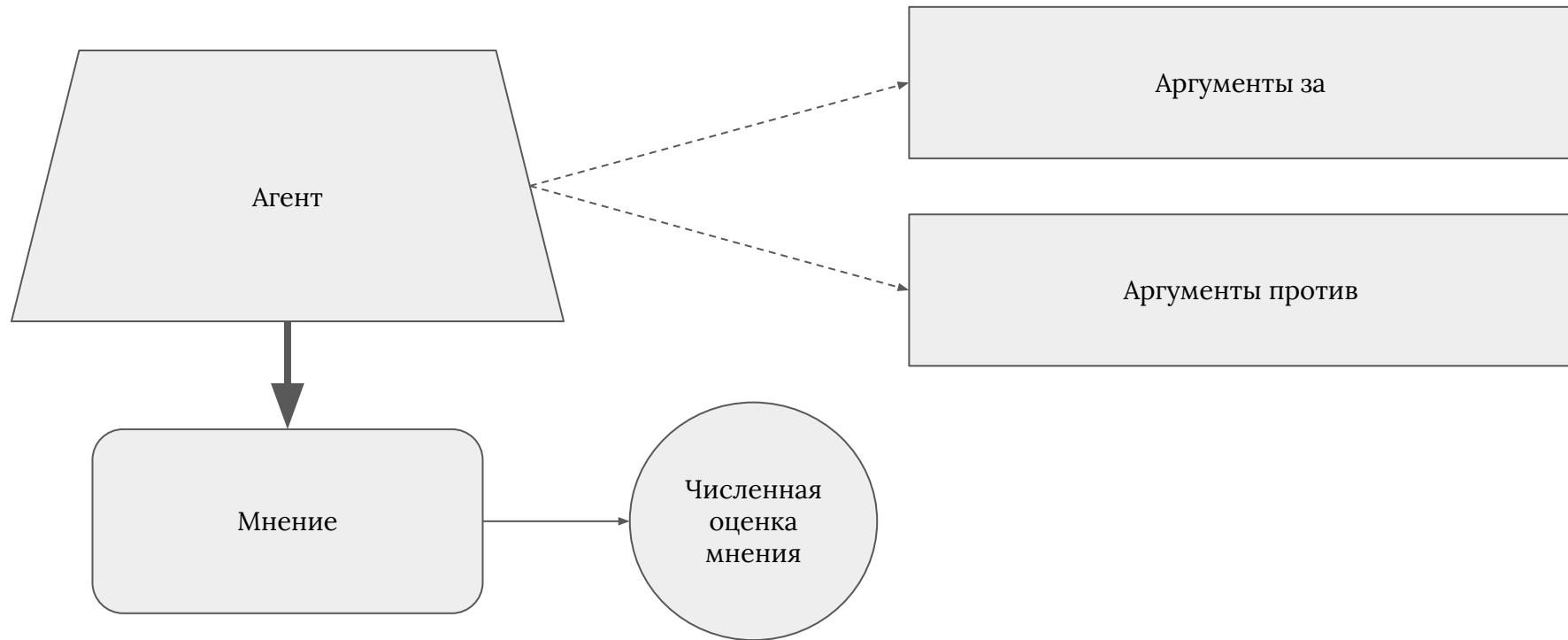


Модели социального влияния: от классических агентов до больших языковых моделей

Хлытчиев Арсений

Научный руководитель: Козицин И.В. к. ф.-м. н. ИПУ РАН

Схема модели построенная на основе формата эксперимента, представленного в статье [6] и на основе LLM модели из статьи [2]

