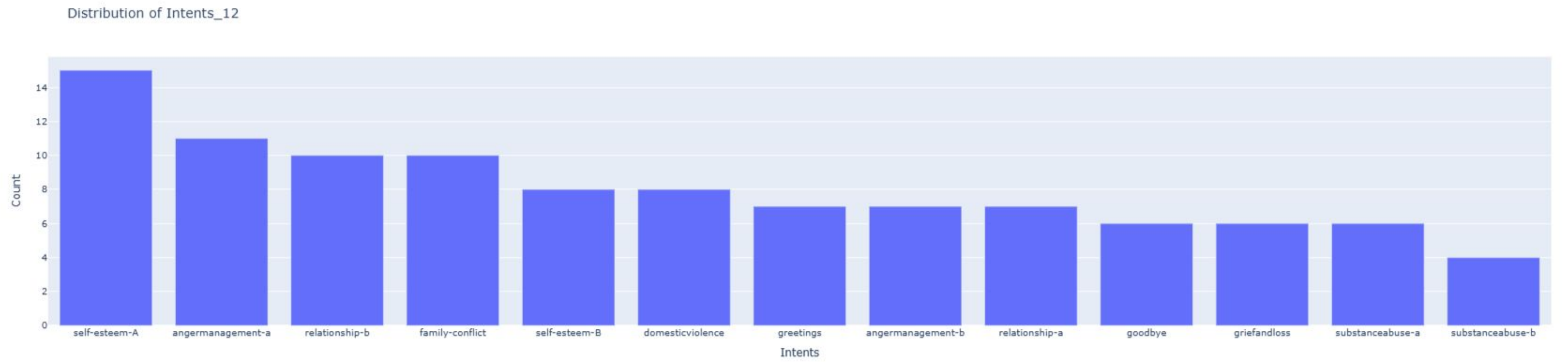
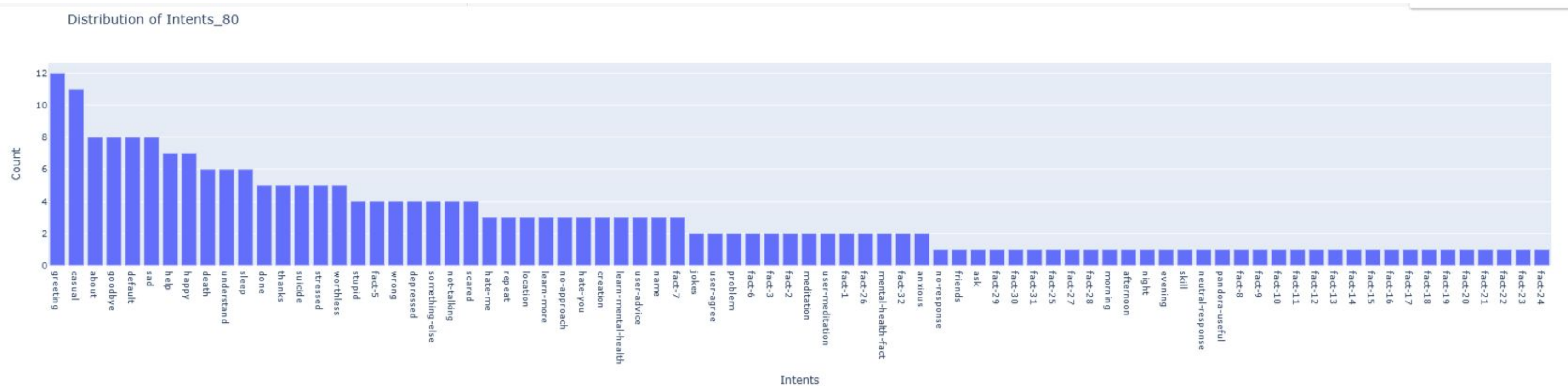
Améliorer l'expérience utilisateur en personnalisant les réponses du chatbot pour qu'elles soient empathiques et adaptées au contexte.

Dataset JSON :

Sources : Mental Health Conversational Data & Therapist Patient Conversation Dataset

```
{
  "intents": [
    {
      "tag": "about",
      "patterns": [
        "What are you?",
        "What's your name?",
        "What should I call you?",
        "Tell me about yourself",
        "Who are you?",
        "Tell me more about yourself.",
        "Who you are?",
        "What is your name?"
      ],
      "responses": [
        "I'm BAZER-Bot, your Personal Therapeutic AI Assistant. How are you feeling today",
        "I'm BAZER-Bot, a Therapeutic AI Assitant designed to assist you. Tell me about yourself.",
        "I'm BAZER-Bot. I am a conversational agent designed to mimic a therapist. So how are you feeling today?",
        "You can call me BAZER-Bot.",
        "I'm BAZER-Bot!",
        "Call me BAZER-Bot"
      ]
    },
    {
      "tag": "afternoon",
      "patterns": [
        "Good afternoon"
      ],
      "responses": [
        "Good afternoon. How is your day going?"
      ]
    }
  ]
}
```

Visualisation Dataset Json :



Prétraitement des données de Dataset Json:

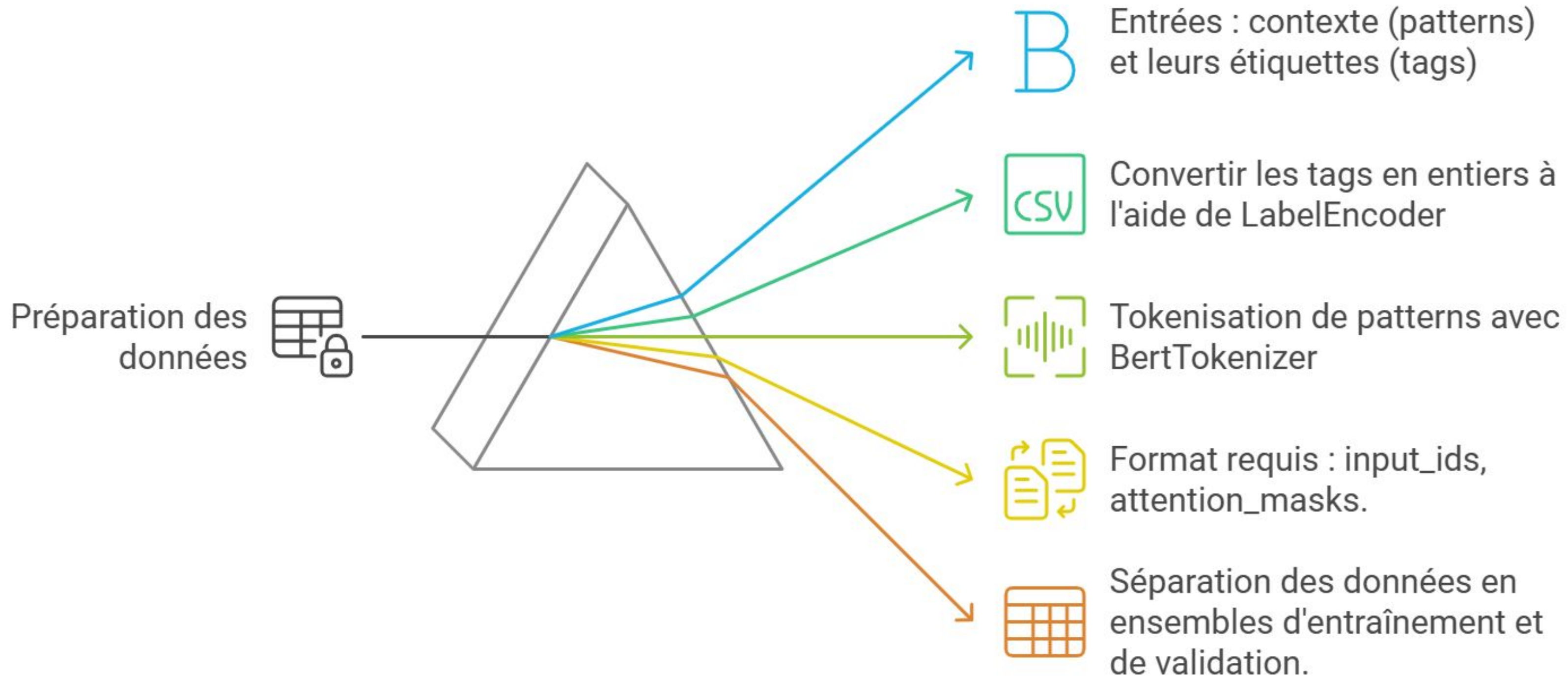
Prétraitement des Données pour l'Amélioration de la Qualité



