

Desafio Computer and Information Research Scientist

1. Aplicação

O candidato desenvolverá uma aplicação em Python, contendo algumas funcionalidades implementadas em C++.

- 1.1. A aplicação deverá ser executada no Linux.
- 1.2. A aplicação receberá como entrada:
 - Uma string contendo uma dissertação (essay);
 - Uma lista de strings contendo consultas (queries).
- 1.3. A aplicação irá:
 - Dividir a dissertação em frases;
 - Codificar as frases da dissertação e as questões em embeddings;
 - Calcular, para cada questão, qual a frase da dissertação que a responde melhor.

2. Dados de teste

- 2.1. Essay:
 - [Anexo 1.](#)
- 2.2. Queries:
 - What is courage?
 - What is bravery?
 - An example of a character in the literature who displays courage
 - An example of a character in the literature who exhibits bravery
 - What risks a courageous act entails?
 - What risks a brave act entails?

3. Funcionalidades

3.1. Pré-processamento da dissertação

Dividir a dissertação em frases.

3.2. Sentencing embeddings

Usando um codificador de sentenças, crie uma rotina em Python que receba uma string e retorne os embeddings do texto como uma classe (que chamaremos aqui de `SentenceEmbedding`) que deverá ser implementada em C++. Note que o codificador será em Python, mas a definição dessa classe ficará em C++, ou seja, será necessário, também, escrever bindings do C++ para o Python. Exemplo de cabeçalho da função:

py

def encode(sentence: str) -> SentenceEmbedding:

...

A classe `SentenceEmbedding` deverá armazenar, pelo menos, a sentença dada como entrada (parâmetro `sentence`) e os embeddings retornados pelo codificador (como um array de números de ponto flutuante).

Dicas:

- Usar um modelo para codificação de sentenças do [BERT](https://www.sbert.net/docs/sentence_transformer/pretrained_models.html).
- Usar torch para carregar e realizar inferências, e então converter array do torch para array do numpy.

3.3. Similaridade entre sentenças

A classe `SentenceEmbedding` deverá conter um método que recebe uma lista de `SentenceEmbedding`s, calcula alguma medida de similaridade entre ele e os da lista, e, ao final, retorna uma tupla contendo o índice do objeto mais similar dentro dessa lista e o valor calculado para essa similaridade.

3.4. Comunicação Python/C++

A comunicação entre Python e C++ deverá ser feita usando Pybind](<https://github.com/pybind/pybind11>).

3.5. Build

Criar um sistema de build utilizando uma ferramenta de sua escolha (exemplo: Make, CMake, Meson, Ninja, etc.) com instruções para a compilação.

3.6. Servidor HTTP

O candidato deverá integrar o código escrito em um servidor Web usando **Flask** (<https://flask.palletsprojects.com/en/3.0.x/>).

O candidato deverá disponibilizar um rota `/answers` que receberá um json contendo a dissertação e as questões no seguinte formato:

```
```json
{
 essay: <str>,
 queries: [
 <str>,
 <str>,
 ...
]
}
```
```

e retornará em um json as respostas no seguinte formato:

```
```json
{
 answers: [
 <str>,
 <str>,
 ...
]
}
```
```

4. Extra

Para os mais aventureiros, consideraremos como atividade extra reimplementar as funcionalidades descritas aqui utilizando de outras estratégias.

4.1. Docker

O candidato deverá usar Docker para encapsular o programa em container e executá-lo.

4.2. Versionamento

O candidato deverá usar Git para versionar a solução registrando todo o processo de desenvolvimento. Por fim, o projeto deverá ser publicado em um repositório privado no GitHub e compartilhado com os avaliadores.

5. Entrega

Ao concluir o desafio, envie um e-mail para rh@most.com.br para avaliação do projeto.

6. Avaliação

Será avaliado do candidato:

- Boas práticas de programação;
- Otimização da solução;
- Uso de funcionalidades modernas das linguagens;
- Organização do código (modularização, comentários, nomenclatura de funções, etc.);
- Tipificação (mesmo em Python);
- Qualidade das respostas da API;
- Criatividade da solução (divisão em frases, cálculo da similaridade, utilização de implementações próprias, etc.);
- Capacidade de buscar e mesclar diferentes soluções.

Anexo 1:

At first glance, courage and bravery might seem like synonyms, two words used interchangeably to describe the quality of being fearless in the face of danger. However, a closer look reveals subtle but significant differences between these two traits that are central to the human experience. It's like comparing the calm, steady flame of a candle to the bright, bold firework – both are sources of light, yet they illuminate in distinct ways. But what precisely is the difference between courage and bravery?

Defining Courage.

Courage is not merely the absence of fear but the ability to act in spite of it. It is a composite of mental and moral fortitude. Courage lies in the center of enabling individuals to face daunting circumstances with resilience. This extends beyond the realm of physical dangers and covers the psychological and moral spheres. For instance, courage is manifest in a person who speaks up against injustice despite potential social repercussions. It's also seen in individuals battling chronic illnesses, persisting through pain and uncertainty. This aspect of courage highlights its depth, transcending momentary acts to become a sustained state of being.