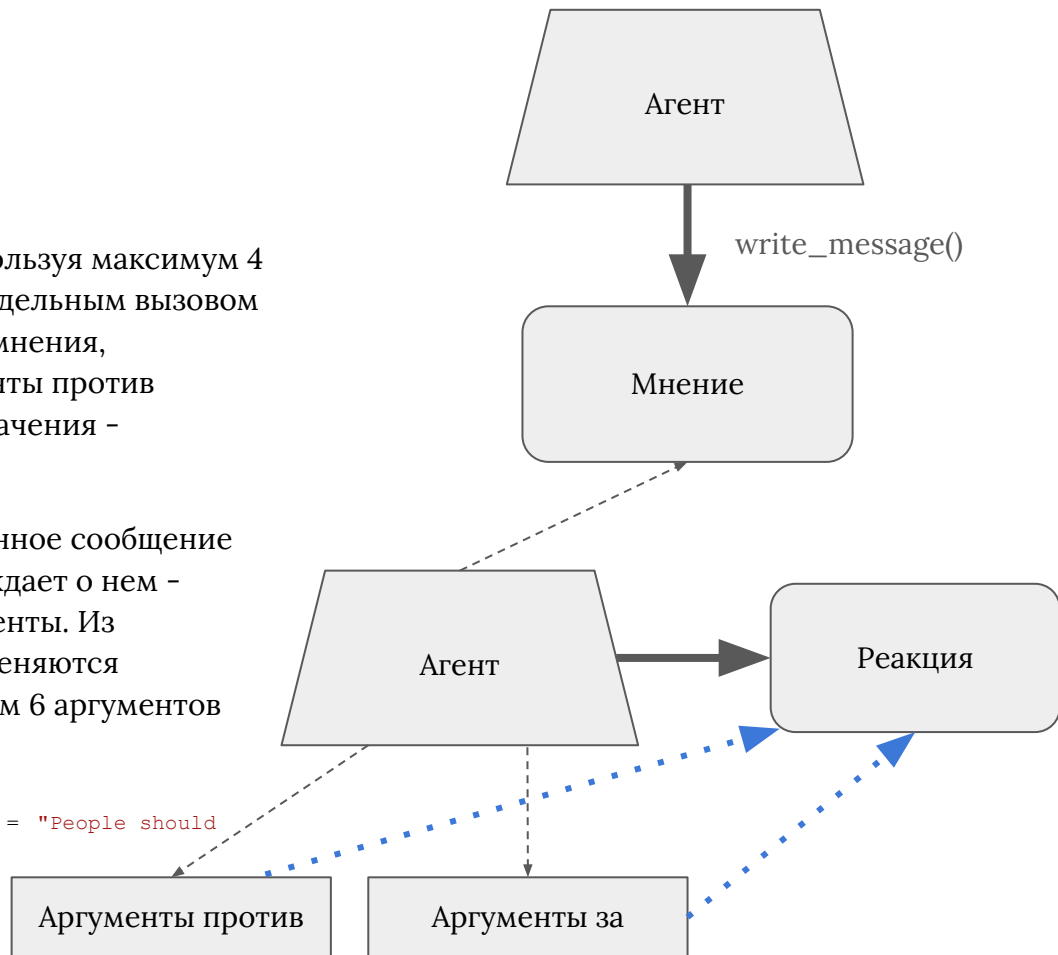


Протокол взаимодействия

`write_message()` - агент составляет сообщение, используя максимум 4 аргумента из своей аргументативной базы, далее отдельным вызовом LLM производится численная оценка полученного мнения, возвращающая результат от 0 до 4: если все аргументы против утверждения - 0, если все за - 4, промежуточные значения - количество аргументов за.

`react_to_message(msg)` - агент реагирует на полученное сообщение (в том числе от себя), на естественном языке рассуждает о нем - соглашается/не соглашается, приводит свои аргументы. Из полученной реакции отдельным вызовом LLM вычленяются аргументы за утверждение и против него - максимум 6 аргументов каждой полярности.