Application de Modèles Bert et BiLSTM

Architecture model Bert:

Prétraitement des données pour BERT



Architecture du modèle Bert

Architecture du Modèle BERT



Base utilisée : Modèle Pré-entraîné bert-base-uncased



Configuration de l'Optimiseur AdamW avec un faible taux d'apprentissage ($2e-5$).



Définition du Nombre d'Époques : 100

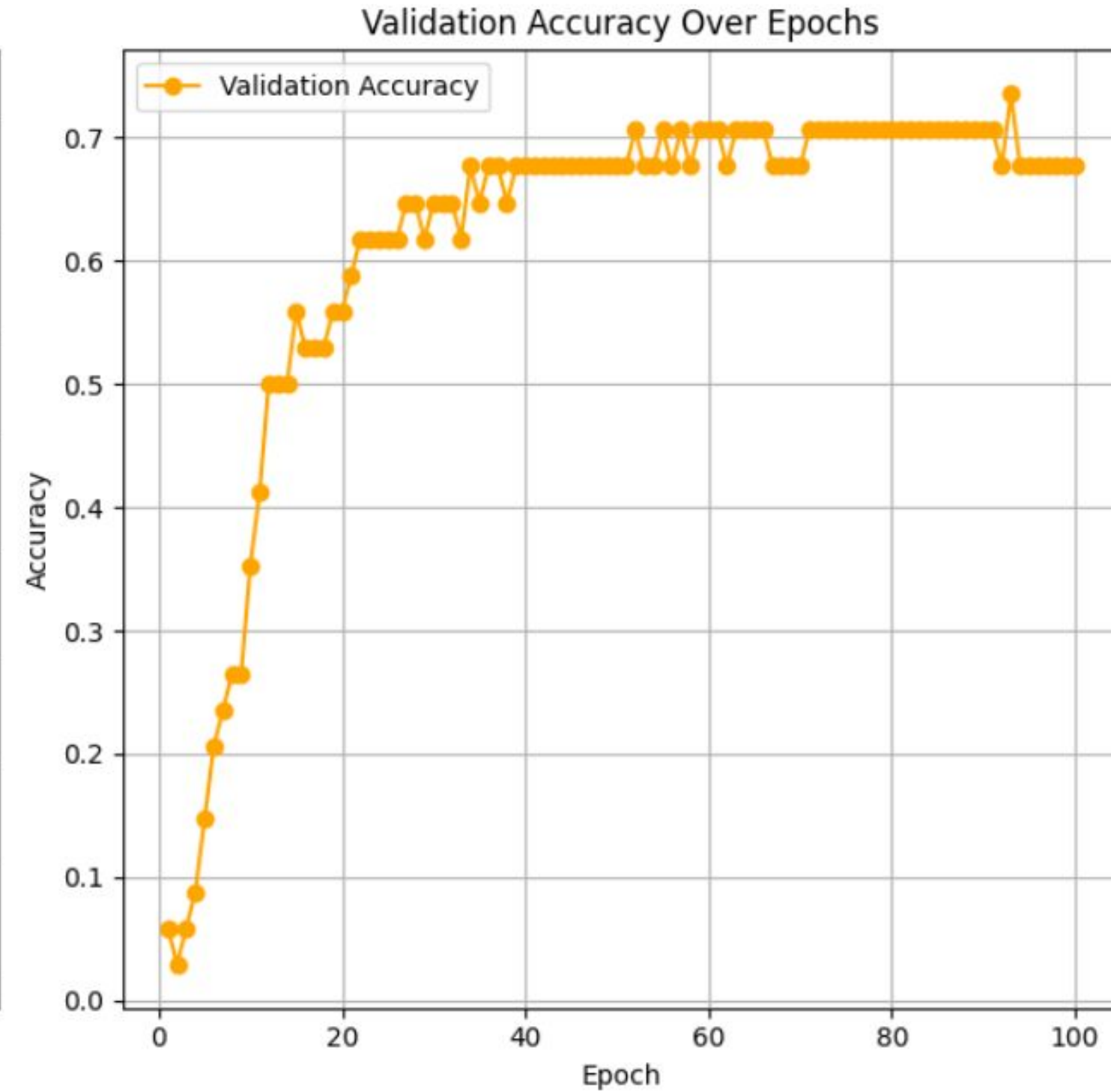
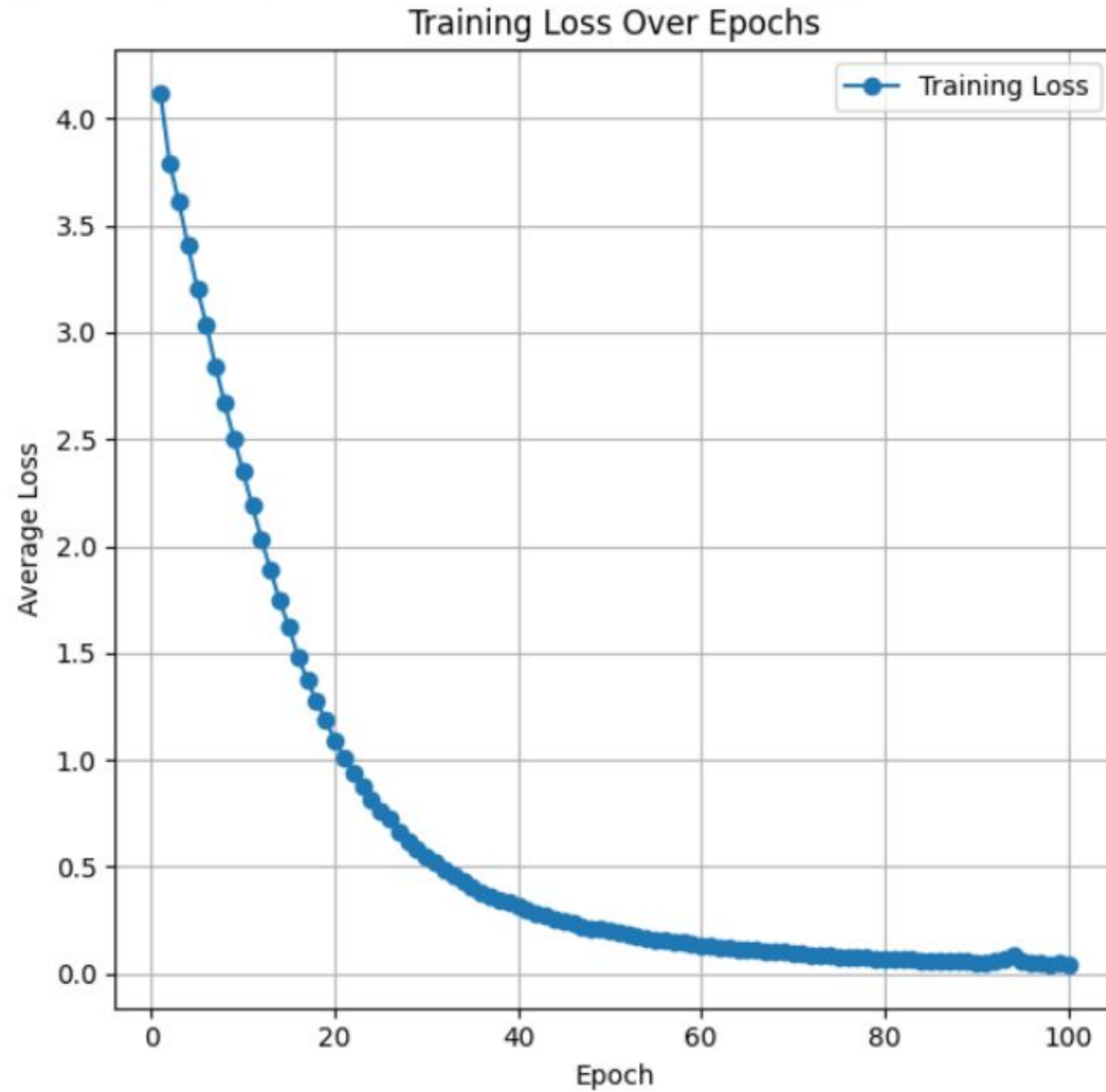