In "To Kill a Mockingbird" by Harper Lee, Atticus Finch, the protagonist, exhibits profound moral courage. He defends a Black man, Tom Robinson, accused of a crime he didn't commit, in a racially prejudiced town. This act of standing up for justice, despite societal backlash and personal risk, showcases Atticus's deep-rooted courage. His courage lies not in a lack of fear, but in his commitment to what is right, even when it is unpopular and dangerous.

Or if you are more of an Orwell fan, in his book "1984", Winston Smith, the main character, displays psychological courage and strength in his quiet rebellion against the oppressive regime of Big Brother. His act of keeping a diary, falling in love, or even thinking against the Party's doctrine, demonstrates a kind of internal



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courage. It's a rebellion not just against the state but against the pervasive fear it instills, making Winston's acts emblematic of courage in the face of psychological and ideological control.

Defining Bravery.

Bravery, often perceived as a subset of courage, is characterized by bold action in the face of danger, particularly physical. It's the instinctive response during emergent situations requiring immediate action. Bravery is the firefighter rushing into a burning building, the soldier defending their country, or the bystander intervening in a crisis. This concept is frequently associated with a lack of fear, but in reality, it often involves recognizing one's fear and choosing to act regardless. Bravery is less about the absence of fear and more about the mastery over it.

If you ever heard of J.R.R. Tolkien, you might be familiar with his underrated series of books called "Lord of the Rings" (but we doubt it, you know such niche literature). Bilbo Baggins, a hobbit who prefers a quiet life, displays remarkable bravery when he faces the dragon Smaug. Despite his initial reluctance and fear, Bilbo confronts a literal giant in his path, a clear demonstration of bravery. This act is a bold, direct confrontation with a physical threat, embodying the essence of bravery.

Another fitting example of bravery can be seen in "Harry Potter and the Sorcerer's Stone" by the one who-shall-not-be-named. Harry Potter's decision to go after the Sorcerer's Stone to prevent it from falling into the wrong hands illustrates bravery. The act of sneaking past teachers, facing magical challenges, and ultimately confronting Professor Quirrell and Voldemort, are actions taken in the face of immediate physical danger. Harry's actions are not just about overcoming fear but actively confronting a dangerous and uncertain situation, typifying bravery.



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These examples from literature vividly capture the essence of courage and bravery, highlighting how characters in different situations embody these virtues in their actions and decisions.

Pointing Out the Distinctions Between Courage and Bravery.

While courage and bravery are distinct, they often intertwine. Bravery can be seen as an actionable expression of courage. It's the moment courage steps into the light, transforming internal resolve into external action. In this sense, bravery is the visible manifestation of the deeper, enduring quality of courage.

Circumstances Matter.

When we talk about courage vs bravery, the contexts in which they are applied significantly differ. Courage is more versatile; it can show up in a range of situations. For example, a person demonstrating moral courage might stand up against unfair practices at work, knowing well it could risk their job. It also appears in personal battles, like someone dealing with an illness over many years, showing emotional and psychological strength. On the other hand, bravery is often linked to physical acts in immediate, often dangerous situations. Like a passerby rushing to help in an accident, bravery shines in these urgent, often life-threatening moments, where you have to take the leadership.

Nature of the Risk.

The risks involved in bravery vs courage are quite distinct. Courage encompasses a broad spectrum, dealing with risks that are not just physical but also moral, emotional, and psychological. For instance, a whistleblower exposing corruption shows courage by facing potential backlash, reflecting moral risk. In contrast, bravery usually relates to physical dangers that demand immediate action. Think of a firefighter entering a blazing building to save lives; this is bravery in its most typical form, confronting direct, physical peril and showing strength. While courage



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can be a quiet, internal struggle against fears, bravery is often a visible, external fight against tangible dangers.

Emotional Involvement.

The emotional aspects of courage and bravery also differ. Courage often involves a deeper, more reflective process. It's about understanding one's fears, evaluating the risks and consequences, and then deciding to act despite them. This might be seen in someone who decides to speak publicly about a personal issue, knowing it could invite criticism but feeling it's important to share their story. In contrast, bravery often requires a more immediate, instinctive reaction. It's less about long deliberation and more about quick, decisive action in the face of danger like someone instinctively running into a risky situation to help others without pausing to weigh the consequences.

Closing Thoughts.

In conclusion, courage and bravery, while overlapping, are distinct virtues. Courage is a broader term signifying the endurance of both physical and psychological challenges, often sustained over time. Bravery is more immediate, typically associated with physical risks and bold actions. Understanding their nuances not only enriches our vocabulary but also deepens our appreciation for the complexity of human resilience and the diversity of its expressions. Both, in their own right, contribute to the human experience.