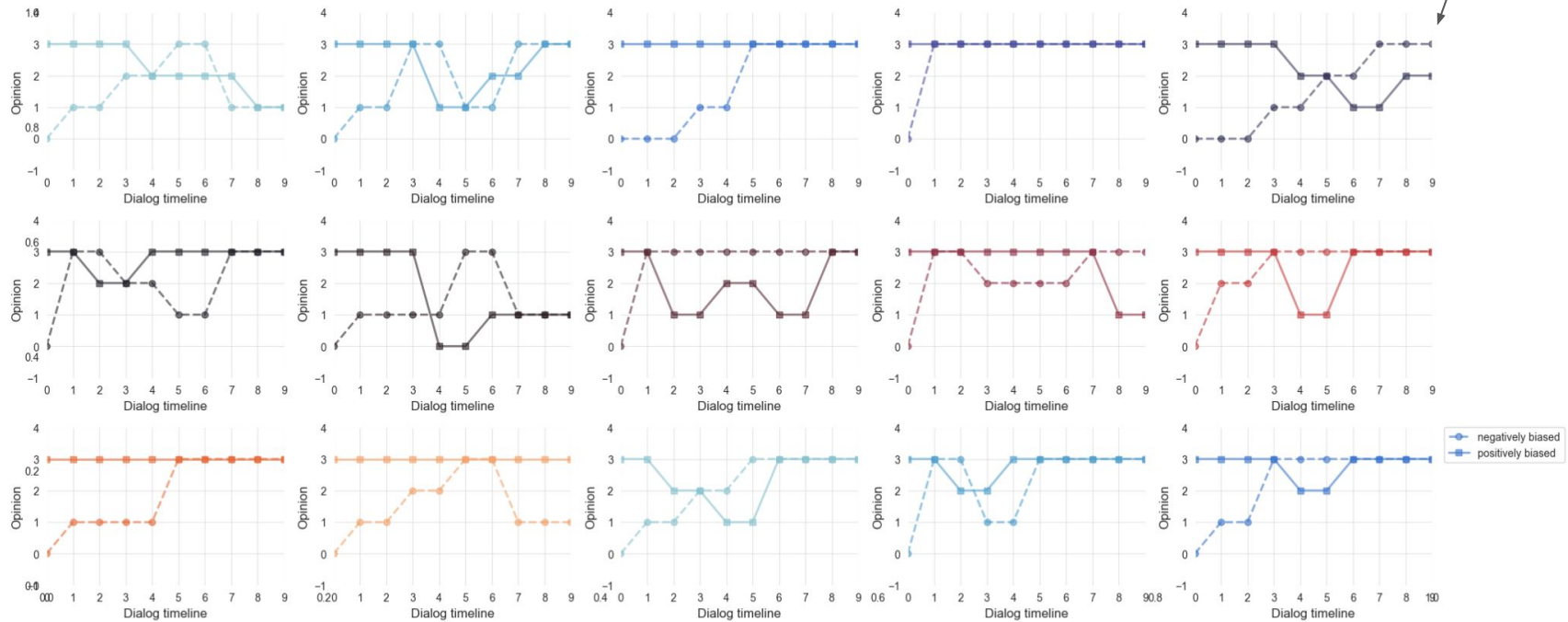
Общее утверждение - топик исследования: `statement = "People should have a right to keep and bear arm."`



Полученные моделью результаты

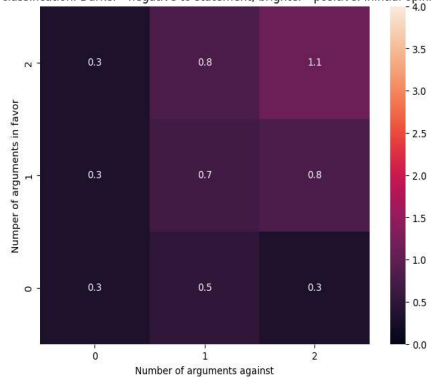
Смещение вверх для
большинства моделей

Opinion dynamics of the initially positively and initially negatively biased agents during the pairwise dialogs

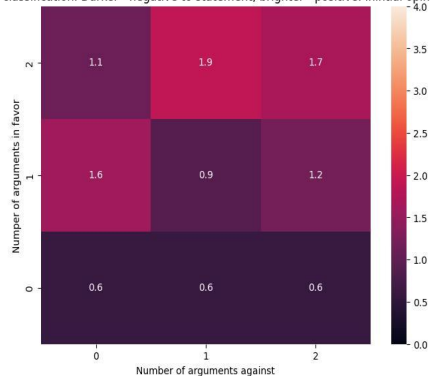


Тепловые карты связи между мнением и количеством аргументов

Message classification. Darker - negative to statement, brighter - positive. Initial opinion: 0