Calcul des Logits : Scores non normalisés pour chaque classe convertis en prédictions avec `torch.argmax`



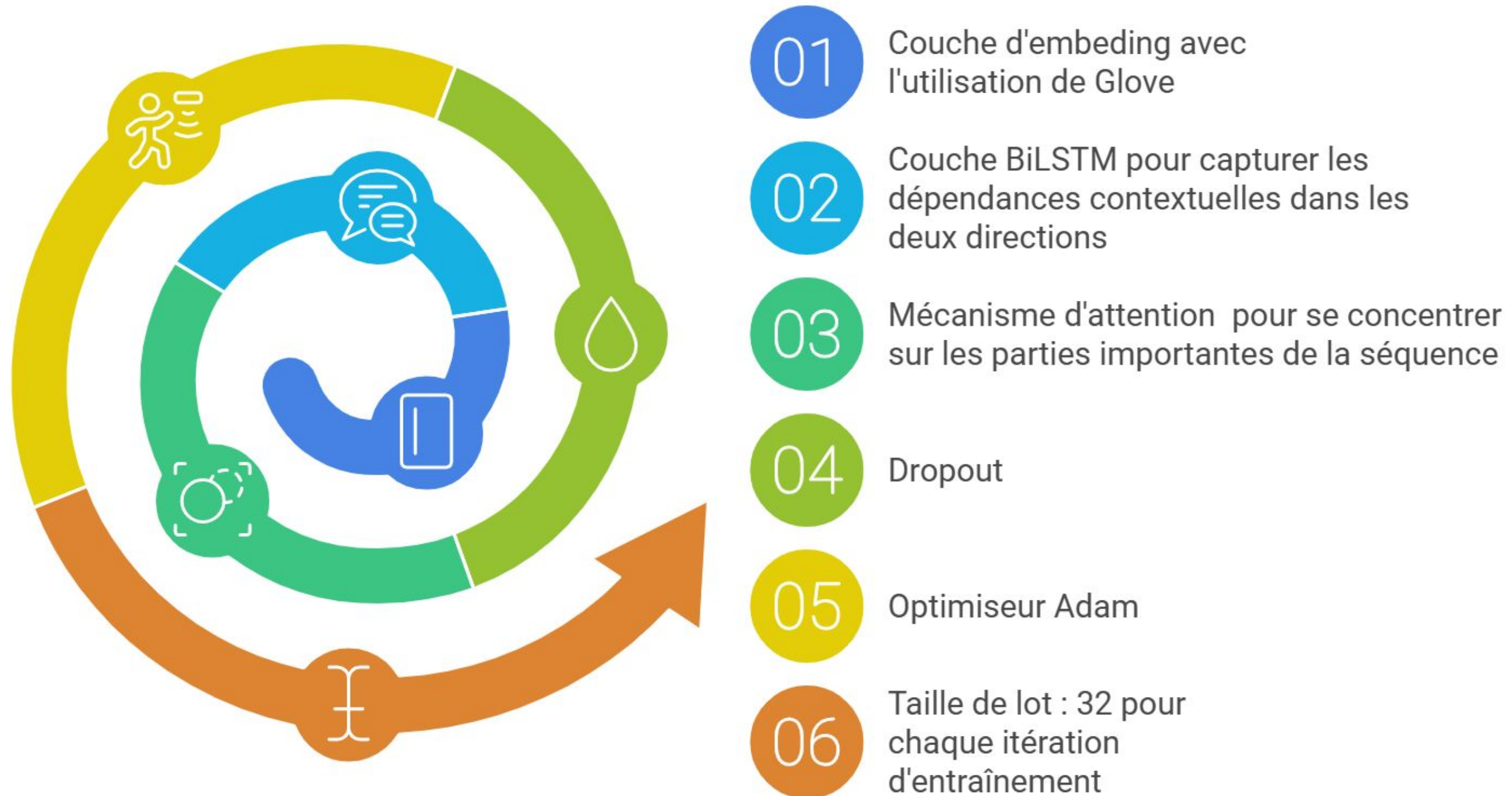
Lancer Entraînement avec l'utilisation `CrossEntropyLoss`

Fine Tuné Bert sur dataset json :