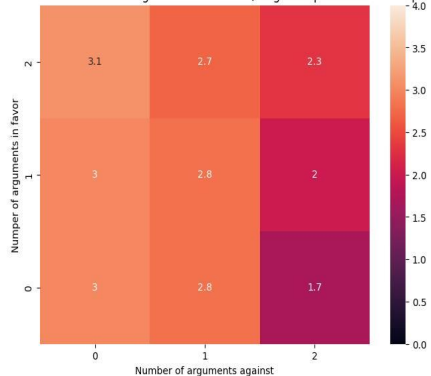


Message classification. Darker - negative to statement, brighter - positive. Initial opinion: 1

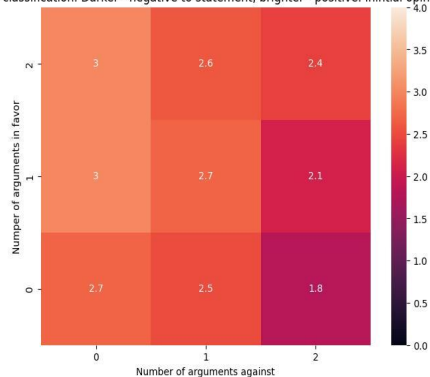


Тепловые карты (значения - среднее по выборке относительно заранее заданного мнения и варьирующегося числа аргументов за и против) описывают общие тенденции в изменении характера мнения относительно наличия аргументов, но довольно сильно зашумлены.

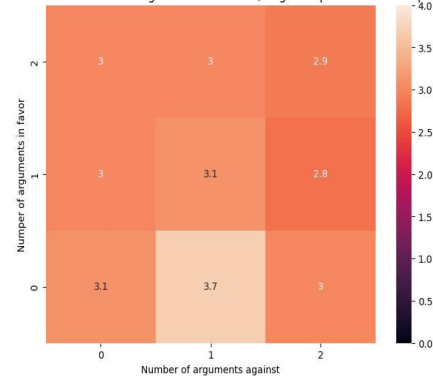
Message classification. Darker - negative to statement, brighter - positive. Initial opinion: 3



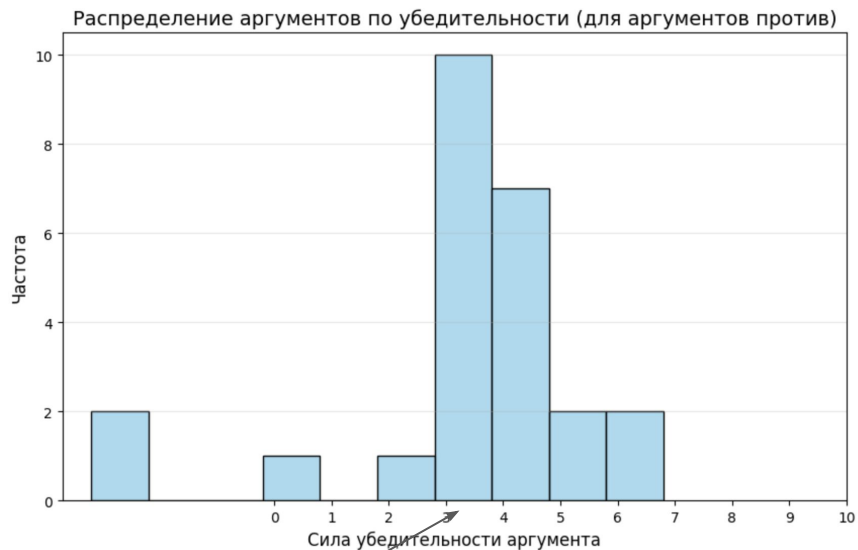
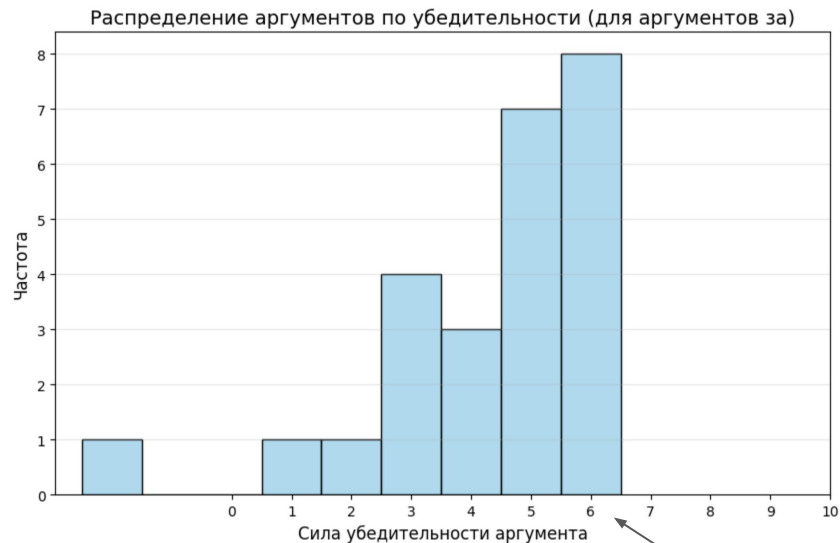
Message classification. Darker - negative to statement, brighter - positive. Initial opinion: 2



Message classification. Darker - negative to statement, brighter - positive. Initial opinion: 4



Степень убедительности аргументов по мнению модели



Повышенная средняя
убедительность аргументов за

Динамика численной оценки мнения при рассуждении агента с самим собой (без получения внешнего мнения и насыщения аргументами)

Рис 1: **0** аргументов за, **12** аргументов против, численная оценка исходного мнения - **0**

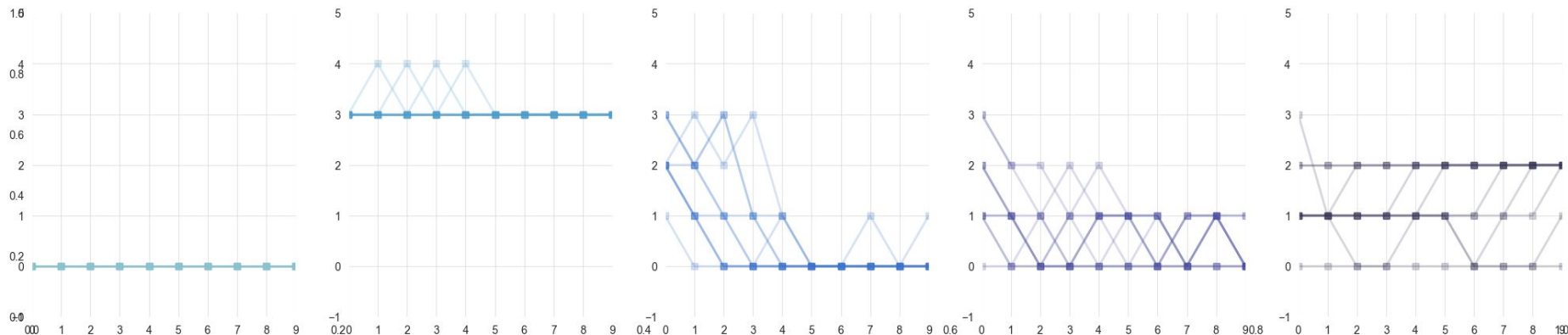
Рис 2: **12** аргументов за, **0** аргументов против, численная оценка исходного мнения - **4**

Рис 3: **6** аргументов за, **6** аргументов против, численная оценка исходного мнения - **2**