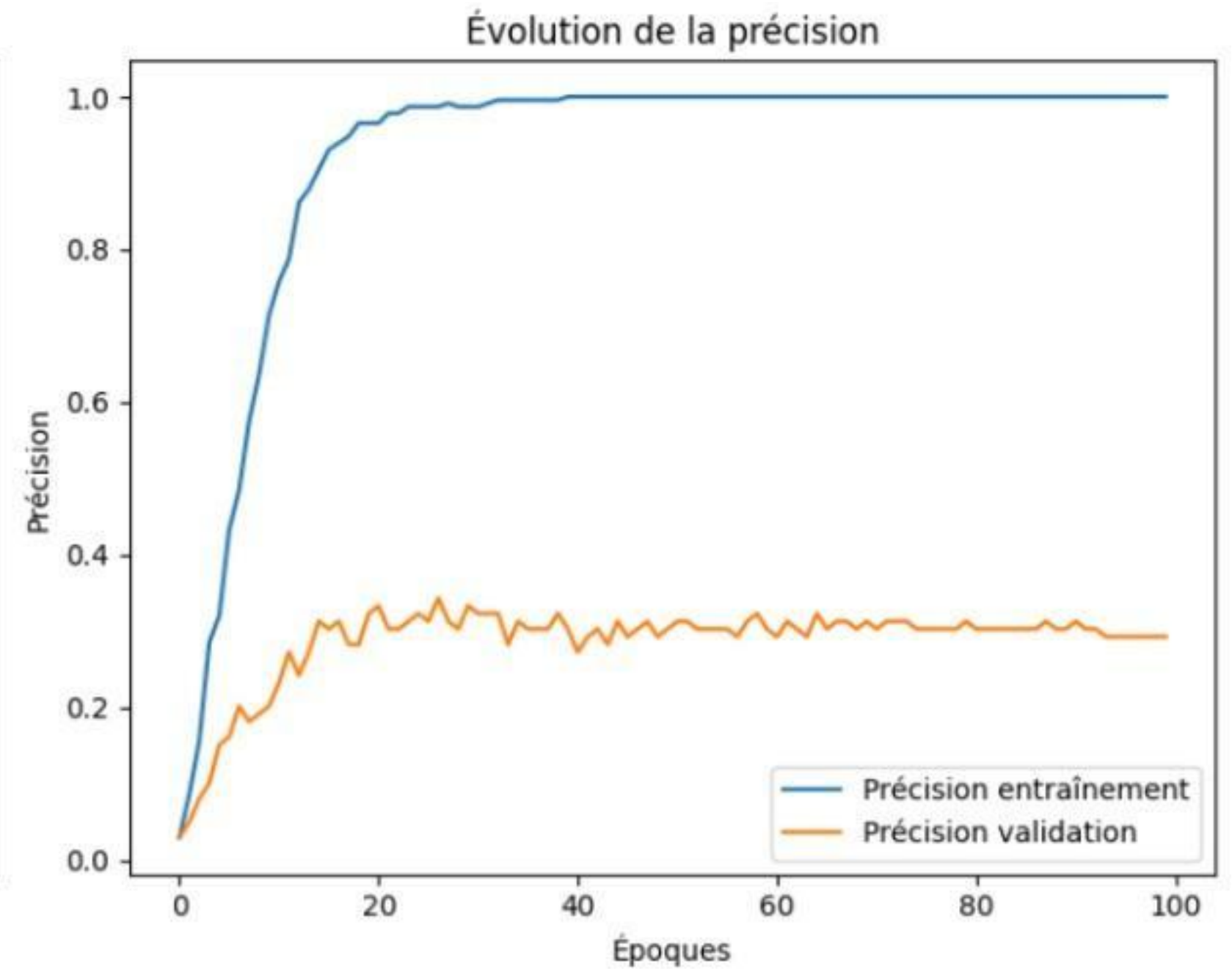
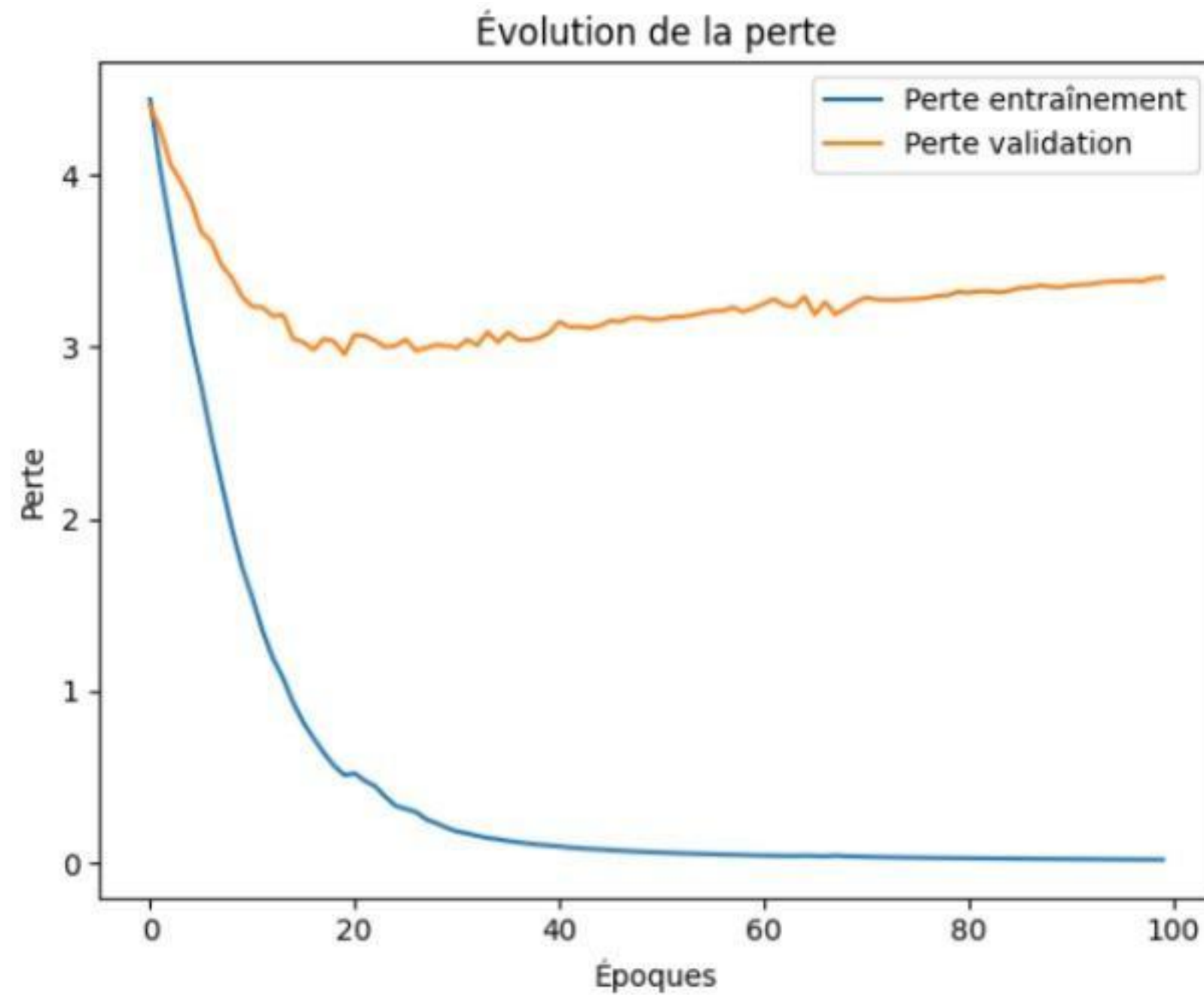


Architecture du modèle BiLSTM

Architecture du modèle BiLSTM



Train BiLSTM sur dataset json :



Dataset Csv:

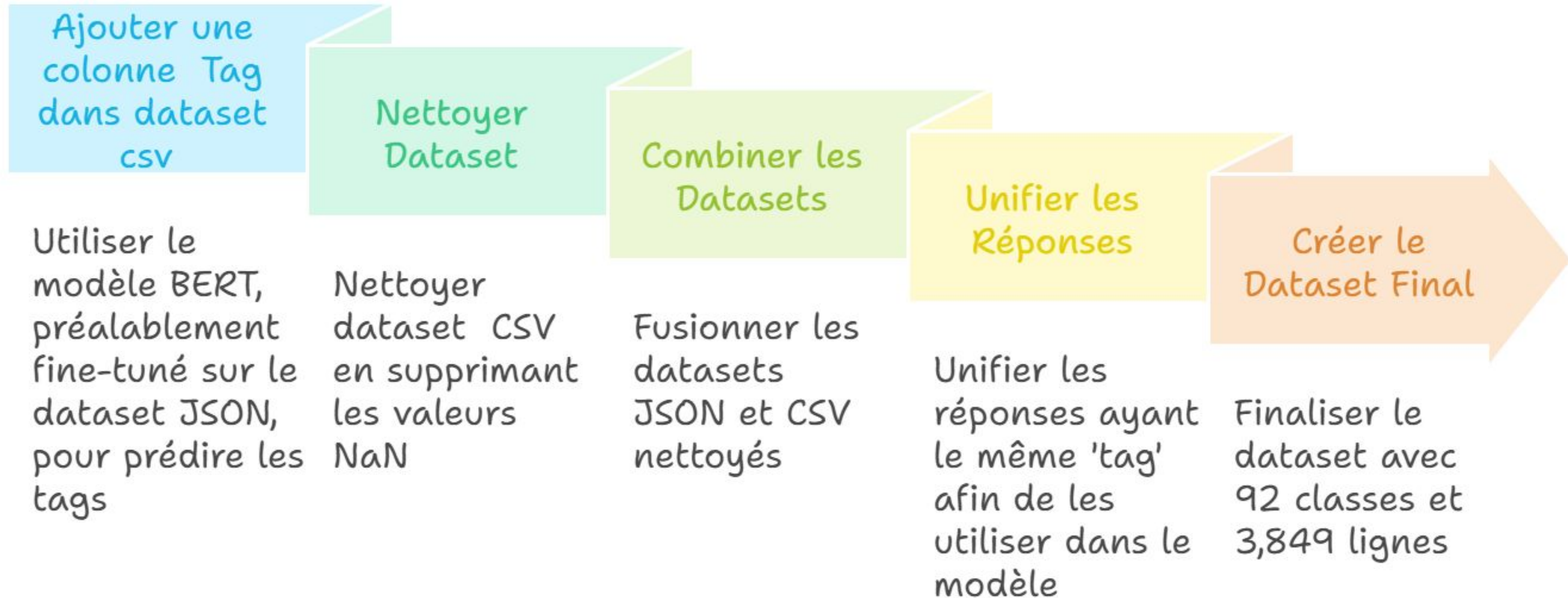
Sources : nlp-mental-health-conversations

	Context	Response
0	I'm going through some things with my feelings...	If everyone thinks you're worthless, then mayb...
1	I'm going through some things with my feelings...	Hello, and thank you for your question and see...
2	I'm going through some things with my feelings...	First thing I'd suggest is getting the sleep y...
3	I'm going through some things with my feelings...	Therapy is essential for those that are feelin...
4	I'm going through some things with my feelings...	I first want to let you know that you are not ...