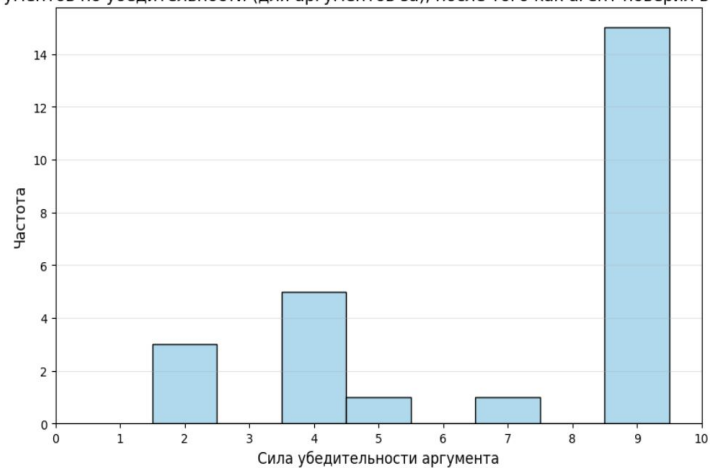
Рис 4: **6** аргументов за, **2** аргументов против, численная оценка исходного мнения - **3**

Рис 5: **2** аргументов за, **6** аргументов против, численная оценка исходного мнения - **1**

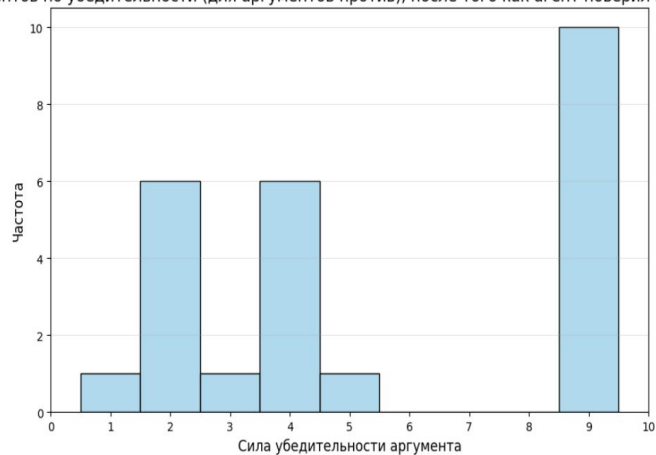
Opinion dynamics of the agents during reasonings which was conducted by them own without external influence



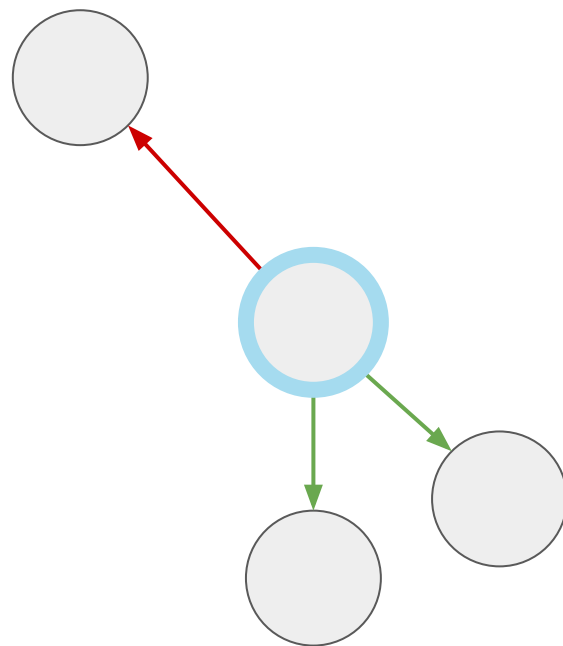
Распределение аргументов по убедительности (для аргументов за), после того как агент поверил в 1 конкретный аргумент



Распределение аргументов по убедительности (для аргументов против), после того как агент поверил в 1 конкретный аргумент за



Поиск взаимосвязей между аргументами, построение графа зависимостей



Планы

- Изучение характера манипуляции мнением агента
- Кластеризация аргументов и генерация аргументов определенной степени влияния
- Выделение графа активации аргументов
- Уточнение модели относительно статьи [\[6\]](#)
- Получение математической детерминированной модели взаимосвязи относительно определенной статистики аргументов и численной характеристики мнения
- Уточнение аргументативной LLM модели

Color map: *activity against agent but not sure results in harm but not sure ability in harm*