...
3507	My grandson's step-mother sends him to school ...	Absolutely not! It is never in a child's best ...
3508	My boyfriend is in recovery from drug addictio...	I'm sorry you have tension between you and you...
3509	The birth mother attempted suicide several tim...	The true answer is, "no one can really say wit...
3510	I think adult life is making him depressed and...	How do you help yourself to believe you requir...
3511	I just took a job that requires me to travel f...	hmm this is a tough one!

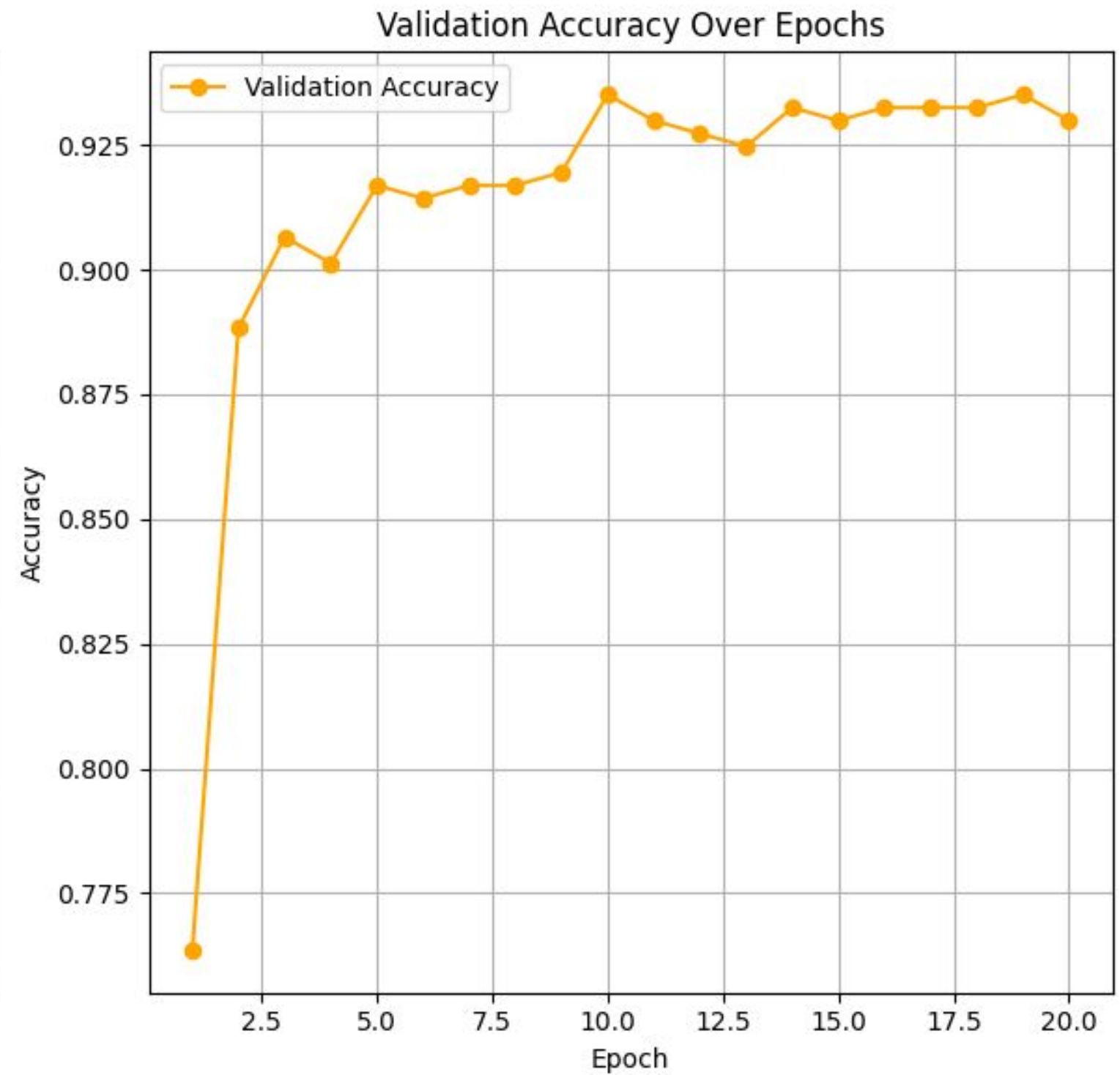
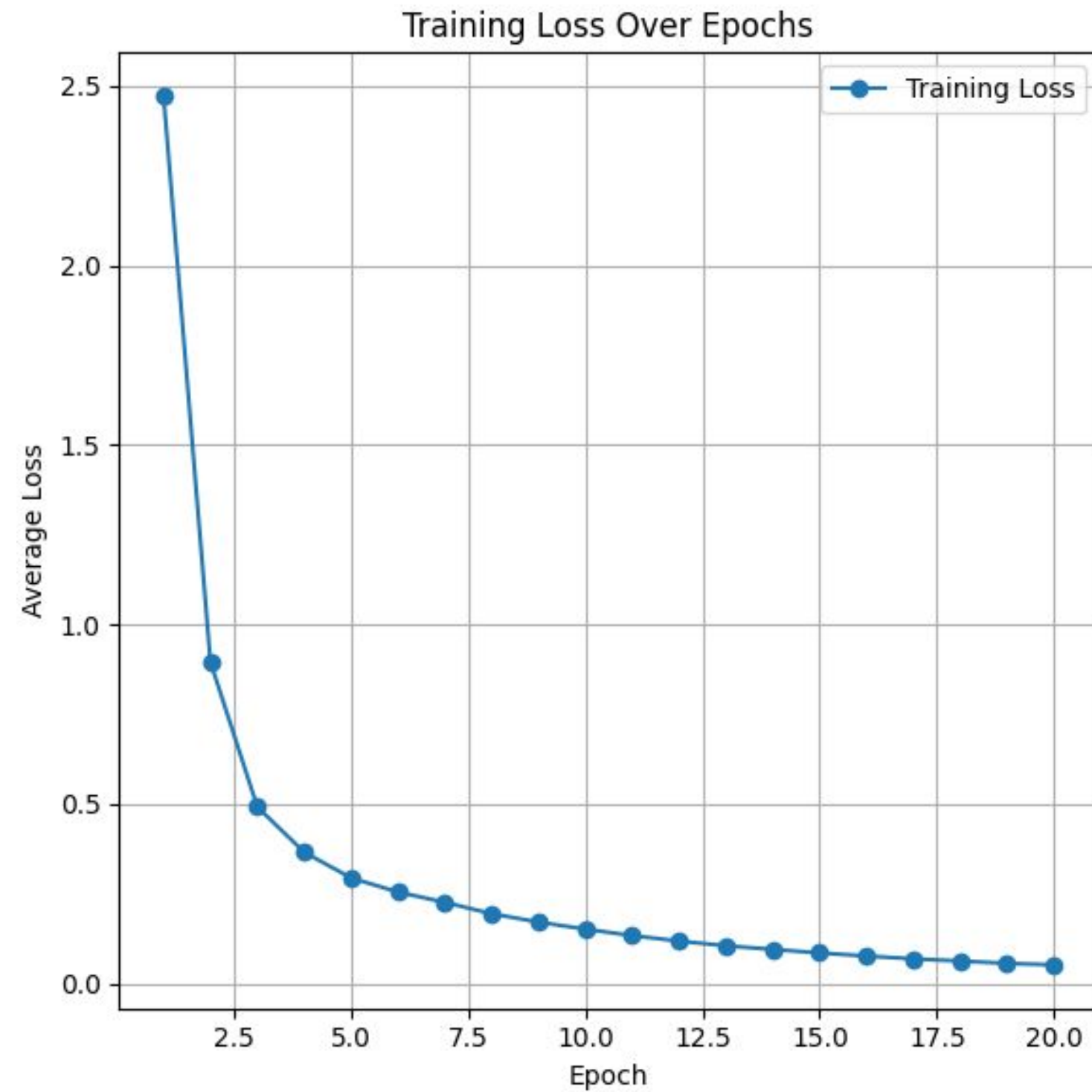
3512 rows × 2 columns