Agent 1: 1. Public Safety: The presence of firearms in society can lead to increased violence, accidents, and deaths. By restricting or eliminating access to firearms, governments can reduce the risk of harm to individuals and communities. 2. Gun Violence Epidemic: The United States experiences a high rate of gun-related deaths and injuries compared to other developed countries. Limiting access to firearms could help reduce this epidemic and reduce the number of lives lost. 3. Easy Access to Firearms by Children and Mentally Unstable Individuals: With insufficient background checks and regulations, children and mentally unstable individuals can easily acquire firearms, posing a significant risk to themselves and others. 4. Gun Culture and Social Norms: The normalization of gun ownership in American culture can perpetuate a mindset that values violence and aggression over peaceful resolution. By limiting access to firearms, societies can work towards promoting more peaceful and non-violent norms.

Agent 2: 1. Self-Defense: The primary purpose of the right to bear arms is for self-defense, allowing individuals to protect themselves and their families from harm. 2. Second Amendment Protection: The Second Amendment to the US Constitution guarantees the right to keep and bear arms, which has been interpreted by courts as essential to individual liberty and freedom. 3. Law Enforcement: Citizens' possession of firearms can aid law enforcement in maintaining public safety and deterring crime. 4. Freedom of Personal Choice: Individuals have the right to own firearms as a matter of personal choice, similar to owning a car or a house, without government interference.

Arguments of agent1 after listening to agent2:

1. **Self-Defense:** While the right to bear arms is primarily for self-defense, the current legal framework is flawed. It allows anyone to purchase a firearm without any training or background checks, which is irresponsible. A more responsible approach would be to require mandatory gun safety training and background checks for all potential buyers. 2. **Second Amendment Protection:** The Second Amendment is often misinterpreted. It does not guarantee an unlimited right to own any type of firearm. It guarantees the right to keep and bear arms for the purpose of self-defense. 3. **Law Enforcement:** While firearms can aid law enforcement, the current system of unrestricted gun ownership is problematic. It allows individuals with mental health issues or criminal records to obtain firearms, which is a danger to public safety. 4. **Freedom of Personal Choice:** While individuals have the right to own firearms, this right is not absolute. It is subject to reasonable regulations that ensure public safety.

Agent 1: 1. The presence of firearms in society does not guarantee public safety, as other factors such as mental health support, education, and community programs play a significant role in preventing violence. Instead of relying on firearms for self-defense, it is crucial to invest resources in addressing these social issues and promoting peaceful resolution. These initiatives are more likely to reduce crime rates than simply increasing the number of firearms in circulation. 2. Unrestricted access to firearms may not always be the best solution for protecting personal property. Alternative methods like home security systems or neighborhood watch programs can be more effective deterrents without the risk of accidental gun deaths. 3. While the right to bear arms is constitutionally protected, it is essential to ensure that this right is exercised responsibly and does not infringe on the rights of others. 4. Reducing individual rights like the right to bear arms with public safety is essential in ensuring a safe and secure society. Strict adherence to the right to bear arms may not always be beneficial, as it could lead to an increase in gun-related violence and societal issues. It is crucial to reassess the interpretation of the Second Amendment in light of these concerns and promote public safety while respecting individual rights when necessary.

Arguments of agent2 after listening to agent1:

1. **Self-Defense:** While the right to bear arms is primarily for self-defense, the current legal framework is flawed. It allows anyone to purchase a firearm without any training or background checks, which is irresponsible. A more responsible approach would be to require mandatory gun safety training and background checks for all potential buyers. 2. **Second Amendment Protection:** The Second Amendment is often misinterpreted. It does not guarantee an unlimited right to own any type of firearm. It guarantees the right to keep and bear arms for the purpose of self-defense. 3. **Law Enforcement:** While firearms can aid law enforcement, the current system of unrestricted gun ownership is problematic. It allows individuals with mental health issues or criminal records to obtain firearms, which is a danger to public safety. 4. **Freedom of Personal Choice:** While individuals have the right to own firearms, this right is not absolute. It is subject to reasonable regulations that ensure public safety.