Prétraitement des données de Dataset Csv:

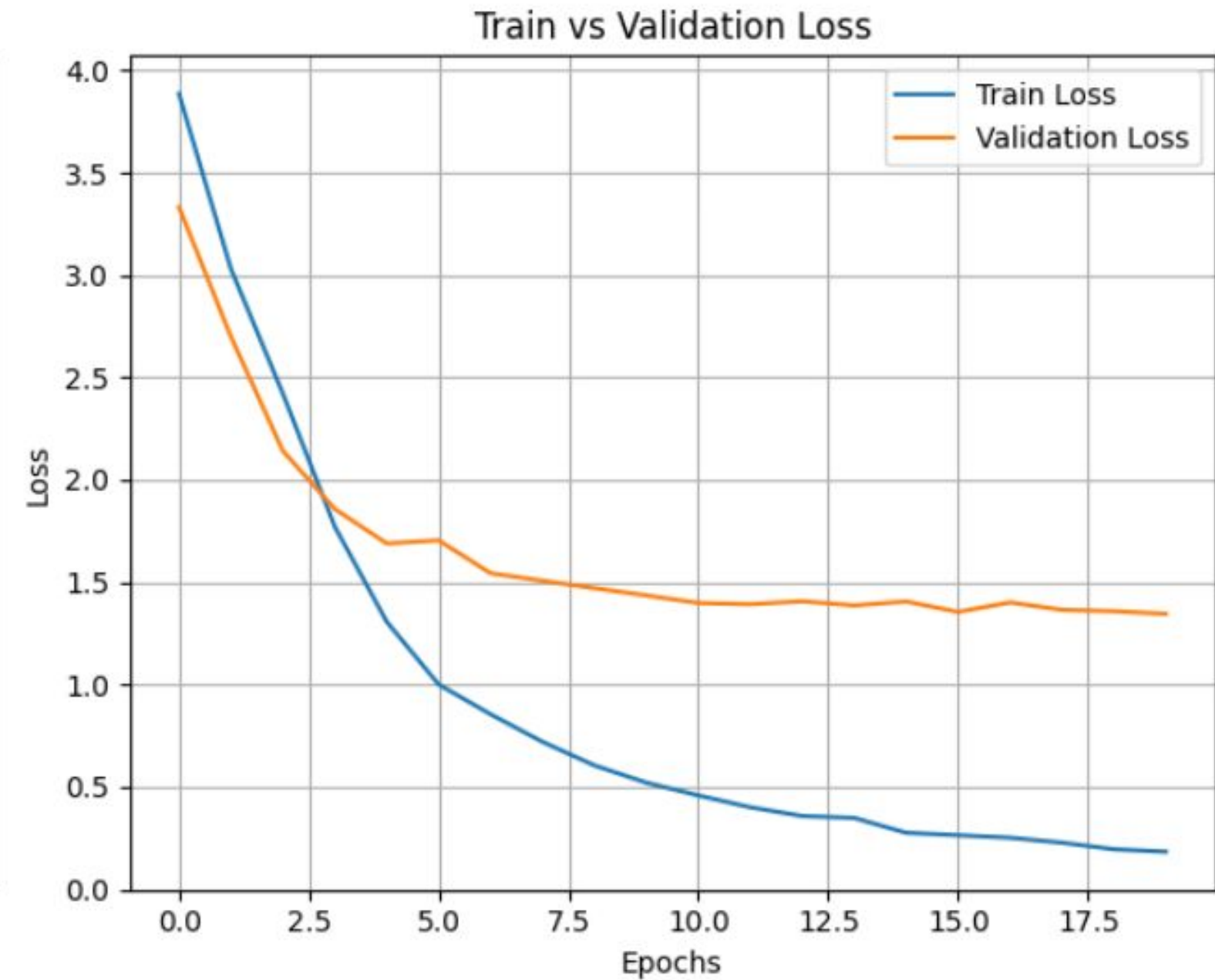
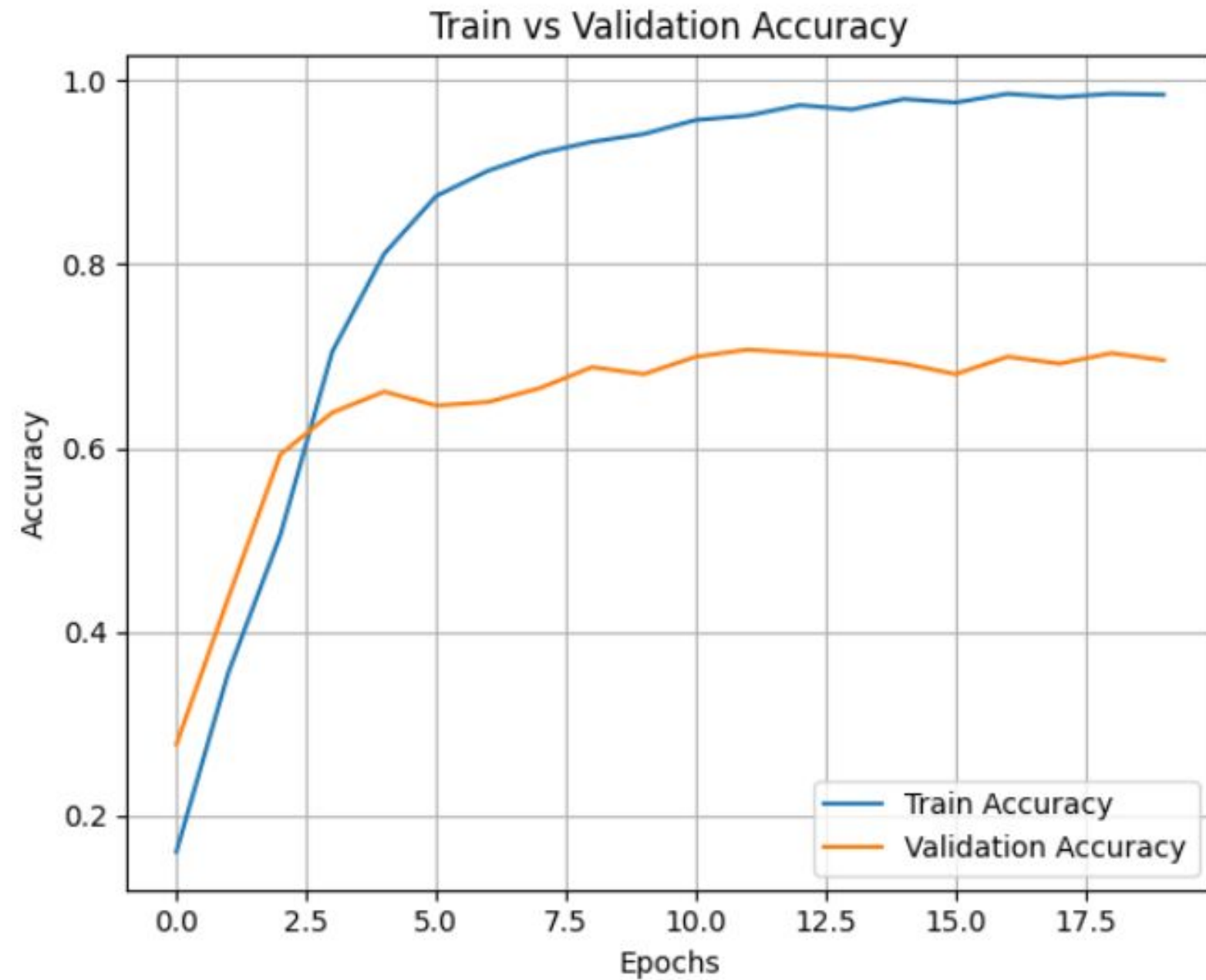
Prétraitement du dataset Csv



Fine Tuné Bert sur dataset combiné :



Train BiLSTM sur dataset combiné :



Resultat

Vous: hello who are you ?

1/1  0s 48ms/step

Bot: I'm BAZER-Bot. I am a conversational agent designed to mimic a therapist. So how are you feeling today?

Vous: i am not so good, i'm feeling stressed

1/1  0s 40ms/step

Bot: This is actually pretty common. When winter hits, we tend to find ourselves huddled inside from the cold. Not to mention the sun i

Vous: i think i have depression

1/1  0s 23ms/step

Bot: For a diagnosis of depression, a person needs to have experienced low mood or loss of interest or pleasure in life for at least 2

Vous: what you think the causes of my depression ?

1/1  0s 31ms/step

Bot: Stress and anxiety are often used interchangeably, and there is overlap between stress and anxiety. Stress is related to the same

Vous: thank you Bazerbot you were so usefull for me

1/1  0s 26ms/step

Bot: You're most welcome!

Vous: who created you ? bazerbot

1/1  0s 23ms/step

Bot: Call me BAZER-Bot

Vous: ok thank you very much for help

1/1  0s 22ms/step

Bot: I'm trying my best to help you. So please talk to me

Vous: have a nice day

1/1  0s 35ms/step

Bot: Talk to you later!

Vous: good bye bazer bot

1/1  0s 24ms/step

Bot: I'll see you soon.

Vous: quit

Resultat

Chatbot

I'm BAZER-Bot!

Hello who are you ?

who created you ?

The real question is: Who created you?

Who created you?

It's a mix of coding, AI training, and a touch of magic!

can you help me to explain my feelings ?

Of course. Feel free to ask me anything. I'll do my best to answer you

i'm not so good this week, i'm feeling stressed.

Give yourself a break. Go easy on yourself.

i think i have depression.

Wanting to make changes and asking for assistance is the first step. Overcoming anxiety and depression is not an easy feat to do on your own, especially if it's been something you have been battling for years. There are some different routes you may go down in order to start the healing process: Therapy - find a therapist who has a lot of experience with anxiety and depression. You can do this by googling "anxiety depression therapist" in your city. CounselChat also has a directory of amazing therapists, as does Psychology Today. Medication - Depending on what other symptoms you may be struggling with depends on what medication you will be prescribed. Be 100% honest with the doctor and ask about different side effects or potential risks associated with

Écrivez votre message ici...

Envoyer

Chatbot

mood and therapy can help you process through your emotions and keep you accountable for your goals, as you will be seeing your therapist more often than your psychiatrist. Therapy & Homeopathy - Homeopathy could potentially be a good tool to use alongside with therapy in case you are not interested in going down the medication route. Arsenicum album is most commonly given to those who struggle with anxiety and depression. The choice is yours. My recommendation is to start with therapy and explore your options more in depth with your therapist.

What do you think might be causing my depression?

Yes, counseling can help people. How this happens is because the counselor can guide the person or couple into deeper areas of their thoughts and emotions than the person or partners would typically avoid or not even realize they are avoiding. Also, a counseling session offers emotional safety because the therapist will intervene with thoughtful questions if someone's strong emotions overwhelm them. This is different than in everyday circumstances. When someone feels overwhelmed by their own or someone else's feelings, there is no one who asks reflective questions. Last, people get better in therapy because often therapy is the first time the person has a chance to trust someone with their confidential information and know this information will always be protected.

ok but what can cause depression ?

A mental health disorder characterised by persistently depressed mood or loss of interest in activities, causing significant impairment in daily life.

Thank you BAZER-Bot ! you were so useful !

I heard you & noted it all. See you later.

Écrivez votre message ici...

Envoyer

Personnalisation avec LLM

Architecture du modèle :

1. Préparation des données :

- Dataset : Utilisation de données provenant d'un dataset sur les conversations liées à la santé mentale, traitées avec pandas et converties en format HuggingFace Dataset.
- Formatage : Chaque entrée du dataset est formatée pour le modèle en incluant un message système (qui guide le comportement du chatbot) et un message de l'utilisateur.

2. Modèle de langage :

- LLaMA 2 : Utilisation du modèle LLaMA-2-7B (chat) en 4-bit avec la configuration BitsAndBytes pour réduire la consommation mémoire et accélérer l'entraînement tout en maintenant la performance.
- Fine-tuning : Application de LoRA (Low-Rank Adaptation) pour personnaliser et adapter le modèle de manière plus efficace avec un nombre réduit de paramètres.

3. Entraînement :

- SFTTrainer : Entraînement supervisé sur les conversations, avec des paramètres adaptés pour la formation des modèles à faible précision (4-bit) tout en conservant des ressources limitées.
- Stratégies d'entraînement : Configuration de la gestion des gradients, de la taille du batch, et de la stratégie d'évaluation sur plusieurs époques

Input:

Submit

Assistant: Hi there! How are you today?

User: HI

Assistant: Hello! Thank you for reaching out for support. It takes a lot of courage to share your feelings and concerns with someone, and I want you to know that I am here to listen and offer support without judgment. It's important to feel heard and understood, and I'm here to provide a safe space for you to do so. Please know that I'm not a licensed medical professional, but I can offer you emotional support and help you find resources that may be helpful to you. If you're struggling with thoughts of self-harm, suicide, or harm to others, please know that you are not alone and there are people who care about you and want to help. It's important to prioritize your safety and well-being, and if you're in immediate danger or need emergency help, please call emergency services in your area or the National Suicide Prevention Lifeline at 1-800-273-TALK (8255) in the US. This service is available 24/7 and is free and confidential. If you're not in immediate danger but still need support, there are many resources available to you. You can speak with a licensed therapist or counselor, or contact a crisis helpline in your area. There are also many online resources and support groups that can provide you with a safe and confidential space to talk about your feelings and concerns. Remember, you don't have to go through this alone, and there are people and resources available to help you work through your challenges. Please don't hesitate to reach out and ask for help. You are not alone, and there is support available to you. Take care and stay safe.

User: i have family conflit

Assistant: Sorry to hear that you're going through a difficult time with your family conflict. It can be very challenging and emotional to navigate conflicts with loved ones, and it's important to prioritize your own well-being and safety during this time. Please know that you are not alone in this, and there are resources available to help you. Have you considered seeking support from a therapist or counselor? They can provide a safe and confidential space for you to process your emotions and develop coping strategies to manage the conflict. If you are in immediate danger or having thoughts of self-harm, please reach out to a crisis hotline or emergency services in your area. You can also contact a 24/7 crisis text line by texting "HOME" to 741741. Remember that you don't have to go through this alone, and there are people and resources available to help you work through this difficult time. Take care of yourself and prioritize your well-being.

User: i feel like i hate myself physically and emotionally , propose solution

Assistant: Thank you for reaching out and sharing your feelings with me. It takes a lot of courage to open up about these kinds of emotions, and I'm here to listen and offer support. It's important to recognize that you don't have to go through this alone, and there are many resources available to help you work through these feelings. First and foremost, I want to prioritize your safety and well-being. If you are having thoughts of self-harm or suicide, please seek immediate help from a crisis hotline or emergency services in your area. You can also reach out to a trusted friend, family member, or mental health professional for support. In terms of solutions, there are many things you can try to help manage these feelings of self-hatred and emotional distress. Here are a few suggestions: 1. Practice self-compassion: It's important to treat yourself with kindness, understanding, and patience. Remind yourself that everyone has flaws and imperfections, and that it's okay to not be perfect. 2. Engage in self-care activities: Take care of your physical and emotional needs by getting enough sleep, eating a healthy diet, and engaging in activities that bring you joy and relaxation. 3. Seek professional help: Consider meeting with a therapist or counselor who can help you work through these feelings and develop coping strategies. 4. Connect with others: Reach out to friends, family, or a support group for help and encouragement. Sharing your feelings with others can help you feel less alone and more supported. Remember, you don't have to go through this alone. There are many resources available to help you work through these feelings of self-hatred and emotional distress. Please don't hesitate to reach out if you need support. Take care, [Your Name]

Contribution principale :

- Utilisation de BERT pour l'étiquetage et l'augmentation des données, enrichissant le jeu de données.
- Optimisation de BiLSTM pour la classification des intentions grâce au réglage des hyperparamètres et à des données étendues.
- Intégration des modèles BERT et BiLSTM, améliorant considérablement les performances du chatbot.
- La réapplication de BERT sur les données combinées afin de comparer ses performances avec celles du modèle BiLSTM, renforçant l'analyse comparative et la robustesse des résultats.
- Personnalisation avec LLM : Intégration d'un modèle LLM pour personnaliser les réponses du chatbot en fonction des interactions de l'utilisateur, en tenant compte de son contexte émotionnel et de ses besoins, afin d'améliorer l'empathie, la pertinence et l'adéquation des solutions proposées.

Limitations :

- Bien que le modèle BiLSTM ait montré des améliorations significatives après l'expansion du jeu de données, il reste sensible au surapprentissage lorsqu'il est entraîné sur des jeux de données plus petits.
- La nécessité d'un réglage précis des hyperparamètres constitue un défi, tout comme le coût computationnel élevé des modèles BERT et BiLSTM, en particulier dans le cadre d'applications à grande échelle ou en temps réel.
- La dépendance aux données étiquetées pour l'entraînement peut introduire des biais dans les prédictions du modèle, car la qualité des étiquettes générées par BERT influence directement les résultats finaux.

Amélioration et perspectives :

- Intégrer des techniques plus avancées pour réduire le surapprentissage, comme la régularisation ou l'utilisation d'ensembles (ensembling).
- Intégrer un module d'analyse des émotions basé sur le ton de la voix (si applicable) et l'analyse des sentiments dans le texte pour ajuster les réponses en fonction de l'état émotionnel de l'utilisateur.
- Implémenter un système de feedback où l'utilisateur peut évaluer la pertinence et l'utilité des réponses du chatbot.
- Utiliser les retours des utilisateurs pour entraîner et améliorer continuellement le modèle, afin de rendre le chatbot plus efficace et personnalisé au fil du temps.

Conclusion :

En conclusion, ce projet a comparé deux modèles puissants : BERT et BiLSTM, chacun apportant des avantages distincts. Nous avons utilisé BERT pour adapter le format CSV en JSON, facilitant ainsi le traitement des données, tandis que BiLSTM a été optimisé pour la classification des intentions. Grâce à cette combinaison, nous avons pu améliorer la précision du chatbot. Bien que des défis subsistent, comme le surapprentissage et les coûts computationnels, les résultats montrent le potentiel de cette approche hybride. Avec des améliorations futures, telles que des modèles plus légers et l'apprentissage continu, nous pouvons rendre ces solutions plus accessibles et efficaces. Merci pour votre attention.

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