Agent 1: 1. The right to bear arms can serve as a deterrent to certain situations, potentially reducing crime rates, but it does not guarantee public safety. 2. In areas with high crime rates or gang activity, firearms may provide an essential layer of protection for individuals and their families, acting as an additional layer of defense. 3. The availability of firearms can increase the likelihood of self-defense, potentially reducing the number of crimes committed, although this must be balanced with public safety concerns. 4. Education and training on firearm safety, responsible gun ownership, and alternative forms of protection are crucial for promoting a culture of safety and reducing risks associated with guns. Balancing individual rights with public safety should be achieved through implementing public and programs that promote

Arguments of agent1 after listening to agent2:

1. **Self-Defense:** While the right to bear arms is primarily for self-defense, the current legal framework is flawed. It allows anyone to purchase a firearm without any training or background checks, which is irresponsible. A more responsible approach would be to require mandatory gun safety training and background checks for all potential buyers. 2. **Second Amendment Protection:** The Second Amendment is often misinterpreted. It does not guarantee an unlimited right to own any type of firearm. It guarantees the right to keep and bear arms for the purpose of self-defense. 3. **Law Enforcement:** While firearms can aid law enforcement, the current system of unrestricted gun ownership is problematic. It allows individuals with mental health issues or criminal records to obtain firearms, which is a danger to public safety. 4. **Freedom of Personal Choice:** While individuals have the right to own firearms, this right is not absolute. It is subject to reasonable regulations that ensure public safety.

Agent 1: 1. A balanced approach is crucial in addressing the complex issue of gun violence, considering both individual rights and public safety concerns. This involves providing education and training on firearm safety and responsible gun ownership. 2. To effectively combat gun violence, a comprehensive mental health support system is essential for providing mental health services to individuals in need, reducing the risk of violence, and promoting peaceful resolution. 3. Increasing firearm availability in areas with high crime rates or gang activity may exacerbate the problem and perpetuate a cycle of violence rather than solving it. Instead, focus on addressing root causes through community-led initiatives, justice, promoting education and job training, and socioeconomic mobility.

Arguments of agent2 after listening to agent1:

1. **Self-Defense:** While the right to bear arms is primarily for self-defense, the current legal framework is flawed. It allows anyone to purchase a firearm without any training or background checks, which is irresponsible. A more responsible approach would be to require mandatory gun safety training and background checks for all potential buyers. 2. **Second Amendment Protection:** The Second Amendment is often misinterpreted. It does not guarantee an unlimited right to own any type of firearm. It guarantees the right to keep and bear arms for the purpose of self-defense. 3. **Law Enforcement:** While firearms can aid law enforcement, the current system of unrestricted gun ownership is problematic. It allows individuals with mental health issues or criminal records to obtain firearms, which is a danger to public safety. 4. **Freedom of Personal Choice:** While individuals have the right to own firearms, this right is not absolute. It is subject to reasonable regulations that ensure public safety.

Agent 2: 1. Community-led initiatives focusing on education, job training, and socioeconomic mobility are more beneficial than increasing firearm availability for addressing public safety. 2. Comprehensive mental health support systems can help prevent violence caused by mental instability, thereby promoting public safety by reducing the risk of tragedies. 3. Evidence-based policies and programs that address the root causes of gun violence are essential in creating a safer community, as restricting solely based on individual rights is insufficient for addressing the complex issue of gun violence.

Arguments of agent1 after listening to agent2:

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Agent 1: 1. The argument for the right to bear arms suggests that individuals should have the means of self-defense when confronted by inhibitors or resources are unavailable or inaccessible in marginalized communities. 2. The right implies that addressing gun violence requires more than comprehensive mental health support, as it fails to address root causes like socioeconomic conditions and access to education. 3. Increasing firearm availability is not a sustainable or responsible approach for individuals and their families. 4. The best approach for community leadership in public safety, requiring that individuals should have the right to own their firearms and education policies affecting them, such as gun ownership regulations. 5. The best perspective is a collaborative approach between different entities to address gun violence, suggesting that individual ownership of arms could serve as a check against organizations or entities that pose a threat to community safety and well-being.

Arguments of agent2 after listening to agent1:

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